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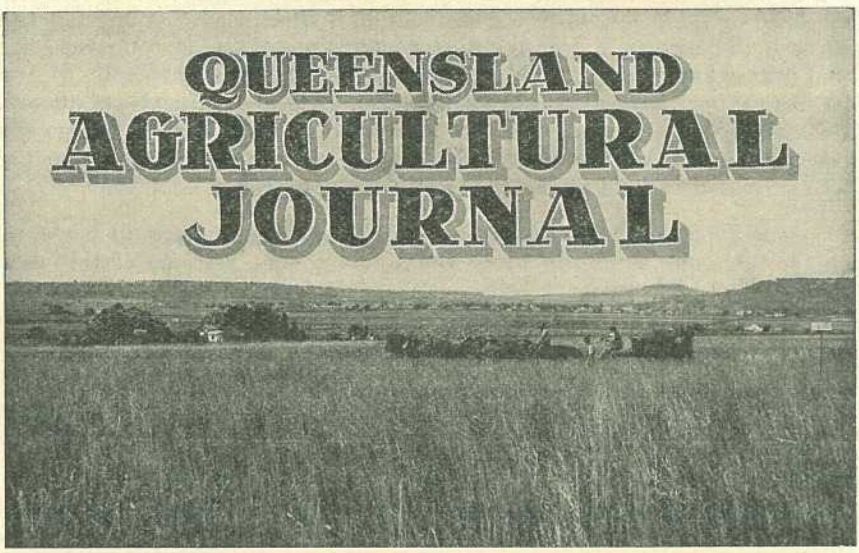


VOL. XLIV. 1 SEPTEMBER, 1935. PART 3

Event and Comment.

Agricultural Progress.

IN the course of his speech at the official luncheon at the Brisbane Show, His Excellency the Governor, Sir Leslie Orme Wilson, remarked that that big show gave him a wonderful opportunity of renewing friendships which he had formed in other parts of the State and of making new friends. Two things which struck him in visiting shows were the element of progress which was everywhere evident, and that new times demanded new methods. He had a great admiration for the men and women who had laid so well and truly the foundations of the great edifice which was called the State. The people of to-day were doing a good work in building upon those foundations, but the coping stone was still a long way off.

Australia's Marketing Problems.

"MARKETING of our products is just as important as production." That was the keynote of a notable address by the Premier, Hon. W. Forgan Smith, at the same function. "It is recognised by everyone," he said, "that in regard to Australian products only the best is good enough to place on the markets of the world." Continuing, the Premier stated that there could be no one-way traffic in trade—they could not expect to sell unless they themselves were purchasers. He had given the

subject a lot of thought, and from the conversations he had had with leading men in England last year, he had come to the conclusion that it was no use talking about the Ottawa Conference agreements, or about the need or the desirability of Australia and Queensland having markets abroad. There was a technique of negotiations between countries, and that was what he wanted to impress on them that afternoon. It was no use asking Great Britain, with her commercial ramifications all over the world, to accept unlimited supplies of the products they had to dispose of. A trade treaty was under consideration, and, he understood, it was proposed to hold an Empire economic conference next year.

But, he asked, what was wrong with Australia putting all her cards on the table and saying to Great Britain, "We can sell you certain commodities, and in return we will buy certain commodities from you"? If negotiations were carried on along those lines, he felt confident it would lead to satisfactory results. There certainly was nothing wrong with Imperial reciprocity from a business point of view. There was nothing wrong with the principle of trading with those who were prepared to trade with them, and a treaty of that nature would be of mutual advantage to Australia and to Great Britain.

"Queensland, with its great natural resources, had already secured an extraordinary share in the export trade of the Commonwealth, and obviously Queensland's prosperity depended on the restoration of world trade, on the orderly marketing of all Australian produce, and on the general prosperity of Australia," said the Federal Minister of Commerce, Right Hon. Dr. Earle Page, at the same gathering. The restoration of world trade looked as if it would be best and most quickly secured by working on an Empire basis for the re-establishment of triangular trade, Dr. Page continued. It was quite hopeless for Australia to balance its trade with every country it dealt with, but the Empire as a whole might be able to get an approximate balance. Trade between the constituent parts of the Empire should be stimulated to a greater degree. The success of any Imperial arrangement could only be assured by the proper organisation of orderly marketing, towards which end negotiations were now proceeding.

Unfortunately, during the last few months, the position of the legislation that had been passed by the Federal and State Parliaments to assist the orderly marketing, and especially the export control of the great staple industries of Australia, had been threatened on grounds of legal and constitutional technicalities, said Dr. Page. If that threat should unfortunately destroy the marketing legislation, an alteration of the Constitution would be necessary to remedy the position.

To prevent that unfortunate circumstance arising, the Commonwealth Government had made an appeal to all sections of Governments and to all parties in Australia to put the constitutional position beyond doubt, and to confirm what was regarded as the present legal position which permitted that orderly marketing legislation to function. He was glad to say that both the Premier and the Minister for Agriculture in Queensland had subscribed to that appeal, and he asked for general backing, not merely in the interests of the industries directly concerned, but in the interests of the whole of the people of Australia.

Agricultural Consciousness.

ADDRESSING the same assembly later in the proceedings, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, congratulated the Royal National Association on the great success of its Jubilee Exhibition. He spoke of the Association's record of sixty years' progressive service. Incalculable advantages to agriculture had accrued from the efforts of the Association. The great need was confidence in the future of our primary industries. The annual Royal Show encouraged confidence in that direction. Nobody could be blind to the progress agriculture had made. The whole history of our people was intimately concerned with the welfare and progress of the Royal National Association. The Association built up a great city which, although it lasted only for a week, provided a very definite nexus between the executive of that Association and kindred public bodies. The Royal Show put the hallmark of excellence on production.

At one time there was a distinct line of demarcation between the respective spheres of influence of the country and the city, but, thanks largely to the work of the Association, that line of demarcation had disappeared. The Association had rendered a service second to none given by any other body in the State. The standard laid down sixty years ago had been a progressive one, consistently maintained during the long period of the Association's existence. Referring to the fact that there were only dairy cattle exhibits at the first show, the Minister remarked that there were now nearly a million milch cows in Queensland.

"The prosperity of our State," added Mr. Bulcock, "depends upon the prosperity of the primary producer. If we can develop an agricultural consciousness in the city, as the Association is so successfully endeavouring to do, it will radiate throughout the State for the benefit of the State."

The Dignity of Agriculture.

PLEADING for the spreading of the doctrine of the dignity of agriculture, the Minister for Agriculture, in opening the Dairy Produce Hall at the Exhibition, deprecated the tendency of certain newspapers and other publications to caricature the man on the land. "There is nothing more calculated to daunt the aspirations of boys who look to the land as a means of livelihood than ridicule," said Mr. Bulcock. "If you turn to some of our newspapers you see facetious references to and caricatures of the man on the land, who earns his bread by the sweat of his brow and the use of his brains—for, after all, they go together. There is a tendency to refer to these people as 'cockies,' 'hayseeds,' or as 'Dad' and 'Dave,' and other names with equally contemptuous inference." This attitude, the Minister continued, was creating a wrong consciousness, a wrong outlook towards the land. "Let us realise and tell our people," he said earnestly, "that farming is not a profession for the inefficient, either mental or physical—that it requires high mental capacity as well as physical stamina. I would like to see a campaign directed towards elevating and directing public thought in the direction of regarding agriculture as the foremost of professions. We should all be ardent advocates of the dignity of agriculture."

Corn Ear Worm *

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

ONE of the most destructive Queensland insects is the species now commonly known to cotton and other farmers as the corn ear worm. Among tobacco-growers this insect is generally referred to as the budworm, maize-growers know it as the maize grub, and tomato-growers call it the tomato worm.

The caterpillars, on hatching from eggs laid on cotton, obtain their first meal by feeding on the tender young leaves at the growing tip, or on the very young squares. As the attack progresses the squares are hollowed out (Plate 90; fig. 4) and are subsequently shed. If the corn ear worm outbreak coincides with the commencement of squaring, the squares may be attacked and shed as quickly as they are formed and the attacked plant's energies may be almost completely diverted to vegetative growth, boll production being negligible. Corn ear worm infestation, however, is only one of a number of factors responsible for excessive vegetative growth. The caterpillars also frequently attack bolls of all sizes (Plate 90; fig. 3), passing from one boll to another, the damaged locks in the boll becoming infected with moulds which may spread through the whole boll. Actually the loss of squares is usually more serious than the attack on the bolls, for many of the latter may still yield quite marketable cotton from undamaged locks. The type of attack just described is that normally associated with corn ear worm bred on the cotton plant, but a migratory attack from other areas or host plants sometimes occurs and the plants may then be practically defoliated in the case of a young crop. In older crops, however, the corn ear worm still shows a marked preference for squares and bolls even in the case of a migratory attack.

This species is quite appropriately referred to as the budworm by tobacco-growers, because it displays a very definite liking for the growing tip of the tobacco plant (Plate 90; fig. 6). It may bore down the stem and the terminal bud may be destroyed, thus leading to the production of lateral buds which may also be the subject of attack. Most of the larvæ, however, feed exposed on the leaves which may be either wholly or partly destroyed. When attacking maize the corn ear worm feeds on the silk and the tip of the ear (Plate 90; fig. 8) after first feeding on the leaves. In the case of the tomato the fruit is the main object of attack, entry thereto being generally obtained at the calyx end (Plate 90; fig. 1). Here again the caterpillar shows a marked tendency to move from fruit to fruit, numbers thereof being rendered valueless by a single individual. Lucerne may also be seriously attacked.

Life History and Habits.

The pearly-white dome-shaped eggs (Plate 91; fig. 1) are about half the size of a pin head and are generally laid singly on the flowers, flower buds, or young foliage, the moth normally laying about a thousand eggs during the two weeks of its life. After an incubation period of three to six days, whitish larvæ emerge from the eggs, and in a short time acquire quite a pronounced colour pattern. The colour varies very considerably in the full-grown corn ear worms (Plate 91; fig. 2)

* *Heliothis obsoleta* Fabr.

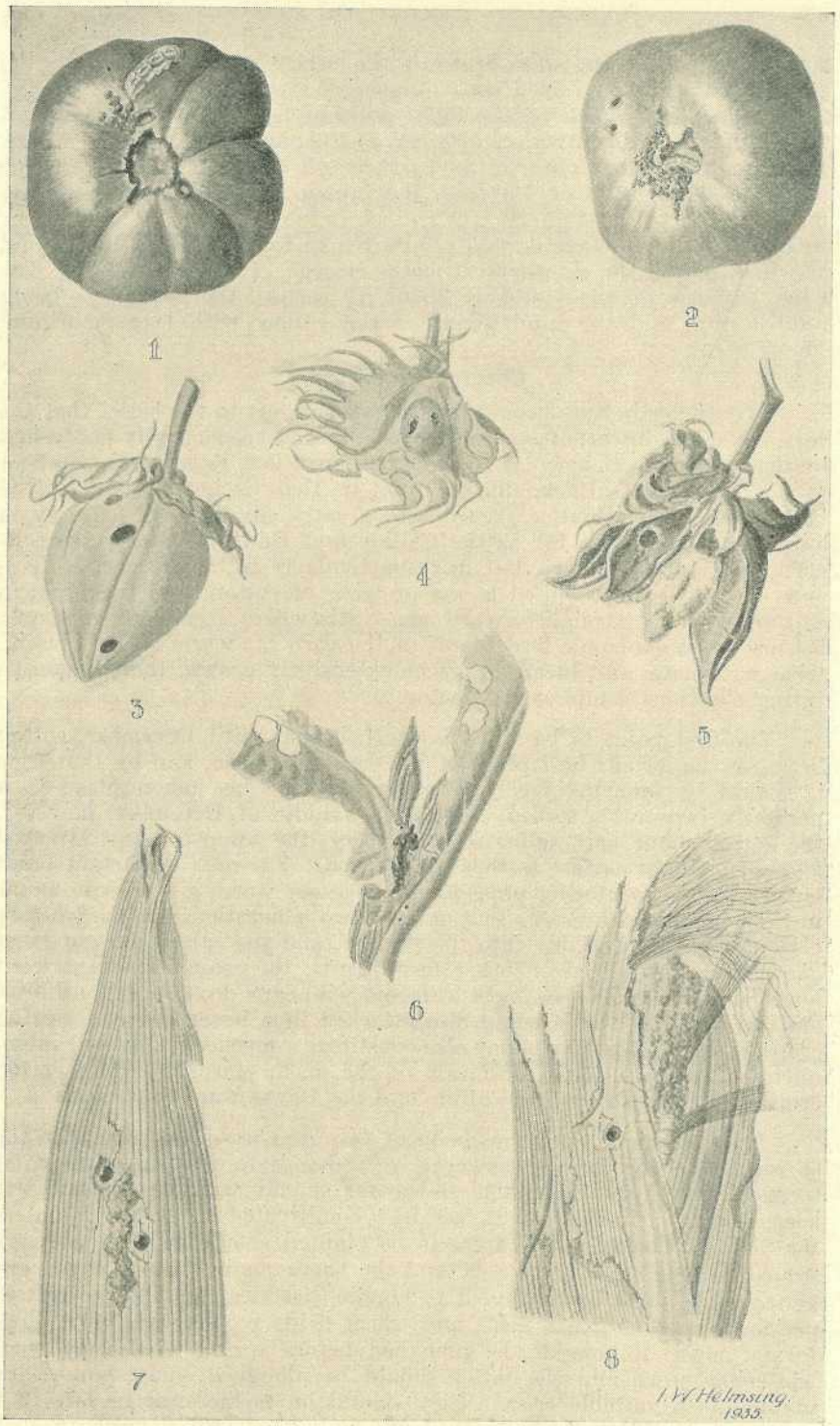


PLATE 90.—CORN EAR WORM.

Fig. 1.—Infested tomato.
Fig. 2.—Infested tomato.
Fig. 3.—Damaged cotton boll.
Fig. 4.—Damaged cotton square.
Fig. 5.—Damaged cotton boll.
Fig. 6.—Attack on tobacco.
Fig. 7.—Attacked maize cob.
Fig. 8.—Attacked maize cob.

All figures half natural size.

some specimens being dark-brown while others are a pale-green, the general colour being varied by a number of stripes of different shades. The caterpillars, which possess eight pairs of legs, are about 1½ inches in length when full growth is attained at the end of two or three weeks. Pupation then takes place in an earthen cell (Plate 91; fig. 4) in the soil at a depth of 3 or 4 inches, the brown pupæ (Plate 91; fig. 3) measuring about three-quarters of an inch in length. During the warmer weather the pupal stage normally lasts ten to fourteen days, at the end of which period the stout-bodied moths emerge (Plate 91; fig. 5). The wing expanse of the moths is about 1½ inches, the forewings being reddish-pink and the hind wings creamy-yellow with large marginal smoky areas.

Control in Cotton.

Experience in Queensland lends little support to the belief that the corn ear worm in cotton can be successfully and economically controlled by the use of insecticides. Hence growers must look to cultural practices as the best line of attack, and, fortunately, there is justification for the belief that strict attention thereto will greatly minimise corn ear worm losses—at least, in so far as the Callide and Dawson Valleys are concerned. In these valleys, but more particularly in the former, agriculcure is practically confined to the growing of cotton, and the problem is thus a fairly straightforward one. Elsewhere it is not so simple because other economic host plants of the corn ear worm such as maize, tobacco, tomato, and lucerne may be extensively grown, thereby constituting a serious complicating factor.

The first point to be noted is the fact that until December, cotton is not an important host plant of the corn ear worm, and by that time it should be squaring freely if early planting has taken place in a normally favourable season. From the middle of December, however, the cotton plant may suffer severe injury, the squares being attacked and shed almost as fast as they are formed. The next important point is that the overwintering pupæ of the corn ear worm give rise to moths in September which means that at least two generations are bred before cotton comes appreciably into the picture, and the caterpillars of those generations must feed on other host plants, the most important weed hosts being the pig weeds, twin leaf, and wild cape gooseberry, bull head and a few allied weeds being also attacked in a lesser degree. Spring crops of maize and tomato may also constitute a menace which will subsequently lead to serious infestation of the much more important cotton crop—i.e., in so far as the Callide and the Dawson are concerned.

The potentially enormous body of favoured weed host plants in the spring and early summer, however, very definitely constitutes the chief menace, and every reasonable endeavour should therefore be made to keep them well in check, both within the cultivated cotton areas and in the vicinity thereof. The areas to be planted should receive thorough preparation to eliminate weeds, and the battle against the weeds in the young crops must be continued as long as practicable. Old cultivation paddocks such as maize fields and wheat fields require attention. The former must, if possible, be ploughed before spring to destroy overwintering pupæ and the latter should be ploughed early, both being planted to a suitable crop. They should on no account be left in a neglected condition, for pig weed and bull head will flourish in such areas and produce an enormous corn ear worm population in the early

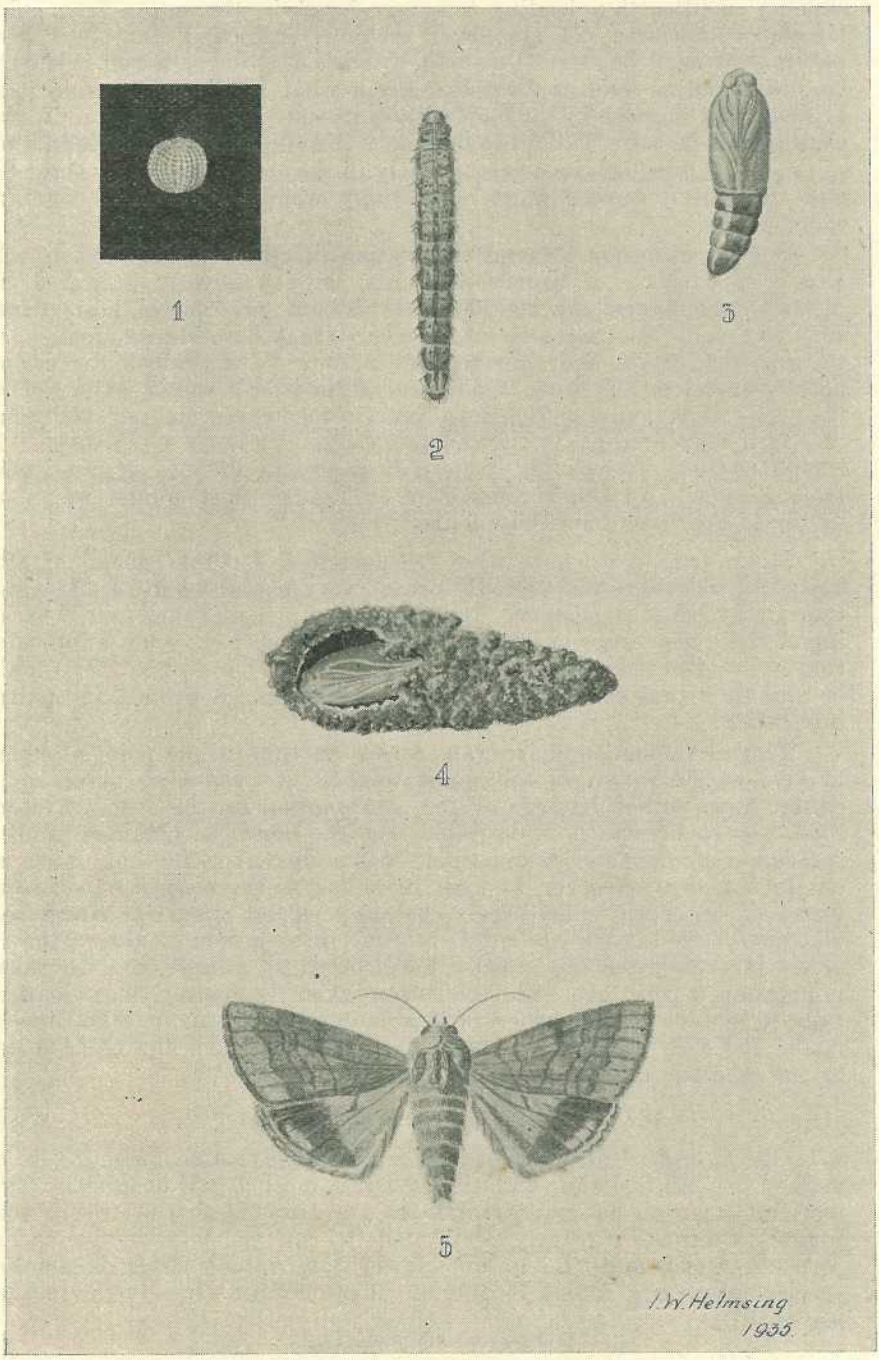


PLATE 91.—CORN EAR WORM.

Fig. 1.—Egg × 14.
Fig. 2.—Larva, natural size.
Fig. 3.—Pupa × 1½.
Fig. 4.—Pupa in earthen cocoon × 1½.
Fig. 5.—Adult × 1½.

summer months, thus leading to severe losses in the cotton from mid-December onwards. If standover cotton is ratooned, the weed host plants in it must be cleaned up, but if it is not to be ratooned it should be eliminated as soon as possible. From what has just been said it is evident that success in dealing with corn ear worm in cotton in the Callide and Dawson Valleys is definitely linked up with the elimination of the weeds on which it breeds so freely in the spring and early summer, and the cotton grower must accordingly wage an incessant warfare thereon.

Similar attention to weed elimination in other cotton districts will also be productive of beneficial results, but, as already indicated, in districts other than the Callide and Dawson, alternative host plants such as tomato, lucerne, maize, and tobacco may breed large numbers of the corn ear worm and thus provide a source from which the cotton may be infested. Even so, weed elimination is still worth while, for at the worst it is sound agriculture apart altogether from any beneficial results it may produce in the campaign against the corn ear worm. It is obvious that cotton should be sown at as great a distance as practicable from lucerne and other alternative cultivated host plants so as to minimise the risk of infestation therefrom.

Maize trap crops have been recommended for the control of this pest, and they have undoubtedly proved very useful when handled in a thoroughly efficient manner. Unfortunately, the planting and harvesting of these trap crops must be carefully timed, and experience indicates that in practice the trap crops are frequently not handled as they should be and they thus constitute a menace rather than a protection against infestation.

This discussion on maize trap crops is an appropriate point at which to give consideration to the safest method of producing maize on a cotton farm, either for sale or for consumption on the farm, as stock food. In such cases it is desirable that the maize be obtained from a succession of plantings rather than from a single sowing, but under no circumstances whatsoever, at least in so far as the control of corn ear worm is concerned, should maize be sown earlier than late November, otherwise serious corn ear worm infestation of cotton is almost inevitable. If a single sowing is made it will breed up a large corn ear worm population to spill over into the cotton when the maize is harvested or fails to mature a crop, whereas if a succession of smaller plantings is made, the corn ear worm population will move from the older maize to the younger maize instead of to the cotton.

Control in Tobacco.

One pound of arsenate of lead is thoroughly mixed with 25 lb. of pollard or with a similar quantity of maize meal if it is available. This dry bait is applied every fortnight to the growing tips of the tobacco plants by means of a finely perforated tin can and is attractive to the corn ear worm and also to the cluster caterpillar* which is another species frequently found feeding in characteristic clusters on tobacco leaves.

Control in Tomatoes.

When attempting to control corn ear worm in tomato crops the reader should keep clearly in mind what has been said about the control of this pest in cotton. Weeds on which it can breed should accordingly be eliminated and any useless neglected economic host plants should

* *Prodenia litura* Fabr.

be similarly dealt with. Infested tomatoes can be destroyed by boiling or by any other appropriate method which will kill the larvæ. Many pupæ of this pest will be destroyed if infested ground is thoroughly cultivated prior to planting, such cultivation also destroying weeds on which the corn ear worm or tomato worm may be breeding. Many growers spray or dust their crops with arsenate of lead, the tomatoes being cleaned before marketing. Such a procedure accounts for considerable numbers of the tomato worm, but unfortunately it may be responsible for undesirable quantities of injurious spray residue on the tomatoes when marketed. Hence it seems desirable to dispense with the application of arsenical dusts and sprays to tomato plants carrying fruit. A suitable non-arsenical insecticide may be evolved, but that is a matter for future experimentation,

Control in Maize.

Insecticidal treatment of growing maize is both impracticable and financially unsound, hence protection against corn ear worm attack on this crop can be attempted only along the general cultural lines discussed when considering its occurrence in cotton and tomatoes.

Control in Lucerne.

The position with respect to infestation in lucerne is similar to that outlined in the case of maize, insecticidal control being out of the question, partly because of the cost and partly because of poisoning risks. Premature harvesting of a heavily infested crop will appreciably increase the corn ear worm mortality and the succeeding crop may consequently be much less heavily infested.

Fused Needle of Species of Pinus.

PROGRESS REPORT.

By H. E. YOUNG, B.Sc.Agr., Assistant Plant Pathologist.

A CONDITION similar to that known elsewhere in Australia as "fused needle" has occurred in Queensland in exotic trees of the genus *Pinus* during the last few years and on account of its economic importance has attracted considerable attention. The species of *Pinus* with which Queensland is most concerned are *P. caribæa* and *P. tæda*. and both of these are susceptible to the conditions, particularly *P. tæda*. The species in which the symptoms have been recorded are: *P. tæda*; *P. caribæa*; *P. palustris*; *P. radiata*; *P. echinata*; *P. muricata*; *P. serotina*; *P. insularis*; *P. montezumæ*; *P. excelsa*.

Apart from a few trees of various little used species the only ones planted in Queensland from which fused needle has not been recorded are *P. patula* and *P. longifolia*. Trees of all ages appear to be liable to attack, specimens being found amongst nine months old nursery seedlings and in plantation trees planted in 1918.

SYMPTOMS.

The condition is manifested by a resinosis of the terminal buds and a twisting and adhesion of each needle in the fascicle, the latter symptom giving rise to the name. The resin is exuded by the terminal buds and on hardening a tight impervious jacket is produced, gumming the bud scales together into a solid mass, which may offer sufficient mechanical resistance to prevent a continuation of growth. When this occurs secondary buds are formed below the affected area and a condition of multiple leaders may result. This process is liable to occur again and again and a stunted shrubby tree results. If the buds do manage to burst, the needles in each fascicle are twisted spirally about each other and are closely appressed giving the appearance of short spikes.

Sections through such "fused" needles show that no actual cell fusion is present but that the needles are held together by a film of resin and the above mentioned twisting. It is noteworthy that, where a stoma of one needle is appressed to the surface of one of its companion needles, then the epidermal cell on the surface opposite the stoma often grows out into a peg like outgrowth into the stoma (Plate 92), this is no doubt due to growth taking place in a restricted area, where the stoma provides the only available space for growth to occur. These pegs from one needle into the opposite stomata would also help in keeping the needles in each fascicle fastened together.

In some cases the ends of the fascicles may be free, in others none of the needles adhere but are loosely twisted together. In extreme cases the fascicles are either unable to burst through the fascicle sheath or only the tip of the twisted gummed up fascicle protrudes. Such a growth usually exhibits a terminal bud well saturated with resin and is accordingly suppressed. These resin coated buds do not die immediately but remain green for many months.

In a number of cases there is no "fusion" or twisting in evidence, but the needles become very short and fine often being reduced to one fourth of their usual length with a corresponding decrease in thickness.

Resinosis though occasionally found in such cases does not usually occur. It is thought probable that this condition is a different manifestation of an effect due to the same cause. It has been particularly noted in *P. tæda* and *P. radiata.*

The checking of the growth of the trees due to the suppression of the terminal buds obviously seriously affects the growth increment as also does the decreased effective leaf surface due to the adhesion of the needles. Owing to the formation of multiple leaders, great loss is also sustained, and in addition as a result of the scanty production of needles and their adhesion, an open tree results in which little or no shading out of the lower laterals occurs. No trees have yet been recorded as having been killed by the disease, but in a few cases a decrease in the actual height of the trees is occurring, resulting from the suppression of each new set of terminal buds and the production of new ones below them again.

Inspection of the root systems of diseased and healthy trees shows no noticeable differences.

INCIDENCE OF THE DISEASE.

In one compartment at Beerwah planted in 1927-28, approximately 70 per cent. of the trees are affected, *P. tæda* and *P. caribæa* being the species in question. This was the area in which the condition was first noted and also the first planted area in that locality. The other areas on the plantation show a very much lower incidence of the disease varying from 1 per cent. to 24 per cent. In a nursery count of *P. caribæa* in 1934 it was found that 0.5 per cent. of the seedlings were affected and in view of the possible infectious nature of the disease all infected seedlings were culled out.

There appears to be a gradual increase in the incidence of the disease year by year, the greatest increase taking place from midsummer to autumn. The infection is also increasing in the newer plantations. This is illustrated in Table 1.

Table 1 indicates that *P. tæda* is more generally attacked than *P. caribæa,* which point is borne out by general observation. In addition it is noticeable that the attack is more severe with *P. tæda.*. The effect on the terminal buds previously discussed is frequent in the case of *P. tæda,* but infrequent in *P. caribæa.* Data on the relative effect of the disease on growth is at present being collected.

The chief area of infection in Queensland is at Beerwah on the coastal plain though the disease is found in other areas in Queensland at higher altitudes.

POSSIBLE CAUSES OF THE FUSED NEEDLE CONDITION.

In considering the factors which might have some bearing on the production of the fused needle condition the following were taken into consideration:—(*a*) Climate; (*b*) Soil—Mechanical factors; (*c*) Soil—Chemical factors; (*d*) Genetics; (*e*) Entomological factors; (*f*) Fungus or bacterium; (*g*) Virus; (*h*) Root and crown balance; (*i*) Mycorrhiza.

Each of these has received attention and, although the work has by no means reached a stage at which definite conclusions can be arrived at, it will be of interest to briefly review the progress which has been made in the several directions.

TABLE 1.—PROGRESS OF THE OCCURRENCE OF FUSED NEEDLE IN FOUR OBSERVATION PLOTS AS ILLUSTRATED BY PERCENTAGE INFECTION AT DIFFERENT DATES.

Date Inspected.	Plot A. *P. tæda.* Planted 1927–28.	Plot B. *P. tæda* and *P. caribæa.* Planted 1927–28.	Plot C. *P. caribæa.* Planted 1927–28.	Plot D. *P. caribæa.* Planted 1932.
25 August, 1933	53·6	..	..	..
10 November, 1933	53·6	..	..	..
23 January, 1934	59·0	37·0	26·0	..
3 April, 1934	62·3	50·8	55·0	3·3
21 June, 1934..	74·4	60·4	67·9	14·7
3 January, 1935	79·5	65·9	72·5	19·0
6 June, 1935..	..	68·0	73·4	24·7

Climate.

In the consideration of the possibility of the disease being due to climatic factors it was realised that the condition occurs under a very wide range of climatic conditions. The disease has been reported in New Zealand, Western Australia, South Australia, Victoria, New South Wales, the Federal Capital Territory, and Queensland. In passing from one of these places to the others there are all variations of climate from that of the cool temperate zone in New Zealand to that of the tropical zone in parts of Queensland, from zones of winter rainfall to zones of summer rainfall and so on. It occurs on a wide variety of elevations from a few feet above sea level to the mountains of the Dividing Range some two thousand feet higher. Again the species listed as attacked have different requirements in regard to climate judging from the locations of their native habitats, yet they are all susceptible to the disease under the same conditions which fact is a strong argument against climate being the primary cause of the disease.

With the two species chiefly under consideration in Queensland, viz., *P. caribæa* and *P. tæda* a careful comparison made between the climates of their habitats in America and at Beerwah showed a similarity between the conditions in Florida and at Beerwah with the difference perhaps that the rainfall in Florida is a little more evenly distributed throughout the year.

Soil—Mechanical Factors.

As with climate the trees showing the condition occur on many types of soil from pure sands to stiff clays. On land which has been cultivated there is less incidence of the disease but this is possibly due to other factors than the improved mechanical condition of the soil because it occurs also on loose loamy sands which should give all the mechanical freedom required. It occurs on deep soils and shallow soils, on gravels and fine clays so that the mechanical composition does not appear to have a direct bearing on the problem.

Soil—Chemical Factors.

As with climate and the mechanical condition of the soil the chemical compositions of the various soils on which the disease occurs cover a wide range, from almost pure sands to the rich red volcanic soils derived from basalts. It is found on grey forest soils, on laterites and on podsols; in fact, it occurs on all the types of soil on plantations

in Queensland. The red basaltic soils show only an infrequent specimen of an affected tree. The highest incidence is on the sandy soils and the grey forest soils but it is by no means confined to these. In the water logged swamp sands it is just as frequent as on well drained ridges. Anaylses of all these soils show no appreciable deficiency in any of the usual essential elements and the variation in soil types would seem to rule out the possibility of any such deficiency, and in any case, in numerous instances healthy trees are found growing alongside very badly affected trees in apparently the same soil type. This would require a very improbable distribution of any such element.

The results of twenty soil analyses are given in Table 2. The samples were taken to a depth of eleven inches and a sample was taken from beneath a healthy and a diseased tree on the same site. It will be noted that there is but little difference between the soils as shown in the table. In all cases the soils were generally poor, but both diseased and healthy plants occurred on soils of similar types. Further analyses are being made.

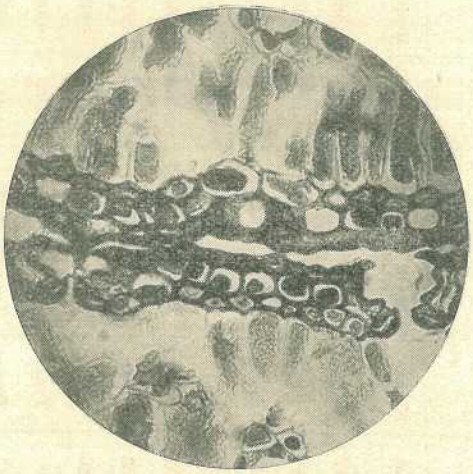


PLATE 92.—Section of a fused fascicle of *Pinus tæda*, illustrating the outgrowth from one needle into the opposite stoma.

A preliminary treatment of individual trees with the essential elements and also with boron, zinc, copper, and aluminium was carried out with negative results. A more detailed experiment with a proper experimental layout has been designed.

An experiment designed to test the efficacy of soil cultivation as a means of combating the condition has also been laid out. Other experiments involving variations in soil include the transplanting of healthy trees to the site previously occupied by a diseased tree and *vice versa*, the potting of healthy trees in soil obtained from beneath diseased trees and *vice versa*, and the potting of healthy and diseased trees in various types of plantation soil. Adequate controls are supplied in all cases. Final results from these experiments are not yet available.

It is noticeable that diseased trees when potted into a good potting soil containing an abundant humus supply recover from the condition,

TABLE 2.

CHEMICAL ANALYSES OF SOILS FROM HEALTHY AND DISEASED TREES.

Sample.	NITROGEN. %		HUMUS. %		PERCENTAGE CITRIC ACID SOLUBLE PLANT FOODS.								pH.	
					P_2O_5.		CaO.		MgO.		K_2O.			
	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.	Healthy.	Fused.
1	·022	·018	·75	1·37	·0020	·0026	·0108	·0146	·0098	·0119	·0088	·0064	6·09	5·91
2	·025	·018	·98	·57	·0017	·0018	·0168	·0127	·0065	·0090	·0022	·0030	6·17	6·05
3	·020	·018	·57	·93	·0008	·0024	·0273	·0145	·0120	·0083	·0030	·0024	6·47	6·36
4	·038	·028	·83	1·0	·0006	·0005	·0186	·0096	·0067	·0025	·0035	·0030	5·94	5·91
5	·057	·046	1·29	1·03	·0005	·0005	·0842	·0783	·0067	·0067	·0021	·0021	6·34	6·34
6	·040	·055	·81	·93	·0005	·0006	·0125	·0149	·0073	·0108	·0078	·0040	5·75	5·62
7	·017	·028	·50	·20	Trace	Trace	·0187	·0124	·0051	·0066	·0029	·002	6·05	5·96
8	·056	·068	1·5	1·0	Trace	Trace	·0139	·0085	·0065	·0036	·0016	·002	5·29	5·81
9	·077	·023	1·42	·47	Trace	Trace	·030	·021	·0064	·0114	·0009	·0179	6·05	6·36
10	·041	·036	·80	·68	Trace	Trace	·0234	·0151	·0060	·0075	·0010	·0040	5·68	6·03
Average ..	·039	·035	·94	·82	..	..	·0256	·0202	·0073	·0078	·0034	·0047	5·98	6·04

and yet on the other hand the disease is found in well manured nursery soil; but there, perhaps, the influence of competition may have the effect of producing starvation.

Chemical analyses of material collected from diseased and healthy trees show no great dissimilarities. The comparative infrequency of the disease on old cultivated land could be due to fertilizers which had been added to the soil, but other observations appear to contradict this conclusion.

Genetics.

No record of the occurrence of the disease has been found in America and it does not seem likely that such a frequently occurring heritable characteristic would have escaped recognition in the native habitats of the species. Seed supplies obtained each year have presumably involved many different parent trees, and yet the disease is apparent in seedlings from all batches of seed, and again since it occurs in so many species of *Pinus* it would appear to be too great a coincidence for it to be due to the same factor appearing in each of the species noted. No work has been attempted on the lines of testing the relative susceptibility of the progeny of diseased and healthy trees.

It appears improbable that an heriditary factor is the cause of the condition.

Entomological Factors.

Apart from being the vector of a virus it was thought that some sucking insect might, by piercing the tissues, be causing the exudation of resin. Examinations have failed to reveal any evidence of insect attack, and treatment of the buds with liberal quantities of resin has failed to produce any of the symptoms of fused needle. In the southern states an insect (*Chermes* sp.) heavily infests *Pinus* spp. and was thought perhaps to have some connection with the disease, but this insect does not occur on the worst affected areas in Queensland.

Fungus or Bacterium.

Attempts at the isolation of any pathogen capable of causing the disease have not been successful, nor have any indications of the presence of such been discovered with the microscope. Inoculations of healthy plants with tissue and tissue extracts from diseased plants have not been followed by the appearance of fused needle symptoms.

Virus.

This aspect at first appeared promising but is now considered as being improbable. The possibility of a virus implied the existence of a vector, probably an insect, but no indications of any insect having been correlated with the disease have been found. As already mentioned *Chermes* sp. was given some attention in the Southern States, but as it does not occur in the chief Queensland fused needle areas it was here dismissed as a possibility.

The position of affected trees in various areas showed that the occurrence is very sporadic, with no definite focus of attack. In fact counts radiating in a number of directions from the worst infected area at Beerwah, which incidentally was that in which the occurrence of the trouble was first noted in Queensland, gave absolutely negative evidence of any infection gradient with that compartment as a focus.

PLATE 93.—Specimens of *Pinus tæda* affected with fused needle disease.

Even within infected areas the individual trees seem to be scattered in an apparently haphazard manner, so that when the positions of trees are plotted the occurrence of the disease has no apparent correlation with any probable centre of attack.

Grafts between diseased and healthy tissues have been made both in the field and in potted plants. In all cases diseased material was used as the scion and the healthy plant as the stock. In all cases so far ready for analysis the diseased scion has regained its health and the healthy stock has remained healthy, indicating that no active infection was carried with the malformed scion to the healthy stock. Diseased *P. caribæa* has also been successfully grafted on to healthy *P. tæda,* resulting in the recovering of the *P. caribæa* scion.

In view of the excellent serological results achieved with known viruses and bacteria it was decided to utilise this method of investigating "fused needle" as a disease of supposed parasitic origin. The virus of tobacco mosaic was very satisfactorily used as a control and the technique employed was that used by Helen A. Purdy (Journal of Experimental Medicine, 1st June, 1929).

One litre of mixed needles and buds from badly affected fused needle trees were minced finely and 25.0 c.c. of physiological saline was added. The material was placed in a linen bag and the juice expressed into a basin. Barium sulphate was added to the expressed juice in order to precipitate the colloids and the supernatant fluid was centrifuged to deposit all the remaining solid materials.

As regards control, three young leaves from a tobacco plant showing mosaic were taken and ground up in a mortar with 25.0 c.c. of physiological saline. The material was then centrifuged until clear.

An antigen consisting of the extract from healthy pine needles and buds was also made up in the same manner as was that from the diseased trees.

Three rabbits were taken and inoculations were made in the marginal ear veins in the usual fashion, the procedure followed out being in accordance with that shown in Table 3.

Anaphylaxis occurred at the fifth injection and consequently to avoid this 0·5 c.c. of the inoculum was administered and the remainder after a period of twenty minutes; the animals were thus desensitized. Unless desensitization was carried out the animals died convulsively.

TABLE 3.

INOCULATION OF RABBITS TO PRODUCE IMMUNE SERA.

RABBIT (1).		RABBIT (2).		RABBIT (3).	
FUSED NEEDLE ANTIGEN.		HEALTHY ANTIGEN.		TOBACCO MOSAIC ANTIGEN.	
Period in Days.	Amount Antigen.	Period in Days.	Amount Antigen.	Period in Days.	Amount Antigen.
..	·5 c.c.	..	·5 c.c.	..	·5 c.c.
3	1·0 c.c.	3	1·0 c.c.	3	1·0 c.c.
3	2·0 c.c.	3	2·0 c.c.	3	2·0 c.c.
3	4·0 c.c.	3	4·0 c.c.	3	4·0 c.c.
3	·5+3·5 c.c.	3	·5+3·5 c.c.	3	·5+3·5 c.c.
3	4·0 c.c.	3	4·0 c.c.	3	4·0 c.c.
15	15·5 c.c.	15	15·5 c.c.	15	15·5 c.c.

Allowing an incubation period of fourteen days, the rabbits were then bled aseptically by cleaning an ear and snipping the edge and collecting the blood in a sterile vessel.

The blood was then allowed to clot overnight in the ice chest and then the serum was drawn off.

The serum was inactivated by heating in a water bath for one hour at 56°C.

Fresh antigens were prepared as before from diseased trees, healthy trees, and diseased and healthy tobacco plants. The healthy pine needles were obtained from a locality where up till then no fused needle had been reported.

The anigens were used in a dilution of 1: 6 of normal saline.

The antisera were absorbed (Table 4) in the case of tobacco mosaic by adding 1 c.c. of healthy antigen dilution (1 part antigen to 4 parts normal saline) to 2.5 c.c. of inactivated immune serum from each rabbit and incubating for one hour at 37°C. (water-bath). A heavy grey white precipitate was formed in each case, and this was removed by centrifuging and the sera allowed to stand in the ice chest overnight, when a further precipitate was deposited. This process was repeated until on addition of further antigen no precipitate was formed even after standing overnight in the ice chest. This process of precipitating absorption with antigens from healthy plants removed all the antibodies to the respective plant protein, leaving only those antibodies which were formed against any supposed extraneous proteins in the antigens, such as a supposed virus or bacterium, e.g. tobacco mosaic virus. The addition of 3 c.c. of healthy antigen dilution proved to be sufficient for the complete precipitin absorption of 2.5 c.c. of immune tobacco serum.

In the case of antisera to diseased and healthy pine extract, the precipitin absorption (Table 4) was carried out as follows: One c.c. of undiluted healthy antigen was added to 2 c.c. of immune serum (inactivated) and a heavy grey white precipitate was produced. The sera were incubated for one hour at 37°C. and placed in the ice chest overnight; the serum was then drawn off. A further 1 c.c. of healthy antigen was then added to the serum in each case again giving a heavy precipitate on incubation and standing. In this way it was found that 6 c.c. of undiluted healthy antigen were required to absorb the precipitins against plant protein in 2 c.c. of either healthy or diseased immune serum prepared as described.

In the case of both tobacco and pine the absorbed sera were then tested, in each case with both healthy and diseased antigens for the presence of further precipitins (Table 5). A series of dilutions of both antigens and antisera were used. All the precipitin tubes were placed in the water bath at 37°C. for one hour and then in the ice chest overnight before finalising the readings. One volume each of absorbed inactivated immune serum to healthy and diseased tobacco was taken and an equal quantity of diseased antigen added to each tube. This was repeated, using healthy antigen instead of diseased. A large number of titrations, using different amounts of the various antigens, were also used. In all cases on incubation a precipitate was formed where tobacco virus antigen was added to tobacco virus absorbed immune serum, and in no other cases, showing that the technique was not faulty.

TABLE 4.

Precipitin Absorption, Using Antigen from Healthy Plants.

Extract—Pine Needles.						Extract—Tobacco Leaves.					
Healthy.			Fused Needle.			Healthy.			Mosaic.		
Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.	Immune Serum.	Healthy Antigen.	Precipitate.
2 c.c.	1 c.c.	+	2 c.c.	1 c.c.	+	2·5 c.c.	1 c.c.	+	2·5 c.c.	1 c.c.	+
2 c.c.	2 c.c.	+	2 c.c.	2 c.c.	+	2·5 c.c.	2 c.c.	+	2·5 c.c.	2 c.c.	+
2 c.c.	3 c.c.	+	2 c.c.	3 c.c.	+	2·5 c.c.	3 c.c.	—	2·5 c.c.	3 c.c.	—
2 c.c.	4 c.c.	+	2 c.c.	4 c.c.	+	..	..	..	..	..	..
2 c.c.	5 c.c.	+	2 c.c.	5 c.c.	+	..	..	..	..	..	..
2 c c	6 c c.	—	2 c.c.	6 c.c.	—	..	..	..	..	..	..
2 c.c.	6 c.c.	+	2 c.c.	6 c.c.	+	2·5 c.c.	3 c.c.	+	2·5 c.c.	3 c.c.	+

TABLE 5.

Titration of Antigens against Absorbed Immune Sera. Numerals represent Comparative Volumes.

Extract—Pine Needles.						Extract—Tobacco Leaves.					
Healthy.			Fused.			Healthy.			Mosaic.		
Absorbed Immune Serum.	Healthy Antigen.	Precipitin.	Absorbed Immune Serum.	Fused Antigen.	Precipitin.	Absorbed Immune Serum.	Healthy Antigen.	Precipitin.	Absorbed Immune Serum.	Healthy Antigen.	Precipitin.
5	5	—	5	5	—	5	5	—	5	5	+
5	1	—	5	1	—	5	1	—	5	1	+
5	·5	—	5	·5	—	5	·5	—	5	·5	+
5	10	—	5	10	—	5	10	—	5	10	+

This was repeated, using the immune sera obtained from healthy and diseased pine extracts and healthy and diseased pine antigens. In no case did the absorbed sera produce a further precipitate on incubation and standing in the ice chest overnight. If the technique is applicable here as with tobacco this would show that no agent extraneous to the plant itself was concerned with the disease.

This serological work should, of course, also apply in the case of a pathogenic infection by a fungus or bacterium.

A number of microscopic sections of diseased tissue were examined but no evidence of phloem necrosis, which is often associated with virus troubles, was found.

As a result of these considerations the virus theory as to the origin of the disease is not now being given great attention in Queensland.

Root and Crown Balance.

Taking the view that there might possibly be some factor missing either in the soil or due to root trouble of some description which, not being supplied to the crown in sufficient quantities, might thus cause "fused needle," it was decided to heavily prune the crown in order that this possible factor might then be concentrated enough in the remainder of the crown to eliminate the trouble. Accordingly a plot, consisting of 150 trees of *P. tæda,* was laid out. At the commencement of the experiment the plot showed 50 per cent. of the trees badly affected with "fused needle" disease. The trees were pruned clean, to the top two whorls of branches on 21st August, 1934. On 3rd January, 1935, observations showed that the percentage of diseased trees had fallen to 33.5 per cent., and on 27th May, 1935, to 32·4 per cent., whilst none of the previously healthy plants had contracted the disease. The plot was situated in compartment 1, Beerwah, where the other observation plots noted in the introduction showed a decided increase over the same period. This lead is being followed up with reference to the section dealing with mycorrhiza.

Mycorrhiza.

It was at the commencement of the investigations thought that the wrong species of symbiotic fungus in relation to the roots of the trees by the formation of toxins, by its inability to supply the correct carbohydrates to the tree, or by direct parasitism, might be causing the disease. On this account a survey of the possible mycorrhiza formers on *P. tæda* and *P. caribæa* was made. In all cases the only fruiting bodies found in direct and constant association with plantation trees in Queensland were those of a species of *Boletus* identified as *Boletus granulatus.* In many cases mycelial filaments were traced from the sporophores to the mycorrhizal roots of the pine trees. There appeared to be a slight variation in the form of the sporophore in several different localities, but this proved to be a minor variation and the fungi are now considered to be the same. Isolations have been made from the sporophores and the soil in which sterile seedlings were growing in pots inoculated with it, with positive results resulting in the formation of typical mycorrhiza. No symptoms of "fused needle" have yet developed in these seedlings.

Inspections of the root systems of diseased and healthy plants fail to show any significant differences either as regards type of rooting system or the presence of a root parasite. The sporophore of *B. granulatus* has been found beneath both diseased and healthy trees.

It was realised that there might be some other factor which, associated with the presence of the particular fungus, causes the disease, and accordingly it was thought desirable to obtain cultures of the mycorrhiza formers from the native habitats of the species of *Pinus* concerned; unfortunately these have not yet been obtained. If the local mycorrhiza-forming fungus is unsuitable and thus causes "fused needle," then trees inoculated with a suitable species of fungus should be immune to the disease. This has yet to be investigated.

The work on the mycorrhizas of forest trees carried out by Dr. M. C. Rayner, of London, shows that "incorrect mycorrhizal equipment is probably an important factor in resistance to disease," and that "incorrect equipment may cause a physiological disturbance manifesting itself in various ways." Dr. Rayner stresses the importance of a correct supply of humus on which the mycorrhiza work and from which are manufactured the various carbohydrates which the plant is thus enabled to obtain and use. In the present case if the plant is securing an unsuitable food supply from its mycorrhiza then it is thought that the physiological upset might be "fused needle."

Experiments in connection with the supplying of humus to "fused needle" trees are in progress with the object of following up this line of investigation. Plots have been laid out for treatments with litter and cover crops in different locations, and cultivation of the soil is being tried also. Pot experiments, involving variations in soil and humus, are also being carried out. It is perhaps noteworthy that the sporophores of *B. granulatus* have not been found on sites severely affected with "fused needle"; this seems to point to a deficient or unsuitable form of humus supply which does not permit the fruiting of the mycorrhizal fungus.

SUMMARY.

The condition known as "fused needle" is described and its host range given.

As the plantations become older the incidence of the disease becomes more frequent. *P. tæda* is more subject to attack than *P. caribæa*.

It is thought that climatic factors have no direct bearing on the occurrence of the disease.

There appear to be no correlations between mechanical and chemical features of the soils and the occurrence of the disease. Experiments to gather additional data on these points are under way, including fertilizer experiments, but preliminary work shows negative results.

The disease does not appear to be due to any genetic peculiarities of the planting stock.

No entomological visitations can be connected with the occurrence of the disease, and bacterial and mycological agencies are improbable.

From serological investigations it appears that the disease is not due to a virus, nor can the disease be transmitted by grafts.

Experiments involving the disturbance of the balance of root and crown appear to indicate that when the crown is reduced recovery is often affected though the tree, in consequence of the pruning, shows little growth.

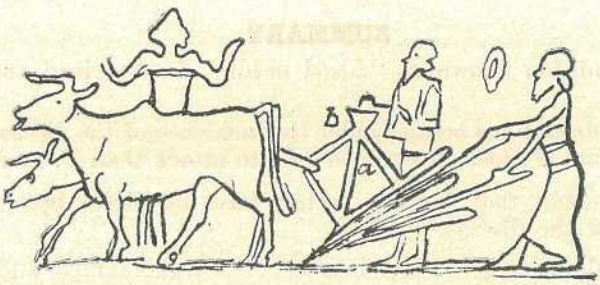
B. granulatus is the mycorrhiza-forming fungus in Queensland plantations. The question of the suitability of this fungus to the requirement of the pines is being investigated. Experiments with the object of supplying food material to the mycorrhizal fungus are under way, as it is thought possible that the malnutrition of the fungus may be causing the upset in the plant's economy.

ACKNOWLEDGMENTS.

Valuable assistance was rendered by the Agricultural Chemist, who kindly undertook the analyses of the soils and plant material involved in the investigations. Thanks are also due to the Director of Pathology of the Brisbane and South Coast Hospitals Board and to the Director of the Animal Health Station at Yeerongpilly, for the use of rabbits and facilities at their respective laboratories. Dr. M. C. Rayner, of the London University, has rendered substantial assistance in regard to the work on mycorrhiza.

NOTHING NEW UNDER THE SUN.

So said Ecclesiastes, expanding the theme in the following verse: "Is there a thing whereof men say, See this is new? it hath been already, in the ages which were before us."



The drawing here presented, which was taken from a Babylonian stone seal (presumptive date earlier than 2000 B.C.), and reproduced in Professor Breasted's "History of the Early World," would appear to provide strong support for the theorem, for here surely is the prototype of the present-day seeding machine—not to speak of the modern cane planter. Professor Breasted adds the following description: "The seeder is drawn by a yoke of oxen with their driver beside them. Behind the seeder follows a man holding it by two handles. It is very pointed and evidently makes a shallow trench in the soil as it moves. Rising from the frame of the seeder is a vertical tube (a) on the top of which is a funnel. A third man walking beside the seeder is shown dropping grain into the funnel." If a drawing of a cane planter were to be made by chipping on a small stone, it is at least doubtful whether any very essential difference would be found between it and the drawing reproduced above.—"The Australian Sugar Journal" for August.

Helminth Parasites of Domesticated Animals in Queensland.

FURTHER RECORDS OF OCCURRENCE.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

IN 1934 the writer published a check list of the helminth parasites of domesticated animals in Queensland. Several species, hitherto unknown in Queensland, were recorded for the first time. Since the publication of this check list, several species not recorded therein have been met with in routine examinations. These are given below.

Host—Domestic Pigeon.

Houttuynia sp.—A tapeworm belonging to this genus was found in a pigeon from Brisbane. The only species of the genus recorded from the pigeon is *H. torquata* Meggett, 1924, which is described from Burma. The specimen examined by the writer conforms in most respects to this species, but as a number of rostellar and sucker hooks were missing, the specific determination was left in abeyance.

Host—Domestic Fowl.

Raillietina (R) echinobothrida (Megnin, 1880).—Numerous small specimens of a tapeworm determined as belonging to this species were collected from a fowl at Brisbane. The small intestine was marked throughout with small nodules.

Host—Sheep.

An examination of helminth material from sheep from various localities showed the following Trichostrongyles to be present, none of which have previously been recorded from this host in Queensland:—

Ostertagia trifurcata—Ransom, 1907.
Cooperia punctata—(v. Linstow, 1907).
Cooperia oncophora—(Railliet, 1898).
Cooperia pectinata—Ransom, 1907.
Nematodirus spathiger—(Railliet, 1896).
Trichostrongylus vitrinus—Looss, 1905.
Trichostrongylus probolurus—(Railliet, 1896).
Trichostrongylus rugatus—Mönnig, 1925.
Trichostrongylus falculatus—Ransom, 1911.

Oesophagostomum venulosum—(Rudolphi, 1809).—Numerous specimens of this species were taken by Clunies Ross some time ago from sheep on a property near Dirranbandi, South-western Queensland, but the writer is not aware of any published record of its presence in this State. It has since been collected from two localities in the Goondiwindi district and from an adjoining property at Dirranbandi.

Host—Rabbit.

Recently a survey was made of the gastro-intestinal parasites of twenty-five rabbits from the Goondiwindi district. All the rabbits came

from a property on which helminths, mainly the small Trichostrongyles, had been causing losses among young sheep over a period of about six months.

Trichostrongylus retortæformis (Zeder, 1800).—This nematode was present in varying numbers in the small intestine of all rabbits.

Trichostrongylus colubriformis (Giles, 1892).—Five males of this species were collected from three rabbits.

Trichostrongylus vitrirus (Looss, 1905).—A single male of this Trichostrongylid was observed in one of the rabbits from which two male *T. colubriformis* were secured.

The occurrence of *T. colubriformis* and *T. vitrinus* in the rabbit is, so far as the writer can determine, the first record of the presence of these two sheep helminths in this rodent host, and indicates that the rabbit may act as a reservoir for the dissemination of the eggs of these two nematodes over sheep pastures.

Passalurus ambiguus (Rudolphi, 1819).—This pinworm was present in the colon and cæcum and occasionally in the small intestine of all rabbits. Several of the animals were infested with enormous numbers of these worms, but their condition did not appear to be affected by the infestation to any noticeable extent.

Multiceps serialis.—A single specimen of the larva of *Tænia serialis* was collected from the lumbar muscle tissues. The following measurements are given for the hooks:—Large hooks, 118μ to 126μ; small hooks, 88μ to 108μ.

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Animal Nutrition.

By E. H. GURNEY, A.A.C.I., Agricultural Chemist.*

THE successful and economical feeding of farm stock for any definite purpose is a matter that has occupied the attention of the stock owner and scientist for many years.

The amount of information upon this subject that is now available is very extensive, but in stock feeding, as in other subjects of human investigation, the more knowledge gained indicates how much more there is to be known.

Stock nutrition may be considered from various standpoints, including the function in the animal body of the different ingredients contained in foodstuffs; the value of different feeds; the production or return desired from the feeding of stock; the particular feed requirements of the different kinds of stock; farm grown foods; and the conservation of fodder.

Stock Foods.

For the purpose of illustrating the function of the different ingredients of food in the body, a comparison of the animal body with an engine at work has frequently been made by writers when dealing with animal nutrition. The engine has to be supplied with fuel to produce the power required from it, and the engine will not efficiently produce power if supplied with an insufficient amount of fuel, or with poor quality fuel, or unsuitable fuel. By continuous working portions of the engine wear out and require repairing, and such repairs have to be made with different material.

The animal requires food to maintain life and normal production, and its food may be classified into different groups. Thus the sugars, starches, fibre (carbohydrates) of the food are utilised by the animal for the energy and heat it requires.

Throughout the life of the animal there is a continual breaking down of the material of its body and, like the engine, the animal's body requires repairing and building up, and the food ingredients that enable such building up and repairing to take place are nitrogenous bodies called Protein.

Again, the mineral matter of the food is required by the animal to maintain the normal amount of mineral matter of the skeleton and fluids of the body and, as will be mentioned later, there is a particularly heavy demand on the mineral matter in the body of animals when producing and yielding milk, and sufficient mineral matter must be available in the food to replace any deficiency of mineral matter caused by this heavy demand and maintain the animal in good condition.

Repeating briefly, the functions of the different food ingredients are—Carbohydrates and fats produce energy and fat, and when assimilated in any excess are stored as fat in the body. Proteins build up flesh and repair waste. Mineral matter (ash) build skeleton and supply mineral content of fluids of body.

* In a broadcast lecture from the A.B.C. National Radio Station 4QG, Brisbane, and 4RK, Rockhampton.

Food Values.

Knowing the functions of the different food ingredients, it is possible to consider the food value of different feedstuffs, but when comparison of different feeds is being made it must be recognised that factors other than the actual composition of the feed have to be taken into consideration, thus the digestibility of the different feeds and their palatability are two very important items that must not be overlooked.

It is known that through consumption of a succulent palatable food stock receive greater benefit than from a food which may contain an equal amount of food ingredients but is less palatable. The mention of palatability will direct attention to young green grass and green fodder crops.

Grass, in connection with stock feeding, has been for some few years past the subject of much attention and research in all countries of the world, both in the older countries where cultivated pastures and meadows have been in existence for long periods of time, and in countries where farming may be said to be only of recent date.

The close attention now being given to grass and grass cultivation is due to different reasons, but particularly, it is considered, to the recognition of the economic value of the very high food content that exists in young grass growth.

The higher feed value of young grass, in fact the higher feed value of all young plant growth, as compared with older growth, is owing to the young growth having very much higher protein and mineral content and lower fibre content than exists in older growth; and still further that all the food ingredients of the young growth are much more digestible than such ingredients in older plant growth.

Different methods are adopted in making practical use of the high food value of young grass. The grass area may be subdivided into a number of paddocks 2 to 3 acres in extent, and these paddocks grazed alternatively in such a way that after grazing off the different paddocks in succession the first paddock has a further growth of young grass to be grazed. This is briefly a description of what is termed rotational grazing. Suitable fertilizer application is generally necessary for the most successful results from this method.

If the number of grazing stock available is insufficient to utilise all young grass, or owing to climatic conditions excessive grass growth occurs, such excess grass is mown and made into hay, which forms a very valuable reserve food for use in times of scarcity.

When pasture paddocks are not subjected to rotational grazing, and good grass growth occurs, if this is mowed—some time before maturity—and made into hay, the stockowner will have a reserve supply of highly nutritious foodstuff whenever required.

From what has been stated it will be understood that the best returns cannot be obtained from milking cows when their food is mostly grass in a matured stage of growth. Such feeding was a common practice in the past, but improved methods of farming, which include the regular feeding of dairy stock with nutritious fodders, are, happily, becoming more general.

Grass as a Crop.

If the best return from any grass is to be obtained, it must be recognised that introduced grass or grasses on any land should be considered as a crop; the grass land should, therefore, receive the cultivation

given usually in preparation for any farm crop. Other succulent feeds, such as green fodder crops—maize, oats, sorghums, Sudan grass, &c.—are, in common with all green foodstuffs, of great value to stock, insofar as they supply palatable food with a beneficial laxative effect and vitamin content.

These fodders are of very similar composition, the green oats as fed usually containing as a rule a somewhat higher protein content. If maize and sorghums are not fed in the green stage, they can be converted into ensilage, which forms a succulent feed in times of scarcity of other succulent foods.

These green fodders and ensilage require to be supplemented with food material of higher protein content, such as linseed, cotton seed meal, or grass hay containing clover, or lucerne hay or chaff.

Legumes.

Leguminous crops are particularly valuable to the farmer for two reasons—their high protein and mineral content; and their capacity of improving the land on which they are grown. These crops, therefore, are most useful in supplementing other forage crops used in animal rations, in that they are capable of supplying relatively cheaply the protein and a considerable quantity of the minor material necessary to make a balanced ration.

The legumes (plants with pods) include lucerne, clovers, cowpeas, other varieties of the pea family, vetches, and soy bean.

Lucerne is considered the most valuable fodder crop the stockowner can grow, for it yields good crops per acre, is fairly drought resisting, and, as mentioned before, has high protein content. Therefore, it cannot be stated too definitely that where conditions are suitable for lucerne growth, lucerne should be grown, for it can replace some of the dearer protein containing concentrates required for any complete ration, and is valuable as pasture, hay, or chaff.

The clovers, the growth of which are increased in laid-down pastures by the application of superphosphate, are valuable for the same reasons as lucerne; and mixed grass and clover hay make rich, palatable reserved foodstuff.

Cowpea, although grown chiefly for green manure, also furnishes a rich foodstuff, either green or as hay.

The foodstuffs so far mentioned may be termed green and dry roughage of varying food value. Another class of stock food goes under the name of concentrate, for it contains higher percentages of the different food ingredients—proteins (or fats) or carbohydrates. By using some of these concentrates together with bulkier roughage, it is possible to compose rations giving all the food requirement for any animal's maintenance, and the production required of it.

It will be understood when feeding animals, then, that the purpose for which the food is to be given must be considered, whether it is given for maintenance only—or to supply the requirements of both maintenance and production.

When Feeding is Unprofitable.

Successful results from any stock feeding can only be obtained when the principles underlying correct feeding are appreciated fully and followed consistently. Consideration, of course, has to be given to the

value of any production obtained, and the cost entailed in such production. Further, the feeding of unthrifty animals or unsuitable animal types is unprofitable, even if feeding is in accordance with established principles. For instance, some cows are only capable of yielding relatively small quantities of milk, although supplied with an ample and correctly balanced ration. Such cows should be culled, for their presence in the herd results in less production without lowering the costs.

When dealing with stock feeding it is necessary to consider any proposed ration from two points—maintenance and production. The object of feeding may be to produce growth, milk, fat, or work, but it must be understood that before any such production can be obtained, a certain portion of the ration must be utilised by the animal for generating the heat and energy necessary for the maintenance of the normal functioning of the animal body. It will be seen, then, that it is only the food in excess of the maintenance requirement that can be used by the animal for production purposes. That food is required for both maintenance and production is often overlooked, which is evidenced when milking cows are allowed to be dependent practically on the grass alone. Some stock owners make the mistake that because there is apparently plenty of grass there must be sufficient food for milking cows. Such grass, which is frequently of a self-sown indigenous variety, is generally not of very high feeding value, particularly when it is more or less mature; and although it may be possible that there is sufficient food for maintenance, the quantity of this grass which a cow is capable of consuming does not provide, after maintenance requirements are satisfied, enough extra food for the cow to produce milk to her highest capacity. In fact, the cow when consuming a food containing not much more than her maintenance requirements in the effort to produce milk will supply material from her body for this purpose, and thus the animal's constitution becomes weakened and less disease resistant.

Computing the Ration.

When computing any ration for stock, the necessity will be seen of first estimating the quantity of fod required for maintenance, after which the quantity of food required for production can be decided. Thus, in computing a ration for milking cows, the first thing to consider is the quantity of food required for maintenance.

Stated in terms of starch equivalence a 10 cwt. cow requires for maintenance feed with 6½ lb. starch equivalence including about 0.7 lb. digestible protein. The content of food required by the animal to produce a gallon of milk varies a little according to the quantity of fat contained in the milk. Thus a gallon of milk with 3 per cent. butter fat will require food of 2.1 lb. starch equivalence value including 0.57 lb. digestible protein, while a gallon of milk with 4 per cent. fat will require food of 2.6 starch equivalence including 0.66 lb. digestible protein. Stated in terms of total digestible nutrients instead of starch equivalence according to the American authorities Henry and Morrison, the maintenance food required by a 1000 lb. cow must contain7·9 lb. total digestible nutrients including 0.7 lb. digestible crude protein. The variation, according to fat per cent. of milk, of food required for production of milk as stated by these authorities is quoted in the leaflet "Rations for Dairy Cows" published by the Queensland Department of Agriculture and Stock. Rations for other kinds of stock, providing for maintenance and production are set out similarly.

Stock Foods.

Naturally grass should be the first stock food to be considered and it is repeated that when grass pastures are laid down, such pastures should be considered as a fodder crop. Therefore, the soil requires similar cultivation to that given when preparing land for fodder crops. When well established, the great value of these pastures to stock is recognised, and a number of experimental plots for the purpose of introducing suitable winter grasses in different districts have been set out under the control of the Pasture Improvement Committee of the Department of Agriculture and Stock.

There is not any very marked varieties in the food value of the different grasses, provided that comparison is made at the same stage of maturity, but it must be emphasised that very great differences do exist in the food value of the same grass at different stages of its growth. The difference in food value of grass at different stages of growth is shown particularly in the protein and mineral content, and in illustration of this fact the following analyses are quoted. (These analyses were made on the water-free material of the grass.)

——	Protein.	Lime.	Phosphoric Acid.
	Per Cent.	Per Cent.	Per Cent.
Paspalum-short young grass 6 inches high contained	20	0·41	0·62
Paspalum-stemmy, with ripe seed heads	4	0·23	0·14

In this case, the young paspalum contained five times more protein, twice as much lime, and four times more phosphoric acid than the old matured paspalum. Rhodes grass, young leafy growth contained 16.4 per cent. protein and 0.72 per cent. phosphoric acid, while an older growth in full seed head contained practically only ⅓ of these percentages, viz., 5.6 per cent. protein and 0.23 per cent. phosphoric acid.

As to the value of any grass as a stock food, it is recognised that it is necessary to take into consideration other factors as well as the chemical composition of the grass. Thus different grasses require different soil types and climatic conditions for their most successful growth. Again, grasses vary in their character of growth, some being of more or less leafy and succulent growth, others of more stemmy and less digestible nature.

It is well known that clovers have a high protein and mineral content and that being succulent and digestible, their inclusion in pasture increases its food value.

Although sown pastures in the young stage of growth may in some cases be capable of supplying sufficient food material for maintenance and production, grass as a general rule—certainly grass of the grazing paddock—is considered as roughage.

Fodder crops such as maize, sorghum, Sudan grass, and cow cane, have somewhat similar food value, and when used in any ration are considered as roughage. Such crops are of great value in supplying succulent feed in times of green grass scarcity.

Lucerne must be considered as the most valuable fodder crop available to the stock feeder, and owing to its high feed value cannot be considered only as roughage when included in a ration.

Hays and chaffs of the different crops and ensilage being generally of somewhat low feed value (excepting lucerne hay and chaff) form when included in a ration the roughage portion.

Some concentrates commonly used in composing stock rations are meat meal, blood meal, linseed and cottonseed meals, maize meal, bran, pollard, and the grains maize and oats.

A cow yielding 25 lb. milk of 3.5 per cent. fat would require a maximum of 2.2 lb. of digestible crude protein and about 15.5 lb. total digestible nutrients. For maintenance this cow requires 0.7 lb. protein and for the production of the 25 lb. milk 1.5 lb. protein. The following daily ration supplies the required protein:—65 lb. green sorghum, 7 lb. lucerne chaff, and 7 lb. maize meal.

The 65 lb. sorghum (roughage) yields 0.78 lb. protein, that is very little more protein than the cow requires for maintenance. The 7 lb. lucerne chaff yields 1.08 lb. of protein and the 7 lb. maize meal yields 0.35 lb. protein. From this the value of the lucerne chaff is seen, in so far as it supplies practically half the required amount of protein. Therefore, as previously stated, lucerne although on account of the bulk it provides it could be called roughage: yet on account of its high food value it may be termed a concentrate.

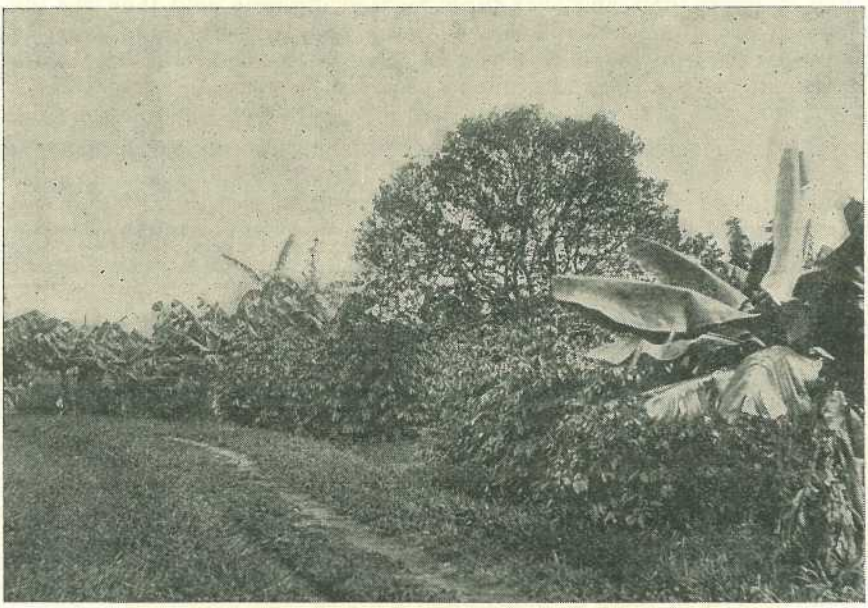

PLATE 94.—A BANANA AND COFFEE PLANTATION, BUDERIM MOUNTAIN, SOUTH QUEENSLAND.

Pig Feeding Experiments.

Report by J. E. LADEWIG, Q.D.A., B.Sc.Agric.

THESE experiments were conducted at the Animal Health Station, Yeerongpilly, under the direction of the Pig Nutritional Committee.

The objective of these tests was to determine whether pigs could be economically raised to pork and bacon weights suitable for the export market with the complete exclusion of milk foods from the ration. Meat meal, manufactured by the Queensland Meat Industry Board at the Brisbane Abattoir, was used as the protein supplement, as this is a source of protein which is reasonably cheap, and large quantities of which are available locally at the Brisbane Abattoir. These tests were initiated in an endeavour to solve one of the major problems of the pig industry in Queensland. Climatic conditions in Queensland are not always favourable to the continuous production of pigs throughout the year. There are periods of dry weather when crop growth is seriously interfered with, when natural and artificial pastures fail to produce as they would do during normal seasons. The winter season while not a long or harsh one is very often a dry one, followed by dry weather during the spring months. These conditions on farms lead to a diminishing supply of dairy by-products—skim milk in particular—as food for pigs, and in the absence of an economical substitute for skim milk pig production falls off, becomes less profitable and both local and export markets are affected.

With the object of finding an economical substitute for skim milk these tests were commenced in February, 1934, and finished in May, 1935. For the purposes of this experiment the four principal breeds of pigs have been used in both in the purebred form and with reciprocal crosses of the several types, the objective throughout being the production of a white-skinned pig for the export trade.

Breeds Used.

The breeds and crosses used were as follows:—

Purebreds—Large White, Middle White, Tamworth, Berkshire.

Crossbreds—Berkshire x Large White, Berkshire x Tamworth, Berkshire x Middle White, Tamworth x Large White, Tamworth x Berkshire, Middle White x Large White.

Grades—Middle White-Tamworth x Middle White.

This variety of types has given a fairly comprehensive range of pigs with which to ascertain the value of the rations used.

Housing.—The pigs were housed under the intensive system, being confined to pens 18 feet by 8 feet, half covered in; the covered part was floored with hardwood over concrete, whilst the open portion was floored with concrete.

Foods Used.

The rations used in these experiments were as follows:—

Maizemeal	45 per cent.
Pollard	40 per cent.
Meat meal	8 per cent.
Lucerne chaff	7 per cent.

A mineral supplement consisting of 75 per cent. calphos (a bone meal product) and 25 per cent. salt was added to the rations at the rate of 2 lb. per 100 lb. of the above mixture.

An analysis of the complete mixture gave the following results:—

Moisture	11·2 per cent.
Protein	18·0 per cent.
Fibre	4·5 per cent.
Fat	4·0 per cent.
Carbohydrates	57·2 per cent.
Ash	5·1 per cent.
Included in ash—	
Lime (CaO)	0·829 per cent.
Phosphoric acid (P_2O_5)	1·749 per cent.
Salt	0·73 per cent.

Clean drinking water was provided, and a suitable amount of green fodder was given to the pigs at midday. This fodder consisted chiefly of green paspalum grass, but green lucerne was fed occasionally when available.

From the time of weaning until the completion of each animal's test the pigs were given their food, *ad lib.*, in the dry form in self-feeding hoppers.

Routine Work.

The pigs were reared from birth in the experiment pens; the male pigs were castrated at six weeks old, all were weaned at eight weeks old and were placed in the feeding test at nine weeks old, by which time they had become accustomed to this system of dry feeding.

They were weighed regularly at weekly intervals and the food consumption was recorded for the same period. When each animal or group reached a suitable condition for marketing (either as porkers or baconers) the final weight was taken and they were despatched to the Brisbane Abattoir for slaughter and inspection. Reports were obtained on the suitability of the carcasses, which were then exported to the United Kingdom, where they were further examined and reported upon as to general suitability for British trade requirements. As an additional guide to the condition of the carcasses, one carcass from each different type of pig was sectioned across the loins, and these sections were then photographed for permanent records.

Observations.

In the early stages of these experiments it was observed that the pigs, which on external appearance appeared to be in ideal condition for slaughter, were, upon sectioning of the full rounded carcass, mostly overfat; this observation was substantiated by overseas reports. The pigs slaughtered during the latter period of the test have therefore been slaughtered in much lighter condition, a condition that usually does not appeal to the observer, but upon sectioning, these lighter conditioned carcasses have shown an excellent "eye of meat" (i.e., the proportion of lean meat) with a very desirable proportion of fat.

In these experiments it was noted that the pigs showed small growth rates up to the age of twelve weeks in comparison with milk-fed pigs, but after this age much better growth rates were observed. This is illustrated in Table 1, which gives the average daily gain in weight per pig, based upon the fifteen litters of pigs used in these experiments.

TABLE 1.—DAILY GAIN IN LIVE WEIGHT PER PIG.

Type of Pig.	9–12 Weeks.	12–15 Weeks.	15–18 Weeks.	18–21 Weeks.	21–24 Weeks.
	Lb.	Lb.	Lb.	Lb.	Lb.
Tamworth x Large White	0·92	1·04	1·46	1·73	1·47
Tamworth x Large White	0·79	0·86	0·90	1·42	1·65
Tamworth x Large White	0·78	0·98	1·54	1·59	1·84
Large White	0·71	1·36	1·21	1·70	1·72
Large White	0·67	1·14	1·14	1·58	..
Mid White	0·45	0·59	1·12	1·45	..
Berkshire x Mid White	0·47	0·89	0·77	1·00	..
Berkshire x Large White	0·73	1·07	1·38	2·01	..
Berkshire x Large White	0·98	1·16	1·42	..	..
Berkshire x Large White	0·87	1·10	1·57	..	..
Berkshire x Tamworth	0·87	1·28	1·44	..	..
Tamworth x Berkshire	0·64	1·01	1·78	..	..
Mid White x Large White	0·71	1·35	1·35	..	..
Berkshire	0·65	0·83	1·17	..	..
Mid White-Tamworth x Mid White ..	0·50	0·92	1·37	..	..
Average Daily Gains based on 15 Litters	0·72	1·04	1·31	1·56	1·67

The low growth rates from nine to twelve weeks are probably due to the fact that the pigs' digestive organs at this stage are not able to efficiently utilize the nutrients in the ration, whereas from fifteen weeks onwards, when the best growth rates are observed, they are sufficiently mature to make the most efficient use of their food.

When this system of feeding is compared with skim milk feeding from the point of view of growth rates, it gives less satisfactory results up to the age of fifteen weeks, after which the growth rates are much better than those obtained when skim milk is fed.

A summary of the results obtained with the different types of pigs used in this test is given in Table 2, which also includes the average results based upon 104 pigs.

TABLE 2.

Type of Pig.	Final Live Weight.	Dressed Weight.	Loss on Slaughter.	Food Consumption.	Food Costs.	Food Consumption per lb. Dressed Weight.
	Lb.	Lb.	%	Lb.	*d.*	Lb.
Tamworth x Large White ..	188	142	24·4	540	404	3·80
Tamworth x Large White ..	160	114	28·7	399	317	3·51
Tamworth x Large White ..	156	113	27·6	454	364	4·03
Large White Pure	191	143	25·2	581	442	4·13
Berkshire x Tamworth ..	139	105	24·4	367	285	3·50
Berkshire x Large White ..	107	75	29·9	221	171	2·95
Berkshire x Large White ..	127	86	32·3	319	254	3·71
Berkshire x Large White ..	118	81	31·3	256	212	3·16
Large White Pure	111	77	30·6	254	211	3·30
Berkshire Pure	103	74	28·2	270	216	3·65
Mid White Pure	106	76	28·3	272	216	3·58
Tamworth x Berkshire ..	105	73	30·5	231	173	3·16
Mid White x Large White ..	97	66	32·0	234	195	3·55
Berkshire x Mid White ..	97	67	30·9	248	206	3·70
Mid White-Tamworth x Mid White	107	75	29·9	266	201	3·55
Average based on 104 Pigs..	126·3	90·1	28·7	325	257	3·61

A feature of note in these results is the variation in the amount of food required to produce 1 lb. dressed weight; this figure varies from 2·95 lb. to 4·13 lb., with an average of 3·61 lb. for the whole series of pigs. This variation is probably due to the fact that some types of pigs are able to more efficiently utilize their food than other types. In this experiment it has been found that the Berkshire x Large White cross makes the best use of the food.

The average figure of 3·61 lb. of food required to produce 1 lb. of dressed weight is less than the generally accepted figure for the meal feeding of pigs.

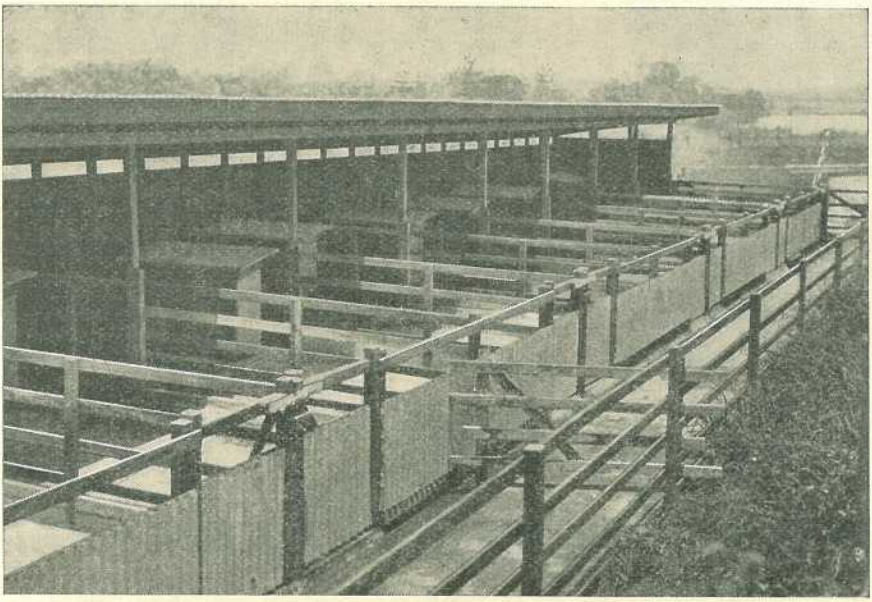

PLATE 95.—Piggeries at the Animal Health Station, Yeerongpilly.

Financial Aspect.

When considering the financial aspect of this work a number of factors must be considered, and many of these vary considerably, so that it is difficult to make an accurate estimate of the costs involved in raising pigs under this system of feeding. The one which varies most is that of food prices. For the purpose of this experiment they have been taken at market value over the period of the test. The cost of the ration used therefore has varied from ·75d. to ·83d. per lb., with an average cost of ·79d. per lb.

When determining the cost of production of porkers and baconers under this system of feeding, the following factors must be taken into consideration:—

(1) Capital value of breeding sows;
(2) Cost of feeding sows;
(3) Cost of buildings and equipment;
(4) Cost of feeding pigs from weaning to marketing;
(5) Labour costs.

Capital Value of Breeding Sows.—As the sow is purchased or reared to breeding age solely for the production of litters, the capital value of the sows must be debited to the litters reared during her breeding life. For purposes of costing, it is assumed that the purchase price of a sow at the time of carrying her first litter is £4 4s., and that an average sow with reasonable care, produces seven litters during her active breeding life with an average of eight pigs per litter. Each pig, therefore, bears a cost of 18d. towards the purchase price of the sow.

Cost of Feeding Sow.—The pigs in a litter also have to bear the feeding costs of the mother from the time of conception until the litter is weaned. Under this particular system of feeding the average cost of feeding one sow for this period was 525d. This cost, however, could be considerably reduced under ordinary farm conditions by keeping the sows in open paddocks, where grazing would provide a large proportion of the sow's food requirements. Each pig, therefore, bears a cost of 66d. for feeding the sow.

Cost of Buildings and Equipment.—The buildings and equipment used in this experiment are much more elaborate than is usually the case on most dairy farms. The depreciation cost on these buildings and equipment amounts to 10d. per pig.

Cost of Feeding Pigs from Weaning to Marketing.—The average cost of food for one pig from weaning to age of marketing in these experiments was £1 1s. 5d. This is based upon the results obtained from 104 pigs used in these experiments. (See Table 2.)

Labour Costs.—Using the hopper system of feeding, one man could handle 400 pigs per year. In comparison with standards applying on Queensland farms £150 per year would be considered suitable wages for a person thus employed in pig-raising.

Labour costs are therefore calculated at 7s. 6d. per pig. To the farmer raising pigs but not employing labour this figure represents additional profit.

The following table sums up the costs incurred in producing pigs in these experiments; these costs are the average results obtained from fifteen litters, representing 104 pigs, which include both porkers and baconers:—

Cost of Producing Carcass weighing 90 lb.—

	£	s.	d.
Capital value of sow	0	1	6
Feeding costs of sow	0	5	6
Cost of feeding pigs from weaning to marketing	1	1	5
Buildings and equipment	0	0	10
Labour	0	7	6
Total costs	£1	16	9

Average weight of carcass	=	90 lb.
Average value per lb. dressed weight ..	=	5·5d.
Average value received per pig ..	=	£2 1s. 4d.
Net profit per pig	=	4s. 7d.
or gross profit, excluding labour ..	=	12s. 1d.

Value of Maize when Fed in Combination with Other Foods.—Maize makes up a large part of the ration used in these experiments, and it is a food which is grown in practically all of the farming areas in Queensland. However, to economically market maize by feeding to pigs the price realised for the pigs must cover all the costs of producing the pigs, and, in addition, give a return for the maize which is higher than the ruling market price.

The rations fed in these experiments form a possible avenue for the profitable marketing of maize by feeding it to pigs. In order to determine whether this is so, the following tables have been prepared,

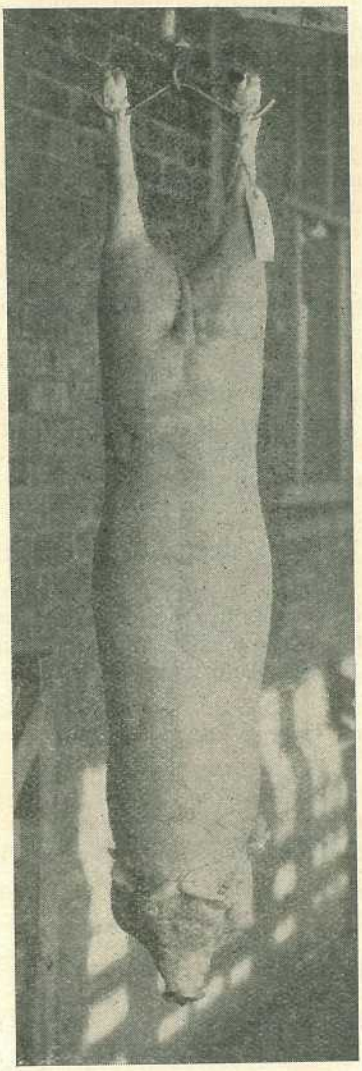

PLATE 96.—Illustrating export porker type of pig; white skinned, fine in the bone, lengthy, yet compact, and of desirable weight (70 lb. dressed). This is a Middle White grade type.

based upon the results obtained in these experimnts using both porkers and baconers.

Baconers.—465 lb. of food are required to produce a carcass weighing 121·5 lb. This amount of food is made up as follows:—

	s.	d.
209 lb. maize (value to be determined)		
186 lb. pollard at 6s. 6d. per 100 lb.	12	1
37 lb. meat meal at 10s. per 100 lb.	3	8
33 lb. lucerne chaff at 5s. per 100 lb.	1	8
Total food costs, excluding maize	17	5
Labour costs (est. on time employed per pig) ..	7	6
Cost of feeding sows (per pig)	5	6
Capital value of sow (per pig)	1	6
Buildings and equipment (per pig)	0	10
Total costs (excluding maize) of producing carcass weighing 121·5 lb.	£1	12 9

Bacon Prices.	Value of Carcass weighing 125·5 lb.	Net return representing value of 209 lb. Maize.	Value of Maize per Bushel.
	£ s. d.	£ s. d.	s. d.
6d. per lb.	3 0 9	1 8 0	7 6
5½d. per lb.	2 15 8	1 2 11	6 2
5d. per lb.	2 10 8	0 17 11	4 10
4½d. per lb.	2 5 7	0 12 10	3 1
4d. per lb.	2 0 6	0 7 9	2 1

Note.—In calculating the net return, which represents the value of the maize fed, the sum of £1 12s. 9d. (total costs, excluding maize) is subtracted from the value of the carcass.

The average price received for baconers for the period under review (1934) was 5d. per lb.; therefore, the maize fed to bacon pigs in these experiments returned 4s. 10d. per bushel after deducting all the costs incurred in the production of the pigs. The market value of maize during this period did not exceed 3s. per bushel.

Porkers.—255 lb. of food are required to produce a carcass weighing 74·2 lb. This amount is made up as follows:—

	s.	d.
115 lb. maize (value to be determined)		
102 lb. pollard at 6s. 6d. per 100 lb.	6	8
20 lb. meat meal at 10s. per 100 lb.	2	0
18 lb. lucerne chaff at 5s. per 100 lb.	0	11
Total food costs, excluding maize	9	7
Labour costs (est. on time employed per pig) ..	5	0
Cost of feeding sow (per pig)	5	6
Capital value of sow (per pig)	1	6
Buildings and equipment (per pig)	0	10
Total costs (excluding maize) of producing carcass weighing 74·2 lb.	£1	2 5

Pork Prices.	Value of Carcass weighing 74.2 lb.	Net return representing value of 115 lb. Maize.	Value of Maize per Bushel.
	£ s. d.	s. d.	s. d.
6½d. per lb.	2 0 2	17 9	8 8
6d. per lb.	1 17 1	14 8	7 2
5½d. per lb.	1 14 0	11 7	5 8
5d. per lb.	1 10 11	8 6	4 2
4½d. per lb.	1 7 10	5 5	2 8

Note.—In calculating the net return, which represents the value of maize fed, the sum of £1 2s. 5d. (total costs, excluding maize) is subtracted from the value of the carcass. The average price received for porkers for the period under review (1934) was 5½d. per lb., therefore the maize fed to porkers in these experiments returned 5s. 8d. per bushel after all costs had been deducted.

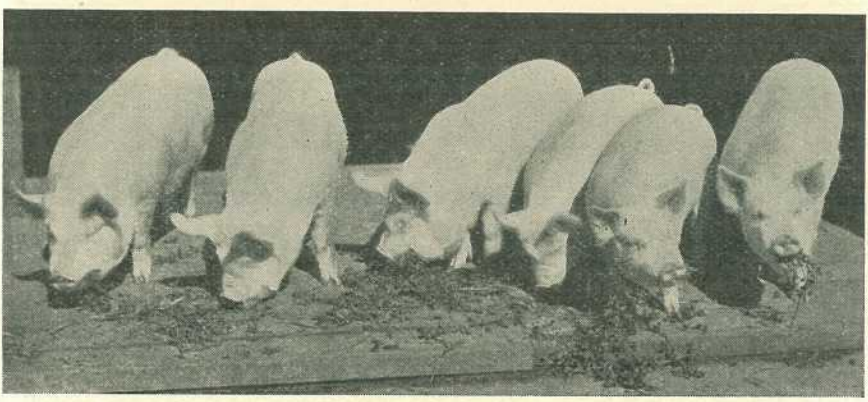

PLATE 97.—Export porkers of a lengthy class, medium in condition, reported upon as of an economical, fast-growing type suited to trade requirements. The progeny of a Large White boar mated to a Berkshire sow.

Quality of Carcasses.—These experiments have shown that pigs can be produced economically under this system of dry meal feeding. Apart from the financial aspect, however, it is necessary that only the best quality carcasses should be produced for the export trade. Reports received from the Queensland Meat Industry Board, and also from Swift and Co., Ltd., London, have shown that the type of carcass produced in these experiments is highly satisfactory for the export trade to the United Kingdom. In a report received from Swift and Co. regarding one shipment containing carcasses of the following types:—Tamworth x Large White, Berkshire x Tamworth, Berkshire x Large White, Large White Pure, Middle White-Tamworth x Middle White—the following statement was included:—

> "As a whole they were some of the finest developed pigs we have seen; percentage of fat and lean was generally well distributed and not wasteful. Handling throughout was all that could be desired."

All the pigs slaughtered from these tests were graded first export quality.

Disease.

Pigs reared under this system of housing and feeding were comparatively free from disease. A feature of note, however, was the fact that in practically every case the litters suffered a severe attack of diarrhœa

at ages varying from three to five weeks. The cause of these attacks was not definitely determined, but it was probably associated with a deficiency of iron and possibly copper.

This was substantiated by the fact that dosing the pigs in the litter with a solution containing sulphate of iron and copper sulphate was successful in stopping the trouble. This solution is made up as follows:—Sulphate of iron, 3¼ oz.; copper sulphate, ¾ oz.; warm water, 1 pint.

The copper sulphate and sulphate of iron are dissolved in the water, and 1 pint of treacle or molasses is added and the whole is mixed thoroughly. Treatment then consists in dosing the pigs in the litters with one teaspoonful of this mixture immediately the symptoms of diarrhœa are noticed.

This mixture is very successful for treating diarrhœa which is caused by a deficiency of iron and copper. The attacks of diarrhœa may be prevented by painting the udders of the sows once daily with the mixture from the time of farrowing until the litters are five weeks old.

From the experiment pigs, ten heads were condemned on slaughter due to abscess formation in the submaxillary glands. The causal organism was identified as *B. pyogenes*.

Conclusions.

1. These experiments have demonstrated that meat meal can be fed economically to pigs in a dry form in combination with cereal meals, minerals, greenstuff, and drinking water.

2. That the ration used is appetising, nourishing, and a good substitute for skim milk, buttermilk, or whey.

3. Meat meal fed pigs as produced in these experiments are of a very satisfactory carcass quality, comparing favourably with those produced where a maximum of milk is used.

4. During periods of short supply of skim milk meat meal could be used to supplement the milk to advantage, especially if fed in dry form with the meals used in these experiments. It is claimed, therefore, as a result of these feeding tests, that the addition of meat meal to ordinary farm rations, inclusive of a proportion of skim milk, would enable the available milk to be distributed over a larger number of pigs, thus enabling pig production to be increased without increase of dairy stock.

5. The two methods of feeding could be combined during periods when skim milk is available in larger quantities, the pigs being fed on milk and other foods until they are from thirteen to fifteen weeks of age, after which they could be given a meat meal ration similar to the one used in these tests until they are ready for marketing.

6. That the return to the farmer for maize fed in conjunction with meat meal to pork and bacon pigs is much higher than market values, provided the pigs are:—

(*a*) Fed correctly from birth to maturity.

(*b*) Are kept under sanitary conditions.

(*c*) That market values of pork and bacon pigs bear a similar ratio to that which has applied during the experiments.

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W. A. Stewart, 1933: Prevention of Anæmia in Little Pigs by Feeding. Journal of Ministry of Agriculture, Vol. 39; p. 1155.

Breeding for Pork and Bacon.

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PIG-RAISERS are frequently confused in the matter of selecting the correct types and breeds of pigs to produce their baconers and porkers, and the object of these notes is to place before Queensland farmers something definite about the pig trade requirements and how they may be met by careful attention to the breeding of pigs.

The information herein is given after careful consideration of all the available evidence of breed tests and performances both here and abroad. It must be noted from the outset that, although the matter of "breed" is important, it is not nearly so important to the pig-raiser as the matter of individuality within the breed; also feeding and management of the pigs have a vast effect on their inherent characteristics.

During their growth pigs pass through a stage when they increase mostly in body frame, then at a later stage they increase in flesh and fat, and as they approach maturity they become very fat. The correct stage at which to market pigs for pork or bacon is when they have put on sufficient flesh and fat to give them a "finished" appearance, but before they carry an excess of fat. Some experience is necessary to be able to determine when a pig has reached this correct stage of maturity or fatness.

Full feeding and restricted exercise favour early fattening at a light weight, whereas limited feeding and grazing tend to retard fattening, though grazing does not necessarily retard growth. Some types of pigs fatten and mature at lighter weights than others.

Wherever one goes, he hears the question: "What is the best breed or cross of pigs " The answer at present is that, "There is no best breed or cross of pigs, but several breeds and crosses give satisfaction in that they meet the requirements of the farmer as well as the bacon curer, pork butcher, and the consumer." Firstly, one must consider the trade for which he intends to cater. The pork trade, the Queensland bacon trade, and the English bacon trade, all require the same conformation and proportion of fat and lean in the pig's carcass, but each of these trades requires the "finished" pig at a different weight. A description of the ideal carcass for any of these trades is as follows:—

A fleshy pig, with a comparatively light covering of fat; the flesh and fat being of fine texture and firm, and should harden under ordinary chilling treatment; in conformation, the pig should be comparatively light in the shoulders, neck and jowl, and head; the middle should be comparatively long and fairly deep with ribs well sprung, but not bulging into a rounded barrel; the back should be slightly arched, and the belly line straight but full to the flanks. The hams should be fleshy, well rounded, deep and broad. The skin and the legs bones should indicate fine quality.

The most desirable weights are—(*a*) For local and export porkers, 60-80 lb. dressed; (*b*) for Queensland baconers, 95-120 lb. dressed; and (*c*) for the English "Wiltshire Side" bacon trade heavier carcasses are required, pigs dressing 130-160 lb. usually realising highest price per pound.

It will now be realised that to have that desired degree of "finish" on a porker, a light baconer, or a heavy baconer, it is necessary to use breeding stock of types which mature early or late as desired.

Although there are variations in all breeds of pigs, we can, in a general way, class our breeds of pigs into two fairly distinct types, viz.:—(*a*) The smaller, quicker-maturing porker type, and (*b*) the larger, later-maturing bacon type.

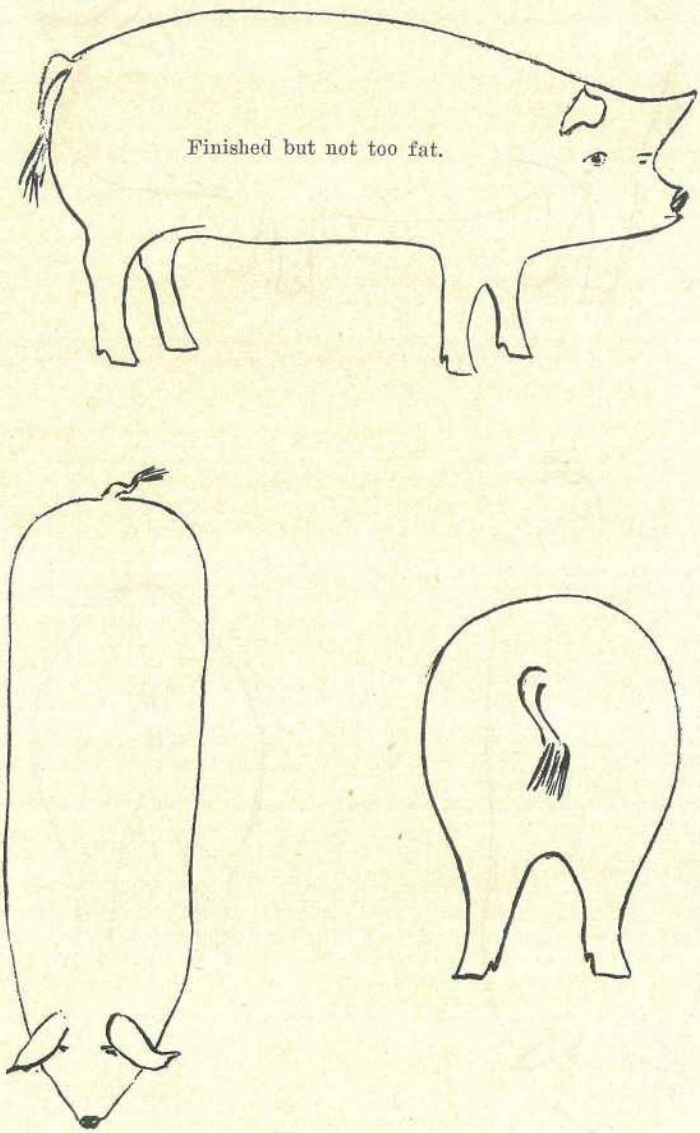

PLATE 98.

Diagrams showing side, top, and rear views of a good type of pig carrying the required proportion of the most valuable parts of a carcass. The ideal conformation to be aimed at by the breeder of porkers and baconers.

Early maturity (with which is associated early fattening) must not be confused with fast growth, which may be found in either late or early maturing animals. Maturity means that the animal has finished its development, at which stage it usually fattens rapidly. Fast growth means that the animal grows rapidly, although it may not be fattening.

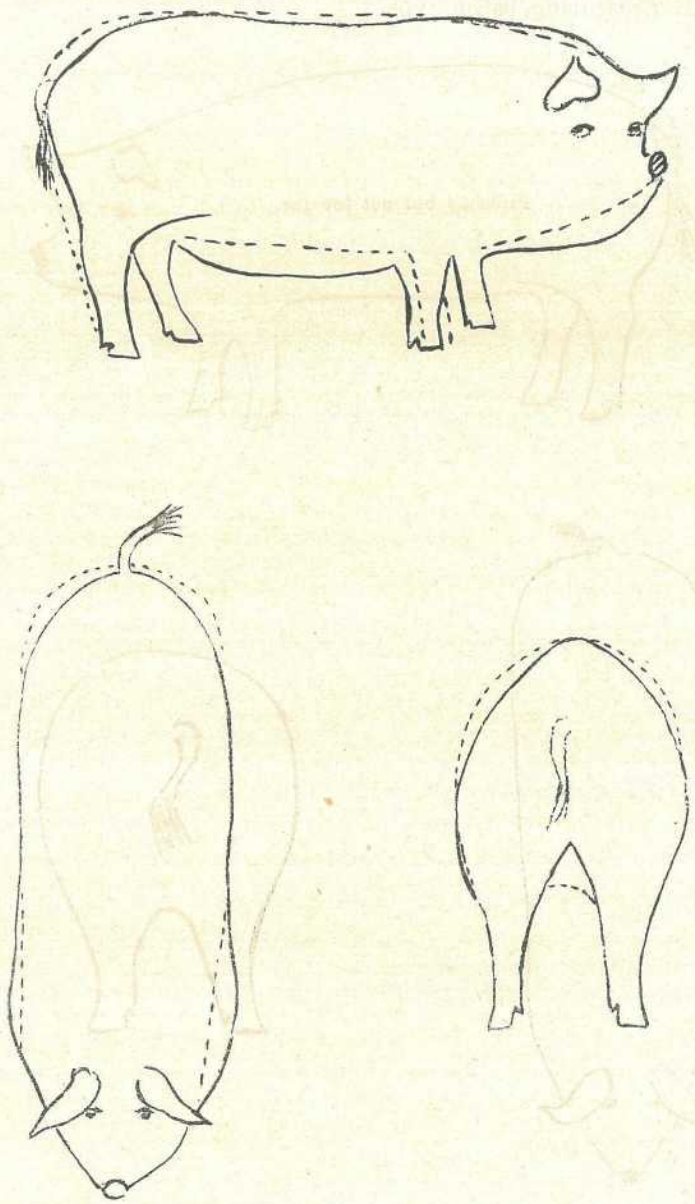

PLATE 99.

Diagrams showing side, top, and rear views of an undesirable type of pig. Comparison of heavy lines with dotted lines shows where this type departs from the ideal.

To have an abundance of lean meat it is necessary to have the animal growing rapidly, but not fattening; therefore, to produce the ideal pig which is in a "finished" condition, but not too fat, when it reaches the most desirable trade weights, and which has grown rapidly, it is necessary to use the correct class of breeding stock. For the production of light-weight porkers, the early-maturing breeds are quite satisfactory, but if this class of pig is grown on rapidly to either local or export bacon weights, it will give a thick and overfat carcass; this is a common mistake made by pig-raisers.

To produce the export baconer, the larger, late-maturing class of pig suits admirably, but if this class of pig is marketed at porker weights or at Queensland baconer weights, it is "unfinished," and does not give a meaty and attractive carcass.

A problem is presented by the Queensland bacon curers who require their "finished" pig at an inconvenient weight. The smaller class of pig, if used to produce bacon, must either be grown very slowly to baconer weights or give an overfat carcass, while the larger class of pig, if marketed at 95-120 lb., gives a very rangy carcass which is usually lacking "finish." So it is a medium class of pig which is required, and this class must be produced either by (i.) selective breeding of either the more lengthy pigs of the smaller class or the more compact pigs of the larger class; or (ii.) by crossing the pigs of the smaller type with pigs of the larger type.

Of the breeds in use in Queensland at present, the Berkshire and the Middle White are typical early-maturing pork breeds, while the Tamworth and Large White are typical late-maturing bacon breeds, although the Tamworth is a little more compact and earlier-maturing than the Large White.

Individual animals and families vary, but the more typical representatives of these breeds fit into these classes. It might be repeated here that selection of the most desirable individuals within each breed is even more important at times than the selection of a breed, as individuals vary to a great extent.

Where crossbred sows of medium type are in use on the farm, they should be mated with boars of the larger class for the production of baconers, and with boars of the smaller class for the production of porkers. When we speak of the smaller class of pig it is not meant to imply that a very small pig is desirable. From the pig-breeder's point of view, size of the individual within the breed is an important characteristic. A good-quality big pig is better than a good little pig.

The English pork and bacon markets and the local pork market have a preference for white pigs, and when these markets are being specially catered for the Middle White and Large White breeds—either as purebreds or for crossing—must receive consideration. The progeny of white pigs mostly are white, even if the one white parent is mated with a black or red animal. It might be mentioned with regard to white pigs that while they are reasonably hardy, their skin will soon become unhealthy if they are exposed to insanitary conditions or to parasites, such as lice and mange mites.

Using typical pigs of the breeds, under average conditions, the following breedings are giving desirable carcasses in their particular class:—For porkers 60 lb. to 80 lb. dressed—Middle White or Berkshire; for local baconers 95 lb. to 120 lb. dessed—Tamworth of compact type,

Large White X Middle White, or Large White X Berkshire; for export baconers 130 lb. to 160 lb. dressed—Large White.

The ideal porker or baconer can be pointed out when alive with a reasonable amount of accuracy, and for the breeder's purpose it is necessary that they should be discernible while alive.

While endeavouring to produce the ideal porker or baconer, the farmer must keep in mind points other than market requirements; these are prolificacy, rate of growth, and food consumption for each pound of pork produced.

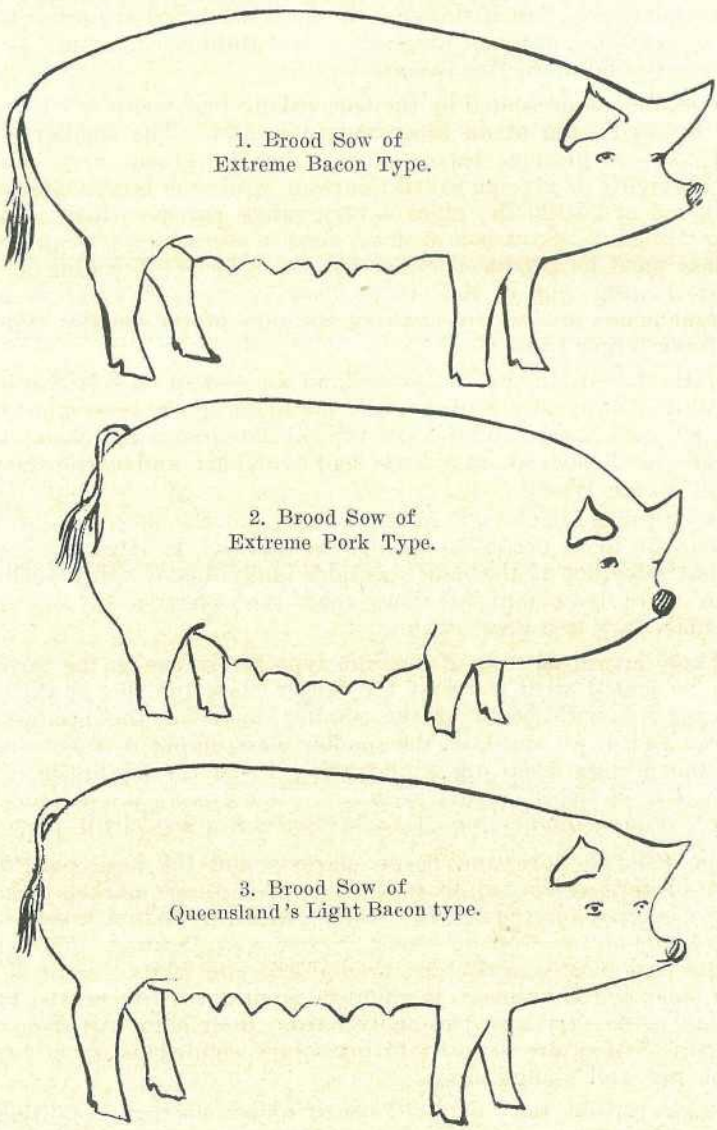

PLATE 100.

The above diagrams illustrate adult pigs of the larger and smaller types, as well as the medium type which suits the Queensland bacon trade.

Feeding Farm Animals.

By H. W. KERR.*

Introduction.

AT the Bundaberg Conference of the Technologists' Society a paper was read by Mr. G. E. Waddell on "Scientific Horse Feeding." An interesting discussion ensued, and it was evident that a wide diversity of opinion exists as to the feed requirements of the farm horse, and the manner in which a suitable ration may be supplied economically. At the request of several cane farmers, I have much pleasure in preparing a review of the proposals and recommendations presented by Mr. Waddell. First of all, however, it appears desirable to set out in a brief and elementary manner the fundamental principles of animal nutrition so as to provide a background for the discussion of an important subject which is all too imperfectly understood by farmers in general.

Composition of Feeds.

There is a very important point of distinction between the plant and the animal kingdoms. It is the function of the plant to build up carbonic acid gas, water, and the so-called plant-foods absorbed from the soil into the various complex tissues, in which process the sun's energy plays a most important part. The animal is entirely dependent, either directly or indirectly on these plant materials for its life functions. We must therefore understand the nature of plant materials, and the manner in which they are utilized in the animal body.

When the chemist analyses a feeding material, he subdivides its constituents into the following groups:—

(*a*) *Proteins*—or substances containing nitrogen;

(*b*) *Carbohydrates* embracing sugars, starches and fibre;

(*c*) *Fats*, and

(*d*) *Mineral substances* (so-called *ash*).

These groups of substances are known as *nutrients*, and each possesses its own peculiar properties and functions when taken into the digestive system of the animal.

Animal Nutrition.

The animal body consists essentially of a bony skeleton of mineral matter—largely phosphate of lime—surrounded by an elaborate muscular system. Fatty tissues permeate the bones and muscles, and around all is the enveloping skin. Within the body cavity are the various special organs, designed for dissolving, distributing and utilizing the nutritive matter of the food and for disposing of the waste. While the composition of the plant is predominately carbohydrate in nature, the animal body is thus largely built of proteins.

The changes which the food undergoes within the digestive tract of the animal is known as *digestion*. This process prepares the nutrients for absorption and use in building new tissues, repairing those which are broken down, and as a source of energy. Carbohydrates can only be absorbed by the animal body when they have been converted into

* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

simple sugars, and there are several digestive juices which act on the starches and more complex forms to reduce them to this simple state. Fats must be broken up during the digestive process and converted to a form in which they may be absorbed through the intestinal wall. Proteins are likewise reduced to simple, soluble compounds before they can be taken into the bloodstream and utilized; thus the relatively complex plant proteins are taken apart before they may be absorbed by the cells of the animal body and built up once again into complex animal proteins. The mineral matter is not substantially changed during digestion, but is merely brought into a soluble condition and thus absorbed.

Functions of the Nutrients.

The digested nutrients are transported by the circulating bloodstream for the nourishment of all parts of the body. They may then be "burned" to warm the animal—through the agency of oxygen absorbed by the lungs—or to produce energy for the performance of work. If more nutrients are supplied than are necessary for these purposes, the excess may be converted into body tissues, either protein or fat. The burning of the nutrients in the animal body produces carbonic acid gas which is eventually eliminated through the lungs; the waste nitrogenous products produced by the breaking down of protein material are excreted in the urine together with the surplus of mineral matter.

Digestibility of Feeds.

Now it is found that all feeds are not of equal value to the animal, by virtue of the fact that their nutrients are but partially digestible. The indigestible portion of the feed is represented by the fæces which have really never entered the animal body. The extent to which the different nutrients are digestible has been determined as the result of a large number of feeding trials, in which the total amount of nutrient fed to the animal is compared with that which is voided in the fæces. The following list provides the results obtained from a selection of common feed materials in which the canegrower will be interested; the figures in brackets denote the percentage of digestible matter in each ingredient:—

Feeding Stuff.	Water.	Protein.	Carbohydrates.		Fat.	Dry Matter—Digestible.
			Fibre.	Sugars, Starches, &c.		
	%	%	%	%	%	%
Concentrates—						
Oats	9	12 (78)	11 (35)	60 (81)	4 (87)	70
Maize	11	10 (74)	2 (57)	71 (94)	5 (93)	90
Bran	10	16 (78)	10 (31)	54 (72)	4 (68)	65
Linseed meal ..	9	34 (89)	8 (57)	36 (78)	8 (89)	79
Molasses	25	3 (32)	Nil	60 (90)	Nil	78
Roughages—						
Oat hay	12	8 (54)	28 (5[illegible])	42 (56)	3 (61)	54
Oat straw	12	4 (28)	36 (60)	41 (51)	2 (39)	54
Lucerne hay ..	9	15 (71)	28 (43)	37 (72)	2 (38)	60
Cane tops	68	2 (54)	10 (59)	17 (75)	..	69
Young grass, 6 in.	70	5 (70)	6 (60)	14 (78)	1 (60)	..
Mature grass (Paspalum)	85	2	4	8	..	..

This list has been subdivided for convenience into two classes of feed—(*a*) *Concentrates,* which are low in fibre and contain a large proportion of digestible nutrients; and (*b*) *Roughages,* which are the coarser feeding stuffs, high in fibre and supplying a lower percentage of digestible matter. In practice it is customary to blend a proportion of each class to provide a ration which supplies bulk as well as the essential nutrients in the required proportions.

Feed Requirements of the Horse.

The following are regarded as the minimum nutrient requirements of the horse:—

Horse.	PER DAY PER 1,000 LB. LIVE WEIGHT.			
	Dry Matter.	Digestible Protein.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	
Idle	13–18	0·8–1·0	7–9	8·0–9·0
At light work	15–20	1·0–1·2	9–11	8·0–8·5
At medium work	16–21	1·2–1·5	11–13	7·8–8·3
At heavy work	18–22	1·5–1·8	13–15	7·6–8·1

It will be observed that the total quantity of nutrients required depends on the nature of the work which the animal is performing. Moreover, it will be seen that the "Nutritive Ratio" varies accordingly. This ratio is simply the relationship between the weights of digestible carbohydrates and fats (energy material) to digestible proteins. With increased exertion, there is also an increase in the rate at which the body tissues are broken down and a consequent heavier demand on proteins to repair these tissues.

In determining a suitable combination of feeding stuffs to provide the farm animal with its requrements, several important considerations demand attention. The horse is limited in its capacity to consume roughage, and in general some concentrate must be added to the ration to supplement the deficiencies of the coarse fodder. The nature of the concentrate added will be governed by the nature of the digestible nutrients available in the roughage. And finally, the farmer will wish to purchase those concentrates which supply the desired nutrients at the lowest unit cost. It will be observed that in these discussions the use of maize or oats, or linseed meal as concentrate, is considered only in its ability to supply econmically the desired nutrients and not because of any special virtue which each possesses. This is a point on which prejudice often obscures the farmer's better judgment.

A study of the list of feeding stuffs given above brings out the following interesting points:—

(1) Maize has the highest percentage of digestible nutrients of all feeds listed: 90 per cent. of the total material is actually digestible. It will be observed, however, that its nutrients are chiefly starches and fats, and it is notably deficient in proteins; in this respect it does not compare favourably with lucerne hay, which is 50 per cent. richer in this nutrient.

(2) Comparing lucerne hay* with oaten hay*, it will be seen that they are essentially equivalent in the proportion of digestible carbohydrates, but lucerne hay will supply almost twice as much digestible

* Generally spoken of as "chaff."

protein as will the oaten hay. This suggests that lucerne might well be used in preference to oaten hay, with advantage to both the farmer's pocket and the animal.

(3) Molasses is a concentrate rich in carbohydrates (sugars) and containing but a small proportion of digestible proteins.

(4) Cane tops ("chop") provide good average roughage, with but little digestible protein and fair carbohydrate value. It does not compare favourably with young pasture with respect to digestible proteins, though it is decidedly superior in every particular to mature dry grass.

(5) Linseed meal is found to be a particularly useful concentrate where it is necessary to supply substantial amounts of protein to provide a balanced ration, thugh it must not be used excessively. One pound per day is regarded as a suitable addition. It is also rich in digestible carbohydrates and fats.

Determining the Ration.

In calculating a satisfactory ration it is best to begin with the amounts of the several nutrients which the horse obtains from the roughage available to it. It will be evident that a horse pastured on young grass will require different supplementary feed from one fed on chop or old pasture; while a horse in full work demands an all-round increase in nutrients over that for one at light work, as shown in the table given above. Consider, for example, a 1,300 lb. horse at regular ploughing work. Suppose it consumes 8 lb. of good quality young grass at night, and receives a daily ration of 8 lb. maize and 14 lb. chaff. The available nutrients in this total feed and the corresponding minimum requirements are:—

Feeding Stuffs.	Dry Matter.	Digestible Proteins.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	
Maize, 8 lb.	7·2	0·6	6·9	1 to 10
Chaff, 14 lb.	12·4	0·1	6·4	1 to 45
Young grass, 8 lb.	2·4	0·3	1·6	1 to 5
Total	22·0	1·0	14·9	1 to 13
Minimum requirements	23·4	2·0	16·9	1 to 8

It is evident then, that the animal is getting too little dry matter and total digestible nutrients, while the high nutritive ratio shows that the ration contains too little digestible protein. This could be adjusted by the addition of a proportion of linseed meal and by substituting some feed richer in protein (lucerne hay) for a proportion of the maize.

For a farmer who is feeding 20 lb. chop and 8 lb. molasses, and allowing his animals to graze out at night on rank paspalum pasture, the daily ration would be somewhat as follows:—

Feeding Stuffs.	Dry Matter.	Digestible Proteins.	Total Digestible Nutrients	Nutritive Ratio.
	Lb,	Lb.	Lb.	
Chop, 20 lb.	6·4	0·23	4·1	1 to 17
Molasses, 8 lb.	6·0	0·08	4·4	1 to 54
Rank grass, 16 lb.	2·4	0·18	1·6	1 to 8
Total	14·8	0·49	10·1	1 to 20
Minimum requirements	23·4	2·0	16·9	1 to 8

In this instance it is again evident that the animal at hard work is receiving a ration deficient in every detail and demanding an increase in protein-rich feed particularly. Failing this the horse must inevitably lose condition.

Molasses as a Feed.

The preceding example must not be interpreted as a condemnation of molasses as a feed. On the contrary when correctly used it is one of the cheapest concentrates available to the canegrower, but it is to be regarded essentially as an "energy" food, and requires balancing with appropriate amounts of protein-rich concentrates. When used in this manner with the proper proportion of roughage, an excellent ration may be compounded.

In this connection a report recently received from Louisiana lays particular emphasis on that very point. Feeding trials have been conducted in that state over a number of years, with farm mules, and it has been demonstrated clearly that molasses will replace ground maize in a highly satisfactory manner. (It was pointed out earlier that the value of maize lay chiefly in its carbohydrate content, which accounts for the interchangeability of these two feeds.) It was determined that animals could be given up to 9 lb. of molasses daily without apparent detriment to the animal; 6 to 7 lb. was, however, considered the most satisfactory allowance. Experience showed that it was best to add the undiluted molasses to the roughage just before feeding.

Typical rations fed to mules in Louisiana plantations are as follows:—

1.	2.
15 lb. ground maize.	7 lb. dried brewers grains.
8 lb. soy-bean hay.	7 lb. cracked maize.
7 lb. molasses.	2 lb. cotton seed meal.
	7 lb. soy-bean hay.
	7 lb. molasses.

Soybean hay and cotton-seed meal could be substituted by lucerne hay and linseed meal.

Mineral Nutrients.

In conclusion, a few comments should be made on the question of the mineral constituents of feed. It is a well recognised fact that an animal must receive its due proportion of minerals—notably phosphate and lime—to maintain it in a healthy condition, and enable it to build the necessary bone and muscle. It is also highly significant that the pastures of our heavy rainfall areas are markedly deficient in the essential minerals. This is a matter requiring investigation, and in all probability it will be found to be related to the shorter useful lfe of draught animals in North Queensland.

Several well-established licks supplying the essential minerals are now marketed in Queensland, and their use is well worthy of consideration by farmers in these parts.

Drought Feeding of Stock.

IN order that useful data may be gathered in connection with the drought feeding of stock, stock inspectors in the affected districts were asked to report on the following points:—

1. How severely the district was affected.
2. Fodders in use during the dry spell, including licks.
3. Quantities of feed used during specified period.
4. Numbers of stock fed.
5. Methods of feeding adopted.
6. Classes of stock fed, especially breeding stock; and in the case of lambing ewes, what proportion of lambs was saved.
7. Approximate daily cost per animal.
8. Water supply.
9. General results achieved.

In connection with 2 and 3, it was desired to ascertain the approximate quantity of dry Mitchell grass or other natural grasses available in the different localities in which green feeding was practised, and also the edible shrubs which were considered most useful.

STOCK INSPECTORS' REPORTS.

Hughenden District.

The District Stock Inspector, Hughenden District (Mr. R. W. Bambrick) reported—

Speaking generally, the drought culminating in July last was not considered any worse than that of 1926. From Hughenden eastwards, very slight losses were sustained. The downs country suffered the heaviest losses both during the dry spell and from the effects of the rain after it.

The stock foods chiefly used during the dry time were—Lucerne hay, maize, Meggitt's meal, and Thorpe's kubettes, and the licks Vita-lick, Vic-lic, and licks made up on the properties from several of the following ingredients in various proportions:—Dicalcic phosphate, Nauru phosphate, bone meal, salt, sulphur, Epsom salts, gentian, molasses.

Quantities of feed used during a specified time would approximate 3 oz. to 4 oz. maize or ½ lb. lucerne hay or 4 oz. Meggitt's meal or 4 oz. kubettes daily. Lick is usually supplied in troughs and sheep would take up to 2 oz. daily.

The feed was spread out on clay pans or gravelly ridges mainly, except in the case of rams where trough feeding was resorted to.

In most instances, where hand feeding was adopted (in addition to ram feeding), the best of the ewes and the young sheep were fed; except where it was thought advisable to maintain woolly sheep up to the time of shearing. Practically all young lambs were lost, and a big percentage of old ewes in lamb.

The approximate cost of hand feeding was sixpence (6d.) per head per month.

The water on most sheep properties in this district is supplied by artesian or sub-artesian bores. In the case of artesian bores, the water

is run along drains through the property. With sub-artesian bores it is pumped by windmill or engine, stored in earth tanks or galvanised iron tanks, and supplied to stock in troughs.

Losses have varied. In some instances, sheep were hand fed and kept alive until rains fell only to perish from wet and exposure afterwards.

Close to Hughenden losses were negligible, but on places to the west and south-west losses from 10 per cent. to 90 per cent. were sustained. It is estimated that over the whole district there was a loss of 25 per cent. of the flocks due solely to starvation.

A few properties which were not overstocked carried small quantities of dry Mitchell and Flinders grass, but due to dry conditions and after the slight falls of rain, the grasses rotted and were not of much use as sheep feed. One case is cited: A property near Corfield carried a fair body of dry Mitchell grass and the sheep on it, which were not hand fed, were rapidly losing condition after May. The shrubs utilised for feeding and considered most useful were whitewood, vine tree, mimosa, and boree.

Many stock owners considered it inadvisable to hand feed, for with the lower sheep values and the uncertainty of rain until summer, the cost of hand feeding would have placed an unrealisable value on the sheep that survived.

Rockhampton District.

The District Stock Inspector at Rockhampton (Mr. J. J. Ashe) reported that stock feeding during the dry time was confined to the dairy herds of local milk vendors.

Emerald and Springsure Districts.

The District Stock Inspector at Emerald (Mr. D. Hardy) reported:—

Emerald and Springsure districts were practically unaffected by the drought. Over 200,000 sheep were agisted in the Emerald and Springsure districts during the dry period from December, 1934, to the end of July, 1935. Of that number, 80,000 came from Wellshot, Ilfracombe, and Longreach.

Since the rains at the end of June and first week in July most of these sheep have returned to their home pastures, all in very fair condition and, in most cases, very much improved in condition. No fodders were used, the sheep being fed on the natural herbage and shrubs in the paddocks where agisted.

Various licks were in ordinary use, including Vic-lic and various mixtures made up of salt, molasses, sulphur, &c.

Plentiful supplies of water in streams and bores were available throughout the period.

The sheep were maintained in a satisfactory condition during the seven months of agistment, and were able to truck away in strong and healthy condition.

The sheep were depastured on Mitchell, Flinders, and Blue grass chiefly; edible shrubs fed included wilga, currant bush, and yellowwood.

The average price paid for agistment was £20 per 1,000 sheep per month.

Longreach District.

The District Inspector of Stock (Mr. C. G. Barth) reported—

It will be noticed from the records given below that the weather has been particularly dry in the Longreach district since the commencement of the year 1934.

Rainfall.—

1932	19·43 in.
1933	21·29 in.
1934	8·48 in.
1935 (January to June)	5·31 in.

From January of this year until the last week in June only 1·88 inches of rain was recorded, the remainder—3·43 inches—fell during the last week in June.

Prior to the rain at the end of June this year the only feed that remained in many places was a few old burnt-up grass tussocks and the leaves which fell from withered trees.

With the exception of a few permanent waterholes along the Thompson, Barcoo, and Diamantina Rivers, the surface water had entirely disappeared, and artesian and sub-artesian water was all that was available to stock.

From January until July of this year stock routes were untrafficable, and owners sending their stock to relief country were obliged to resort to hand feeding between their holdings and the nearest railway; and in many cases water had to be arranged for at some of the stations contiguous to the stock routes.

The Longreach and Winton districts are rather unfortunate in not having a reserve of good edible shrubs for dry times, and where edible shrubs were available, even in small quantities, they were used successfully with a ration of maize, and the cost of feeding was, consequently, reduced considerably.

Several owners of flocks up to 20,000 sheep were compelled to cart water in 1,000-gallon tanks on motor trucks for many miles daily, as the water in their dams had dried up. These trucks were engaged exclusively on this work for many months.

During the last six months, the trees, particularly those on the lighter and sandy soils, were dying as a result of the drought; and on the black soil plains huge fissures could be seen everywhere.

Owing to the prolonged dry spell it was impossible for cattle from the Territory and districts in the North-west to travel south through the Central-west.

In normal seasons the stock routes down the Diamantina and Georgina country are used extensively by thousands of cattle travelling south each year between the months of April and October.

To further indicate how severely the district was affected during the recent dry spell, I submit the following summary (approximate) of the sheep position:—

Longreach District—

20 per cent. sold.

40 per cent. sent away to agistment country.

15 per cent. fed by hand distribution of cultivated and manufactured fodders.

25 per cent. died.

Winton District—

15 per cent. sold.

25 per cent. sent away to agistment country.

10 per cent. fed by hand distribution of cultivated and manufactured fodders.

50 per cent. died.

On some of the holdings in the Winton district 85 to 90 per cent. of the sheep died, but I estimate the average for that district to be 50 per cent. mortality.

The very high mortality among the sheep in the Winton district occurred during the week the rain fell, and was due to the sheep having been recently shorn, the boggy nature of the country, and the cold spell. Under the conditions it was impossible to feed the sheep after the rain commenced, and the majority died from starvation and exposure.

In numerous cases throughout the Central-west, sheep with six months' and more wool, were shorn and turned out in the paddocks to die.

Fodders in use during the drought, including licks.

Lucerne hay, lucerne chaff, oaten hay, oaten chaff, maize, Thorpe's kubettes, Meggitt's nuts, bone meal, Vita lick D, Prophylactic sheep lick, Dalco, Epsom salts, coarse salt.

A few dry butts of Mitchell grass were available on some of the holdings, from which the stock could obtain a certain amount of roughage.

On other places, edible shrubs such as boree, whitewood, dead finish, supple jack, mimosa, leopard tree, and sandalwood or plum tree, were available as roughage; and this fodder, when used in conjunction with a ration of maize, proved to be satisfactory. Mulga, of course, is a superior fodder to any of the abovementioned trees or shrubs, but, unfortunately, there is very little of this in the district; whilst gidgee, of which there are immense quantities, is not regarded as a satisfactory fodder for stock.

Most of the selections and stations in the Longreach district have open downs country, and are without edible scrubs. Owing to the prolonged dry spell they were denuded completely of dry grass and roughage of any kind; and it was on these places where the sheep carrying six months or more wool were shorn during the cold weather, and turned out into the bare paddocks to die.

Quantities of feed used during specified period.

The most satisfactory way to answer this question would be to give details of a few specified cases of hand feeding in the district. In that connection, I submit particulars of what was done on Luthrie, Portland Downs, and Breedon statians to feed flocks during the recent dry spell.

Luthrie Station.

101 bags maize, from 1st May, 1935, to 24th May, 1935.

671 bags maize, from 24th May, 1935, to 14th July, 1935.

A fair quantity of old dry Mitchell grass and other roughage was available on this place, otherwise the cost of feeding would have been much greater.

Portland Downs.

564 tons maize, 268 tons lucerne hay, 21 tons oaten chaff, 9 tons oaten hay, 20 tons salt, 3 tons Vita lick, 3 tons Meggitt's nuts, 6 cwt. bone meal, 4 cwt. Epsom salts.

The sheep in varying numbers were being fed from 4th February, 1935, until 31st July, 1935.

A fair quantity of dry Mitchell grass and boree scrub was available.

Breedon Station.

17 tons lucerne hay, 3 tons maize, 1 ton Thorpe's kubettes, 1½ ton Vita lick. The total cost was £234 16s.

A fair quantity of Mitchell roughage was available, and this reduced the cost of feeding considerably.

Numbers of stock fed.

Luthrie Station.

6,000 sheep, from 1st to 24th May, 1935.

12,000 sheep, from 24th May until 14th July, 1935.

Portland Downs.

Commenced feeding 6,507 ewes, lambs, and rams on 4th February, 1935. By 23rd July, 1935, the numbers fed increased to 62,000 mixed sheep, and diminished to 29,000 by the end of July, 1935.

There are about 100,000 sheep on this station, therefore about 40,000 sheep were not fed.

Breedon Station.

130 rams, 600 ewes.

In addition, 6,000 sheep were away on agistment country, costing £166 12s. 8d. per month.

Methods of feeding adopted.

With the exception of chaff and the various licks, the feed was scattered broadcast from motor trucks on to clay pans and hard ridges. The licks and chaff were generally fed in wooden troughs or on bagging stretched along two plain wires.

Classes of stock fed, especially breeding stock, and in the case of lambing ewes, what proportion of lambs was saved?

Luthrie Station.

6,000 breeding ewes, 2 to 7 years.

1,500 maiden ewes.

150 rams.

Balance of sheep are mixed weaners.

This station was fortunate in not having their ewes lambing during the dry period.

Portland Downs.

37,000 ewes, from 2 years.

23,000 weaners, 6 months to 1 year.

2,000 rams.

No ewes lambed during the last six months, but the drop previous to that did very well on hand feeding, with very few losses.

Breedon.

There were 180 lambs, December-January drop, with 600 ewes, and out of these lambs only 35 were saved; although well fed, the lambs died off.

Generally, I estimate that not more than 5 per cent. of the lambs in this portion of the district were saved during the last six months.

Approximate daily cost per animal.

Luthrie.

·250d., including distribution costs and licks, based on the following prices of feed:—Maize, 3s. 6d. per bushel; railage, 1s. 2d. per bushel; cartage, 6d. per bushel; distribution, 10d. per bushel. Total, 6s. per bushel.

Feed cost this station £600 and licks £100.

Portland Downs.

With roughage, maize ration, and lick, only ·357d. per head per day.

With lucerne hay, maize, and licks, 1·000d., and from 1d. to 3d. per day for rams.

Lucerne hay delivered at Portland cost about £11 15s. 4d. per ton, maize, £12 5s. per ton.

Breedon.

Including distribution costs—1·000d. per head per day, rams costing up to 3d. per day.

Water supply.

Artesian and sub-artesian.

General results achieved.

Luthrie.

Feeding was commenced early while the sheep were in fairly strong condition, with the result that only 70 died.

With the maize ration in addition to the dry Mitchell grass and other roughage, the sheep were in fair store condition at the end of the dry period. The owners are quite satisfied with the results of their feeding.

Portland Downs.

On this station the owners commenced feeding before the sheep lost too much condition, with the result that they held their condition. Over 2,000 good-quality stud rams were fed right through the drought with excellent results. The losses on this place amounted to about 5 per cent., which is regarded as very satisfactory.

Breedon.

The quantity of cultivated and manufactured fodders given was just about sufficient to keep the sheep in strong condition, and they had a certain quantity of dry Mitchell roughage which helped considerably.

Despite the feeding and attention given, sheep carrying six months' wool died during the cold rain which followed the dry spell; and, during the last six months, this station lost quite a big percentage of its sheep.

Roma District.

The District Inspector of Stock (Mr. E. S. Cardell) reports:—

The Roma district, generally speaking, was not affected very severely during the dry season.

Fodders in use were lucerne—chaff and hay—maize, molasses, Master and Vita licks. In a few isolated places, wheaten hay and Soudan grass hay were used.

Only small quantities of cultivated and manufactured fodders were used during the dry season.

Only small flocks were fed.

The methods of feeding adopted were mostly by trough. There were a few exceptions of scrub feeding.

Classes of stock fed were lambing ewes, lambs, and dairy cattle. I have heard of only a small percentage of lambs being lost in the district.

The graziers interviewed had kept no record of the approximate daily cost per animal.

Water supply was getting short in a number of places. Creeks, lagoons and wells were drying up very quickly.

The general results achieved were not unsatisfactory for the drought was only beginning to be felt when the rain came. Very little Mitchell grass was available in the district.

After the rains in the early part of the year, various grasses grew which carried the graziers and others through until recently, when shrub feeding—supple jack, mulga, wilga, ironwood, coolibah, apple-tree red ash, myrtle, womal, and wild peach—had to be resorted to in some places.

CAUSES OF "SCOURS" IN CALVES.

Carelessness, impatience, and indifference on the part of the feeder spells failure in calf-rearing. The greatest cause of loss amongst calves is "scours," and more often than not is due to negligence.

Scours may be caused by—

Allowing very young calves to eat material which affects digestion.

Feeding skim-milk too soon to young calves.

Feeding milk at too low or too high a temperature.

Irregular rations.

Feeding separator froth with milk.

Overfeeding.

Impatience when feeding so that the calf is not allowed to take its time. The calf consequently goes out hungry and drinks water.

Feeding meal to a calf at too young a stage.

Overfeeding with meal.

Feeding undercooked meal.

Feeding soured milk.

Feeding from dirty utensils.

Allowing calves to drink from stagnant water, sewerage water, or water from dirty troughs.

Dirty or infected shed and yards.

Exposure to rain and weather.

Allowing calves to chew old rags, twine, and other rubbish.

FAT LAMBS—SIX "DON'TS."

THE SIX BIG "DON'TS" IN THE HANDLING OF LAMBS ARE:

DON'T overdrive the lambs.
DON'T use dogs that bite.
DON'T grab the animals roughly by the wool.
DON'T prod with sticks, or ill-use in any other way.
DON'T overcrowd in trucks.
DON'T allow the animals to fall off the gangboards during unloading operations.

Owners, agents, drovers, abattoir employees, and railwaymen are asked to co-operate in an earnest endeavour to prevent these and any other injurious practices.

Bruises or lacerations impair the market value of the finished carcass, and result in its rejection for export.

Better handling means better prices—better trade and—better reputation.

SHEARING AND SHEARERS.

By JAS. CAREW, Senior Instructor in Sheep and Wool.

IN view of the fact that sheep shearing by machinery has been practised in Australia for upwards of half a century, the following letter taken from the "Farm, Field, and Fireside" (England) of 5th July, 1935, reads rather quaintly:—

MECHANISED SHEEP SHEARING.

To the Editor of "F., F., & F."

SIR,—For the first time, the sheep in Hyde Park have this year been sheared by machinery, and as I have the grazing rights in the Royal Parks, I am being besieged with questions about hand-shearing and machine-shearing. As the subject will be of considerable interest to your readers, perhaps you will allow me to say a word about it.

I watched the mechanical shearing with the closest attention, and in spite of the bad weather conditions the shearers had to contend with most of the day, I am satisfied that is was better done than it could have been done by hand, and very much more quickly.

In the past I have always had my sheep shorn by hand, but, so convinced am I that mechanical sheep-shearing is the method of the future, that I have decided to have all my sheep sheared by machinery in future, and I believe that my friends will do the same.

In my opinion, this modern method of shearing is invaluable for the large and small flocks in Scotland and Wales, as flock owners have to depend so much upon the weather. Undoubtedly this form of shearing has come to stay.—Yours faithfully,

G. DALE WILLIAMS.

At the Shepherd's Hut, Royal Parks, London, W.2.

In Australia the shearing of sheep advanced in keeping with the numbers of sheep. A hundred years ago there were about 1,000,000 sheep in Australia; to-day there are well over 100,000,000.

During the time this increase was taking place there was a large spread to remote areas, and each flock had to be shepherded. When shearing time came round, the owner arranged to have his sheep shorn at some suitable place, usually near a good water supply. It was quite a common practice before shearing to wash the sheep in a pool and then turn them into a clean, well-grassed paddock to dry. The sheep were then packed together overnight to cause the yolk to rise in the wool, which made it easier to cut. Shearing was paid for at per 100 sheep. The first price I remember was £1 per 100. All other labour was paid at a weekly rate, with rations. As the flocks increased and spread further inland, shearers had to travel long distances on horseback to secure work. Groups of horsemen would commence a journey of 300 or 400 miles with the intention of getting a good "run" of sheds. The rouseabouts, or shed hands who provide the unskilled labour at shearing time, would probably start three months before shearing in order to foot the distance—the ownership of horses, pack and saddle, was generally beyond their means. In fact, many shearers started in this way.

The blades were in universal use half a century ago, but since then machines have replaced them in every shed in which an appreciable number of sheep is shorn.

The system of payment was a great incentive to shear as many as possible per day, with the result that fast work was the chief aim of the shearer. The early type of sheep lent themselves to fast work, for their wool was fine, fairly open, with very little covering over the points.

The old positions for holding the sheep were discarded and new methods adopted, and when a number of shearers using the shears got going, the click, click, click of the blades as they came together set up a rhythm which seemed to engender vitality and generate energy applied with amazing skill which resulted ultimately in world's shearing records being established. One hundred sheep per day extending over the shearing was regarded as a good performance, but these figures were exceeded

by fast men until some wonderful records were established—as, for instance, that of Jacky Howe, who shore 336 sheep in nine and a-half hours.

The conditions under which he established this record were favourable to him, as the sheep were picked "rosellas," but he actually did shear that number in the one day. This record was established at about the time the machines were coming in favour, and, needless to say, many of the crack machine-men made attempts to beat it.

One thing stands against fresh records, and that is that the size of the sheep has increased, and the average quantity of wool per fleece also. Nevertheless, the average sheep shorn per man per day is greater now than when the blades were used. Much prejudice prevailed against the machines, and, in fact, there are many who still maintain that the blades are better as they do not interfere with the growth of wool. The machines are reputed to deter the growth of wool, and although more wool is usually shorn off a sheep with the machines they cause a certain amount of tension of the skin, which takes time to return to normal, thereby causing a loss in growth for a week or more.

The heat of the machines also is blamed for causing skin trouble and retarding the growth of wool, but if they are in good order and in the hands of qualified shearers there is not likely to be any trouble. They pass over the skin so quickly that if in good cutting order it is impossible for any harm to occur.

The social changes that have taken place since the introduction of the machines are very marked. Fifty years ago the different watering places for hundreds of miles were known to the travelling shearers, and every "sheep barber" had the Australian Light Horsemen's love of his steed. Long days of travel were undertaken, and many tales were told around the camp fires of the wonderful endurance of the respective hacks, and of the points of the sires that produced the big-hearted stayers. After the sheds cut out, shearers' races were organised, and a few "specials" were always kept dark for the big events, for many well-bred horses were selected and kept for the purpose.

To-day the motor car has taken the place of the horse, and the shearer, no longer the picturesque figure of old, instead of shearing for the station owner, works for a contractor who agrees to shear the station wool, class the clip, and prepare it for market. Shearers arrange with a contractor usually to shear for a whole season. Their living quarters must be in accordance with a prescribed standard; their beds must be fitted with suitable mattresses; and the galley must be furnished and fitted to suit the cook, usually an expert at his calling.

Shearers are highly skilled tradesmen, athletic in proportion and stamina, and when they have changed from the "Jacky Howe" sleeveless flannel shirts and "beaver moles" of their working day there is nothing to distinguish them from the well-clothed, well-nourished, and well-read city man of moderate prosperity. The day of the "billabonger" has gone. The fires at the end of the recognised daily stages from water to water no longer give a twinkling welcome to the late comer on to camp. The "editor" of the "Billabong Gazette" has told his last lie and published his last "mulga wire." There is now no rest period of camping along the bore drain or under the coolibahs on the river banks waiting for the shed to start. The modern shearer arrives

on the job from his home town by car with suitcases instead of a swag. In Western Queensland, he sometimes journeys to the job by aeroplane, travelling by the regular mail flyers. His contract price for shearing is 32s. a 100, and taking into consideration the seasonal nature of his employment, distances of travel and cost of transport, and uncertainty of a continuous run for any lengthy period, he is not overpaid.

Shearing Records.

Until about 1880 it was rarely that 100 sheep per day were shorn. "Flash" Boyd was the first to shear that number in a day of nine hours with the blades. The best tally legitimately shorn is that of Jacky Howe when he did 321 with the blades at Alice Downs, in the Blackall district, in nine hours. This tally has never been beaten, either with the blades or the machines under similar conditions. Other big tallies were reported to be put up by D. Cooper (318 with the machines at Ballenbullock, Hughenden) and Jim Power (318 at Northampton Downs). Many men have shorn 200 sheep per day and over, including P. Palmer, who did 250 per day at Mount Abundance, Roma, in 1907, where he shore 30 sheep in one hour. At Nive Downs he did one sheep per minute for a short run. The great tallies of to-day show that, regarding speed, the shearers now do many more in a daily tally than, say, thirty years ago. Fred Zimmerle and Harry Livingstone were probably the best shearers (quantity and quality) in Queensland, which means best in Australia. R. Lynn is among the "gun" shearers of later days.

WOOL CLASSING—A COMPARISON.

By J. L. HODGE, Instructor in Sheep and Wool.

ESTIMATE of a clip from 10,000 sheep (merino) classed properly at present-day prices. Estimate of 25 bales (of 300 lb. average) to the 1,000 sheep—250 bales. For purposes of this estimate, no notice was taken of sexes, and no lambs included.

It is to be understood that the fleeces are free. It is a good clip and will average over the price obtained per lb. for the whole sale. 166⅔ fleece wool, 25 broken, 24⅓ pieces, 10 bellies, 12 stains, 12 locks; bales 250. Classed as follows:—

Class.	Number of Bales.	Price per lb.	Nearest £. Value per Bale.	Total.
		d.	£ *s.* *d.*	£ *s.* *d.*
AAA W (or E)	31	14½	18 2 6	561 17 6
AA W (or E)	46⅔	13	16 5 0	758 6 8
A W (or E)	29	11½	14 7 6	414 17 6
AAA Combing W (or E)	33	13½	16 12 6	548 2 6
AA Combing W (or E)	27	12	15 0 0	405 0 0
Broken W (or E)	25	12½	15 12 6	380 12 6
Pieces W (or E)	24⅓	10½	13 2 6	319 8 4
Bellies W (or E)	10	9	11 5 0	112 10 0
Stains W (or E)	12	6	7 10 0	90 0 0
Locks W (or E)	12	3½	4 7 6	52 10 0
	250	..	..	£3,643 5 0

Estimate of a clip from 10,000 sheep (merino) classed indifferently at present-day prices.

Class.	Number of Bales.	Price per lb.	Value per Bale.	Total.
		d.	£ s. d.	£ s. d.
AAA W (or E)	64	13½	16 12 6	1,064 0 0
AA W (or E)	73⅜	12	15 0 0	1,100 0 0
AW (or E)	34	10½	13 2 6	446 5 0
Broken W (or E)	20	11	13 15 0	275 0 0
Pieces W (or E)	20	9½	11 17 6	237 10 0
Bellies W (or E)	11	7	8 15 0	96 5 0
Stains W (or E)	13⅓	6	7 10 0	100 0 0
Locks W (or E)	14	3½	4 7 6	61 5 0
	250	..	..	£3,380 5 0

Note.—AAA combing W (or E) and AA combing W (or E) is strong wool which in the first place was taken out as shown. Here it is left in AAA W and AA W (or E), thereby depreciating the prices to the levels they brought when taken out.

A W badly skirted therefore goes up 5 bales in number, but loses 1d. per lb.

Broken has been picked badly and loses both in number of bales and price per lb.

Pieces treated carelessly, some wool going to stains to the loss of pieces, but no gain to stains.

Bellies unskirted or done badly, lose 1d. per lb.

Stains gain at the expense of pieces (a more valuable wool) in weight but not in price.

Locks become heavier as the result of carelessness and want of supervision on the part of the classer, but the price received is no greater, thus losing the difference between stain prices and locks for every pound gained in weight.

——	Bales.	Lb.	Value.	Difference.
			£ s. d.	£ s. d.
Clip—well classed	250	75,000	3,643 5 0	263 0 0
Clip—classed indifferently ..	250	75,000	3,380 5 0	..

Price per lb. No. 1 clip, 11½·6d.

Price per lb. No. 1 clip 10¾·2d.

I have thought it well for purposes of illustration to take a well-classed clip as against one got up indifferently.

The figures work out well for the purpose for which they are intended. For instance, it would be quite easy to reduce the amounts obtained for clip No. 2 to almost any figure in reason, but here I have shown distinctly the loss entailed (not in an unclassed clip) in a clip classed but done indifferently in comparison with the same clip handled properly.

I might mention that I have been more than fair in the figures quoted to the indifferently classed clip.

THE NECESSITY FOR CULLING AND ITS ADVANTAGES.

By J. L. HODGE, Instructor in Sheep and Wool.

WHEN one comes to consider the position of pre-eminence in the world to which the Australian merino sheep has achieved, one is forced to think further of the importance of selection; and, after all, what is present day culling if not the selection of the best of a flock for a certain combination of conditions as applying to certain types and districts.

Like everything else on the land the proposition resolves itself into what is profitable and what is not economic. If I put the question to an interested listener, "Why feed an unprofitable sheep?" there is no satisfactory reply to be expected. A bad sheep eats just as much as a good one, but the economic position goes further than that, inasmuch as a bad ewe reproduces her kind, or more probably still produces a lamb worse even than herself.

It should be recognised then that the operation of culling is definitely profitable to the grazier. Elaborate yards are not necessary on a small holding for culling operations. A branding race or something resembling one is quite sufficient for the purpose. Culling should take place in the case of the ewes when the latter are carrying from nine to twelve months' wool. Some sheep classers refuse to handle sheep unless they are full fleeced, but I think a man of experience may discriminate in the case of flock sheep when the fleece is three parts grown. The nearer ewe hoggets are to full growth the better.

The type of sheep to aim for necessarily differs in different districts, but viewing the subject generally and as applied to Queensland it should be the object of the grazier to retain sheep answering to the following qualifications. Constitution is of paramount importance. A live dog is better than a dead lion, and in this State of ours it is the considered opinion of all those who count in the industry that we will always have with us, more or less, conditions of drought in some portion of the State, if not the whole. It is necessary then to go for an animal well able to stand up to hard conditions, travel to water and in some measure retain its condition under adverse circumstances. The type of sheep most likely to achieve these objects is the large-framed, medium to strong woolled variety. Australia is a huge pastoral country and there is ample room in which to breed the finer types. These should be sought after in districts where drought is practically unknown.

After constitution comes the covering and all that it means. Density, length of staple, colour, and wool counts are all of the utmost importance. By wool counts we mean the fineness or coarseness of the fibre. A 64 may be regarded as a true medium, and it is a sheep of this quality to which I would advise growers to give special attention. Length of staple has an important bearing on prices and density definitely makes for a heavier fleece. Colour lends attraction to the fleece. Conformation must not be lost sight of.

Culling is not sufficiently practised in Queensland. Some stations cull annually and sheep classers are instructed to take out as much as 33 per cent. year after year. In these cases, of course, numbers permit of this being done, but the smaller grower cannot always afford this heavy culling. It should be the object of the grazier to fix a type

suitable to his district and conditions generally. Of the utmost importance is the choice of this type. Amongst the ewe flocks and the ewe hogget flocks everything should be rejected which does not come up to this standard. Being not true to type, malformation of any sort, unevenness in the fleece, lack of length in the staple, over strength in the covering, possibly ultra-fineness, want of size, delicacy of constitution, are all reasons for the rejection of an individual from a flock from which it is intended to breed.

No domesticated animal known responds so quickly to careful selection and mating as the sheep, when in the hands of a man who knows his business. There is also no shorter cut to increased returns than in the elimination of the unprofitable sheep and the retention of the better animal. It is unfortunately a common practice for graziers to sell their cull ewes as breeders. In the case of heavy station culling, as before referred to, no great harm may be done, as the numbers operated on and the percentage taken out are so great that a fair line of ewes may be purchased. In the case, however, of the smaller grower the practice is not to be recommended. It is therefore the wish of this Department to see such culls fattened and sent to market. A remunerative figure should be received by the owner and the industry benefited by the absence of the rejects.

A great many of the benefits to be derived from culling the ewes are lost unless hand in hand with this operation goes the purchase of better rams. It is a very short-sighted policy to quibble at a guinea or so in the price of rams. Provided the grower knows what he wants and has the necessary experience to select his rams, there is no greater economy than the extra money spent in the purchase of better sires. Should the grazier have doubts with regard to his ability to perform the useful work, he would be well advised to pay a recognised authority to select the type of ram suitable to the ewes proposed to be mated with them.

A medium ewe of about 64^{s} quality has been advocated, but it must be remembered that, in the west of Queensland, to maintain this type, a ram of slightly stronger fibre must be found. With western climatic conditions and possible droughty conditions there is always the tendency for a flock to fine up. This especially applies to the breeding flock. On the other hand, a lush season has a tendency to broaden the fibre.

Having taken out the culls, look after your breeders in the matter of feeding. No greater mistake can be made than in overstocking. All the sheep are affected with a possible loss of a pound of wool per head apart altogether from the further loss sustained in fat stock. Over a period of years it will be found that two sheep well fed will return more than three half-starved animals. There is an old saying that "half the breeding goes down the neck." This is only half a truth, for the reason that it does not pay to feed any ill-bred animal, but provided the blood is there, the saying may be taken as a trueism.

The State average of wool cut per head is, according to the last figures available, 7.7 lb. per head. This is something to be pround of, but at the same time, if systematic culling became universal and a yearly operation on all properties, there is no reason to doubt but that the average would be raised 1 lb. per head over comparatively few years.

This yearly increase in production would, of course, be brought about as much by the introduction of better rams as by the culling of

the ewes, and once more to touch on the economy in purchasing better rams, imagine 1 lb. of wool per head and its value over the whole flock as against the small additional outlay in the price of the rams.

Judged from every point of view, culling the ewe flocks systematically, and the introduction of better rams, has everything in its favour, and nothing against it. A palpable mistake is frequently made in an estimation of the value of a flock from which a clip comes, inasmuch as a grazier will quote price per lb. received. Price per head is the true estimate of what a flock is worth and when in addition to that is added the fact that the flock averaging the price per head is better fitted constitutionally to stand up against the irregularities of our seasons, there should be no doubt in graziers' minds as to the most profitable sheep.

I advise you then to cull and keep on culling, and as part of the endeavour to improve the flocks, to purchase better rams.

FARMERS' WOOL SCHEME.

In reply to the request of several correspondents, particulars of the Farmers' Wool Scheme administered by the Department of Agriculture and Stock are given below.

1. The Minister for Agriculture and Stock is prepared to assist woolgrowers to obtain the best prices for the wool from—

(*a*) Holdings of less than 1,500 merino sheep;
(*b*) Wool from crossbred and British breeds from any holding;
(*c*) Bags and butts from any holding;
(*d*) Star lots from our present selling agents.

The wool is received for classification and placed on the market to best advantage for sale.

2. A correct account of the wool is kept and each woolgrower is paid the amount received, less the broker's and other charges, which are as follows:—

(*a*) A charge of 10s. per bale for classification. (This charge also includes insurance in sheds, on rail, transit to selling broker's stores.)
(*b*) All freight, cartage, handling, broker's charges, bale account, &c.

3. The Department of Agriculture and Stock charges no commission. An advance of 60 per cent., free of interest, is made on the estimated value of the wool as at the time of its receipt in the Department's store. The freedom from interest on the advance does not apply to wool from crossbred and British breeds and bags and butts from holdings of more than 1,500 sheep.

4. The wool is sold as soon as possible, following a sufficient accumulation to enable its being sold to best advantage.

5. The weights as taken in the departmental store and the classification before sale are to be accepted as final.

6. Woolgrowers desiring to take advantage of this arrangement should notify the Under Secretary, Department of Agriculture and Stock, when consigning wool, advice of which, with all particulars, should be given.

7. Consign the wool to the Under Secretary, Department of Agriculture and Stock, Roma Street.

Recommendations.

(*a*) The bales should be branded with initials and numbers on the top only so that the same pack, if in good order, may be used again. This saves the price of a new pack to the grower.

(*b*) All merino wool should be kept separate from other grades and breeds.

(*c*) Locks and belly wool should be kept separate.

(*d*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

Sale of Wool.

The wool is sold under the departmental brand—DA in diamond, thus—

as soon as possible by wool brokers in rotation as arranged by the Department of Agriculture and Stock.

POINTS FOR POULTRYMEN.

When feeding for egg production one should remember that there are two definite objects to be kept in view. The first is keeping up the hen's body, and that in a good and fit condition, and the second is to give food that will yield the necessary materials to form the egg, and that in sufficient quantity to provide for the egg over and above what is needed for the body. Nature teaches that the body will first supply its own needs before commencing the work of making the egg. Materials needed for making are protein or nitrogenous matter, fat, water, and mineral matter, including carbonate of lime for shell-making. The quality of the food supplied has a great deal to do with the maintenance of health, which is a first consideration. Sufficient quantity of food may be given, but if it is not of the best quality it may fail in its results. The fat in the food (10 per cent.) will be supplied in wheat, in oats, and other grains. The protein, of which there must be about 14 per cent., may be supplied in meat, meat scraps, meat meal, fish meal, and in milk. Mineral elements are given in shell, limestone, grit, and salt. Green vegetable matter is also useful in this respect. Water should be supplied in abundance, for of this there is 65 per cent. in the egg, and the supply should be clean and frequently renewed. Not only is mineral food needed for shell formation, the minerals of the hen's body must be maintained as well, and, besides this food is a great aid to the digestion and assimilation of all the nutrients. One can hardly overdo the supply.

WEATHER conditions in the agricultural areas are far from satisfactory, as very little beneficial rain has been received since the early July falls. At the time of writing light rain is falling in the coastal areas which will benefit growing crops, but much heavier falls are required to facilitate the sowing of spring crops. The Darling Downs and the South-west are in need of good soaking rains, as these districts did not benefit greatly from the mid-winter falls.

Sugar.

All cane areas experienced cool dry conditions during the month of August. As a consequence, the 1935 crop made little if any growth, while the young plant cane was also handicapped. In the Bundaberg area the cane planted in March last has been damaged on several occasions by frosts.

Crops in all areas are cutting out below estimated yields, although the sugar content is uniformly satisfactory.

Maize.

The recent crop has met with a good demand at remunerative prices, and in view of the great extent of land available for the production of maize a heavy spring and summer sowing can be anticipated. The value of maize as a stock food is becoming increasingly recognised, and a larger proportion of the grain is likely to be consumed on the farm, as is practised in the United States of America, where it is marketed "on the hoof." In recent months large stocks of maize have been railed to the western pastoral areas in preference to the bulkier hay and chaff, and it is certain that such grain will play a big part in any scheme of drought mitigation in the future.

Difficulty is often experienced in keeping maize varieties true to type, owing to cross-fertilization, particularly in the closer settled districts, where a neighbouring crop may be tasselling at the same time. Considerable improvement can be effected by close selection to the type desired, and the sowing of a small seed plot every year. Such a plot can be sown a fortnight or so earlier than the main crop or can be placed in the middle of a field sown to the same variety.

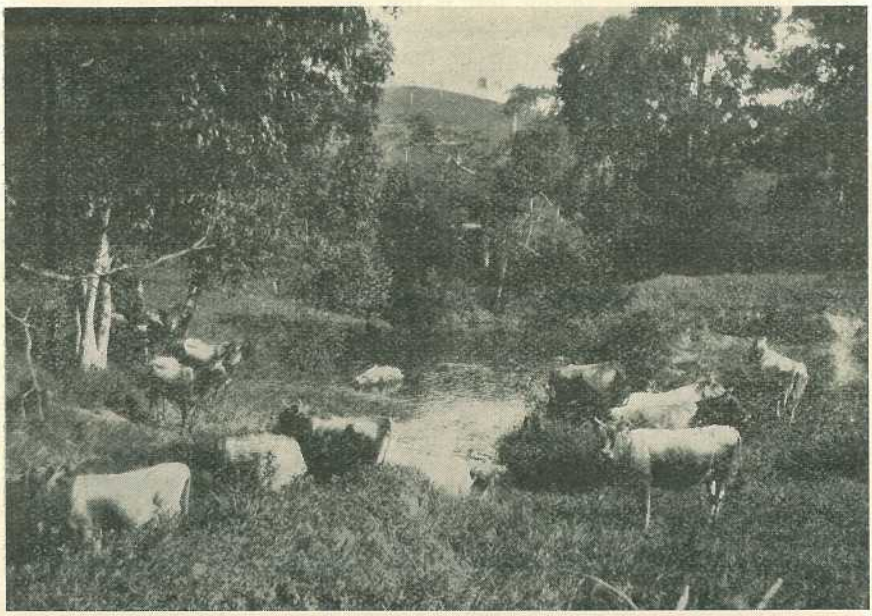

PLATE 101.—RICH DAIRY LANDS, PINBARREN VALLEY, NEAR NORTH COAST, QUEENSLAND.

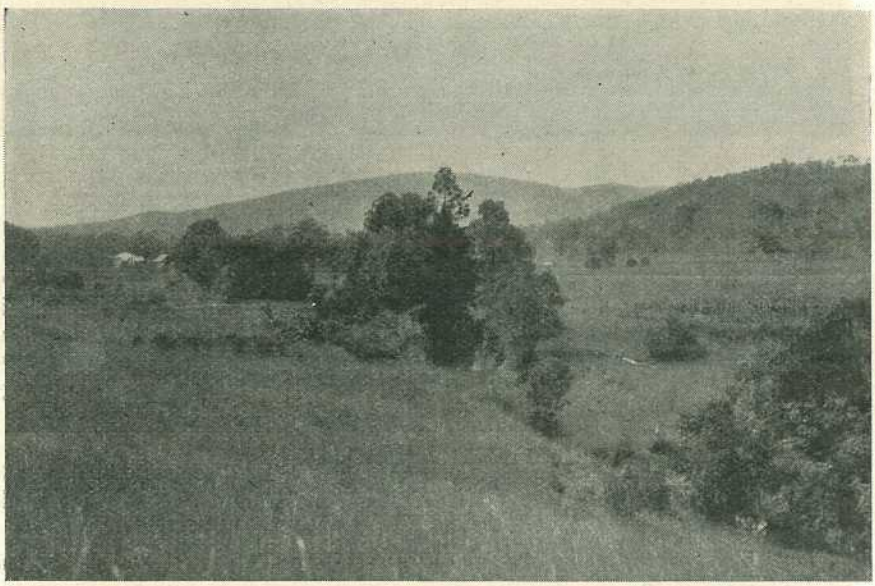

PLATE 102.—ON A BEENLEIGH FARM, SOUTH QUEENSLAND.

Although an ear-to-row test is the only accurate method of determining high-yielding strains, much can be done by simple selection, and it is certain that the variety deteriorates in yield and quality if such selection is not carried out. Heavy mature ears, true to type and containing sound plump grain, should be looked for. A good husk covering is also important, while the general field characteristics of the plant should not be lost sight of. Field officers of the Department of Agriculture and Stock select seed maize of certain approved varieties, but it is obviously impracticable to meet the demand for such seed throughout the State, and orders are therefore limited to one bushel of each variety stocked. However, advice on seed selection can always be obtained on application to the Department.

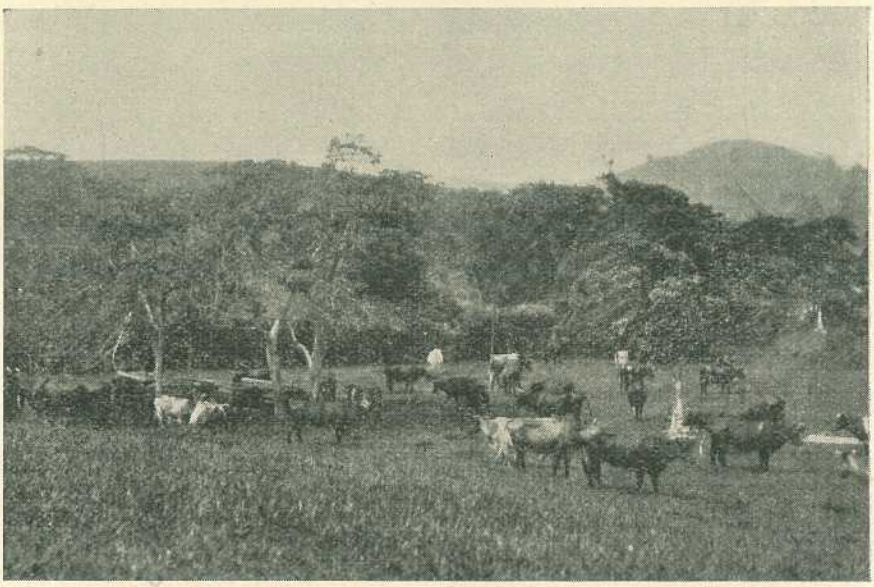

PLATE 103.—ILLAWARRAS ON BUSH PASTURES, KIN KIN, GYMPIE DISTRICT, SOUTH QUEENSLAND.

Wheat.

Severe frosts and westerly winds have had a serious effect on young wheat crops, and as the reserves of subsoil moisture are very low, rain is now urgently required. Such rain would entirely alter the situation, as the wheat plant is hardy and possessed of remarkable recuperative powers. Many forward crops have been grazed as a precautionary measure.

Cotton.

The harvesting of the 1934-35 cotton crop is about completed, 14,326 bales of lint having been ginned to the 26th August, with a probable total of 14,500 bales being obtained for the season.

The good rains in July have allowed of the satisfactory preparation of the seedbed for the coming crop, and all districts report operations well forward, except in the South Burnett and Southern districts, where soaking rains are badly required.

Seed applications are being received at a steady rate, the total acreage being substantially ahead of comparable dates of last season.

Not only are many of the growers of this past season increasing their acreages, but a large number of farmers who either have not grown cotton before or have not had any for several seasons, are applying for seed. Although only moderate yields were obtained in many of the cotton districts this past season, the returns from cotton compared more than favourably with those realised from other crops, and farmers are becoming convinced that cotton-growing should play an important part in the cropping programme in all the districts where this crop can be grown successfully.

PLATE 104.—IN THE LOGAN VALLEY, NEAR BEENLEIGH, SOUTH QUEENSLAND.

General.

As a result of bad weather conditions affecting the potato crop in Victoria and Tasmania, prices have remained firm in all States. Southern Queensland potato crops show a tendency to increase in yield and quality and find a ready outlet in the North. As there is a possibility of a Sydney trade also developing during periods of shortage in Southern States, growers will need to pay particular attention to grading and bagging, as sound, uniformly graded tubers of good size are required.

With the advent of warmer weather weed growth will be in evidence, and cultivating implements will be in greater demand. The importance of this work to check weed growth and conserve moisture cannot be over emphasised.

Land which has received careful preparation during the winter will be in the best condition for the sowing of spring crops.

Tobacco seedlings will now be making their appearance in the seed-beds of the Texas, Yelarbon, and Inglewood districts, where early sowing is the rule. As plants are usually six to eight weeks old before being planted out in the field, such planting will not be general until October and November.

SOME TROPICAL FRUITS.

1. THE MANGOSTEEN.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE mangosteen belongs to the natural order *guttiferæ* and is one of the two hundred odd species of the genus *garcinia,* its specific name being *G. mangostana.*

It may be described as a small tree with deep-green, glistening foliage. The leaves are thick, leathery, and large—6 to 10 inches long —elliptic oblong in shape. The flowers are polygamous.

Its native home is the Malay Peninsula, and it is reported as being a common tree in the gardens of the East Indies and the Philippines. It is, however, a notoriously difficult tree to establish outside its native habitat, consequently it is little known in Queensland.

Many attempts have been made to introduce the mangosteen into Australian cultivation, but practically all have ended in failure. As early as 1854 seed of this fruit was introduced and propagated in Southern Queensland and New South Wales, but although seedlings were raised then and on numerous subsequent occasions, no record can be traced of any of them having reached maturity.

The first recorded success was with trees raised at the Kamerunga nursery, near Cairns. A number of fruit were imported from Java to this institution in October of 1891, and from the seed obtained a number of seedlings were raised. However, they proved to be very delicate and the then manager of the nursery reported from time to time that their growth was very slow and many were killed out when the temperature dropped to 40 deg. to 45 deg. F. When sixteen months old several were transplanted into the field and were then only 4½ inches high. When approximately eight years old these trees were only 18 inches to 2 feet high.

Under its native conditions the mangosteen bears its first crop at eight to ten years of age. Comparison with the Kamerunga trees at

about the same age will show how intolerant it is towards foreign conditions. With the example of the Kamerunga trees it is not to be wondered at that the earlier attempts to acclimatise the mangosteen in Southern Queensland and New South Wales proved failures.

By about 1907 only one tree out of all those raised at Kamerunga remained. In 1910 special attentions to the tree were instituted, mulch, water, and liquid manure being applied at intervals. In 1913, twenty-one and a-half years after planting, the treatment was rewarded by the production of a crop of fruit. So far as is known this was the first tree to produce a crop of the fruit in Queensland.

A short time later the Kamerunga Station was closed down, but the tenant of the land since that time reports that the tree continued to bear fruit every second or third year until 1929, when an effort was made to move it to another side and, most unfortunately, it died.

Besides the trees grown at Kamerunga several (one dozen in all) were distributed to private persons between 1891 and 1895, but no trace of them can now be found, so one must conclude they all perished.

About the year 1900, however, two trees were planted at Mossman, and these still survive. The largest of these is now about 12 feet high and carries small crops. There is no record as to when the tree commenced bearing, nor as to the size or regularity of the crops. This year's crop was four fruit only. The tree carries the distinction of being the only recorded bearing tree in Queensland at the present time. The second tree is much smaller and apparently has not cropped, at least during the last two years.

In addition to these two trees, two young ones (seven years and two years old respectively) are growing at Mossman, and one five years old at Cairns. It is quite probable that a few other trees exist in Queensland, but these are the only ones known.

Description of the Fruit.

A short description of the fruit—called the "Queen of Fruits" and the "finest fruit in the world" by some of its early discoverers—would be appropriate.

The mangosteen is of the shape and size of an apple, 2½ to 3 inches in diameter, slightly flattened between the stalk and apex. The skin is smooth, thick, and somewhat leathery, deep-red to reddish-purple when ripe, with occasional spots of orange-yellow juice which has exuded from a skin injury and hardened on the surface. The bright-green sepals are retained on the stem and encircle the base of the fruit, whilst the apex of the fruit permanently retains the stigmata. On encircling the skin of the fruit with a sharp knife the apex may be lifted off, disclosing several snow white "quarters," varying from five to seven, filling the red-purple cup. The segments are of the shape and size of those of a mandarin, and their texture has been truly compared to that of a well-ripened plum. The flavour is delicious. The only drawback is that the fruit contains a comparatively small amount of pulp for its size.

In regard to the cultivation of the mangosteen, all authorities concur in the need of a wet but well-drained loam for its successful growth. High atmospheric humidity does not appear to be essential, but a reasonably high temperature is required. Temperatures much below 50 deg. F. appear to be definitely harmful, particularly to young trees.

One of the greatest contributing factors towards the difficulty in establishing the mangosteen is probably the paucity of root development. Working on to roots of hardier and more robust species may overcome this trouble. In America experimental work has been carried out with several species, and some promising results have been obtained. Probably at least one out of the two hundred odd members of the genus will be found suitable for the purpose, then possibly the mangosteen will be met with in Queensland more frequently than it is at the present time.

An introduced allied species has very frequently been mistakenly called the mangosteen in Queensland. This is the Cochin-goraka (*G. xanthochymus*). It is a much hardier variety of *garcinia* than the mangosteen, and was acclimatised here with very little difficulty. Quite a number of these trees are to be seen in North Queensland, scattered here and there in ones and twos. Under favourable conditions they grow strongly and carry heavy crops of fruit. The trees usually assume a conical form, the branches growing almost parallel with the ground and radiating from a central stem. The leaves are long, glossy, and pendulous. The fruit is borne in clusters on the smaller branches, is a bright glossy green when young, and golden-yellow when ripe, and about 2½ inches in diameter. The apex is pointed and the axis of the fruit is usually offset from the centre. The skin is thinner and softer than that of the mangosteen, but on being encircled with a knife the same formation of pulp is observed. In this case, however, the segments are yellow—just a shade lighter than the skin. The flavour is distinctly acid, although the degree of acidity varies in different seedlings, leading one to surmise that a good variety of the fruit could probably be bred.

F. M. Bailey lists three species of *Garcinia* as being indigenous to Queensland, viz., *G. mestoni, G. warrenii,* and *G. cherryi.* The first of these finds its native habitat on the slopes of the Bellenden Ker range at an altitude of about 2,000 feet. Its fruit are similar in shape and characteristics to *G. mangostana,* but vary a good deal in size from 2 inches upwards, sometimes being larger than the mangosteen. Its colour, skin, and flavour resemble *G. xanthochymus.*

The habitat of the other two indigenous varieties is given as the Coen district. No description of fruit of *G. warrenii* is given in Bailey's "Queensland Flora," but he describes *G. cherryi* as having yellow, oval fruit 1½ inches long and slightly exceeding 1 inch in diameter. F. J. Cherry, who discovered it and after whom it is named, remarks about it that "it does not taste badly, and birds and insects are very fond of it."

PRESERVING ORANGE JUICE.

USE only glass, porcelain, tin-coated (not galvanised or zinc-coated) or aluminium vessels.

Cut the oranges in halves and extract the juice. (A glass cone is suitable for small quantities.)

Strain the juice to separate seeds and coarse pulp from the juice.

Have bottles thoroughly clean and scalded; fill them to within 1½ inches of the top, and cork.

Place bottles on their sides on the false bottom of a boiler and cover with water. Heat the water to 175 deg. to 185 deg. Fahr. for thirty minutes, and regulate the flame to keep the temperature below 185 deg.

Remove the bottles and set aside to cool, away from cool draughts of air.

PRESERVING LEMON JUICE.

THE juice as it is squeezed from the fruit is allowed to remain for twenty-four hours until a sediment collects at the bottom of the vessel. Then the clear liquid is decanted and reduced by heat to one-third of its volume—i.e., three quarts of juice would be reduced to one quart. The heating process should not be done by direct fire, but by standing the vessel containing the juice in a copper or some larger vessel over the fire. On a large scale a water bath or steam circulating in a jacket boiler could be used. In any case, the vessel in which the juice is heated should be enamelled.

The juice may be sweetened by adding from 4 to 5 lb. of sugar for every gallon of juice before it is reduced by heat. It is bottled when cool, but before bottling it may require straining or filtering.

To prevent deterioration by mould the bottles, which are filled to within an inch from the cork (which is then tied down), are placed standing in a flat-bottomed boiler. Water is placed in the boiler up to an inch from the necks of the bottles, and then heated by direct fire up to 170 deg. Fahr., and kept at that temperature for about twenty-five minutes. Then they are removed and laid on one side, never standing. To prevent breaking of the bottles it would be well to have a false perforated bottom placed in the boiler.

The method of keeping fresh juice, as used in the various Navies, is to add 10 per cent. of brandy, that is to say, 1 gallon of brandy to 9 of juice after it has been heated.

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

Packing Houses.

ATTENTION is again drawn to cleaning up the packing house, sizing plant, and boxes used in the orchard and sheds. Odd days to spare through inclement weather and other reasons can be well used for building many useful home-made accessories to the packing house. "Packing Houses and Their Equipment," free on application to the Under Secretary, Department of Agriculture and Stock, explains how to make many useful things.

Apples.

Growers with apples in cold storage would be well advised to make frequent inspections, and to start marketing regular consignments. Granny Smiths are realising up to 12s. per case, Democrats 9s. to 12s.

Citrus Fruits.

Oranges are firmer in price, good lines realising—Navels 8s. to 9s., Commons to 7s.; small fruit hard of sale. Mandarins are now beginning

to show signs of becoming puffy, a condition which is reflected in the wide discrepancy in the highest and lowest prices, Emperors realising 4s. to 12s., Scarlets 4s. to 10s., Glens 5s. to 12s., the solid Ellendale variety 10s. to 15s. Growers in the northern districts should watch their fruit closely now to avoid placing dry and puffy fruit on the market. The weather as I write these notes (the last week of August) is still showery. This will have the tendency to spoil the keeping quality of the citrus. This season citrus has all kept in much better condition, due to the dry autumn and winter. The display at the Royal National Exhibition was the best we have seen for quality and kept well during the whole of the Exhibition.

Good cured lemons are selling well. The best cured lines have touched 12s. Curing is simple and greatly enhances the keeping quality and attractiveness of the lemon.

Bananas.

Prices for bananas still leave much to be desired. Some packs are coming to hand rather slack, others showing signs of bad sizing. The dry cold winter has not allowed the fruit to fill out in many cases, making it hard for growers to market good-looking, well-filled fruit. Close attention to sizing—in taking care to keep the standard of length a high one—will assist in minimising the lack of girth and angular appearance of the fruit. Prices, 5s. to 10s. 3d. for top-grade lines.

Tomatoes.

Coloured fruit still sells better than green lines. Coloured 4s. to 7s., green 3s. to 4s., with special to 5s. Whilst the cool weather continues growers would do well to leave the Break o' Day variety to fully mature and show signs of colour before harvesting. This variety is a good carrier, ripening slowly and firmly. Traces of blight have been found in some lines the last few days, due possibly to the wet humid conditions prevailing the last week.

Packing-shed equipment is one of the least studied things with tomato-growers. Well-designed sorting tables and benches soon pay for the small cost incurred, as well as helping to materially reduce working hours.

Custard Apples.

Custard apples are now nearly finished, very little first-quality fruit now coming on the market, 2s. to 3s. 6d. being realised.

Passion Fruit.

Passion fruit are finding a ready demand for good lines of well-packed fruit. A pamphlet "Marketing Passion Fruit" is obtainable from the Under Secretary, Department of Agriculture and Stock, free on application, showing the easiest and correct methods of packing in all cases.

Prices 5s. to 12s. Crinkled fruit should be sorted from smooth skins and marketed separately, as they spoil the value of choice lines.

Papaws.

Greater attention still needs to be paid to marketing only ripe papaws during the cold weather. This fruit will not ripen when picked green. Coloured fruit can at present be sent to Southern markets with

safety, while for local market the fruit needs to be ripe. Retailers trying to ripen uncoloured fruit find it goes specky and becomes unsaleable. The prices—1s. 6d. to 4s. per bushel—give a true indication of the difference in quality. With the close advent of warm weather, growers will need to exercise discretion with southern consignments when studying colour.

Pineapples.

Moderately heavy supplies of pines have been coming to hand, and the maturity appears to be better than in some previous seasons. All precautions should be taken to eliminate all chance of specimens with black heart being marketed, as these upset the confidence of buyers. Small Smooths are not in popular demand. Prices, 1s. to 5s. a dozen; cases 3s. 6d. to 6s.

Strawberries.

Small berries are hard to dispose of at payable prices. Many lines are seen which are not well packed. The berries should be stood up well so that the point comes just below the level of the lid. Empty packs are not popular with buyers.

General.

Assistance in marketing can be obtained by growers by applying to the Under Secretary, Department of Agriculture and Stock. This service is free, and growers should take full advantage of it.

MUSHROOM CULTURE.

Mushrooms may be grown in beds in the open, but there is no doubt that better results are obtained in an underground room or cellar, or in a covered shed or room where more even temperature may be obtained and moisture conditions may be controlled. As a basis for making the beds fresh horse manure is the most suitable. If only small quantities are available at a time, the manure should be collected daily and spread out in thin layers to dry, and thus retard fermentation. About half a ton of manure will be required for one packet of spawn, and this will make a bed of about 20 square feet. When a sufficient quantity of manure has been collected, moisten it with water, and stack it to ferment. Turn the heap over daily, bringing the outside of the heap into the centre to ensure even fermentation. After about five or six days the heap should have a brown colour. The moisture content is important, and when ready for making the bed a handful of manure squeezed hard will only show a drop of moisture between the fingers. If too wet allow the fermentation to proceed until the surplus moisture has evaporated. Now make up the beds, packing the manure in layers, and tramping firmly to make a bed from 6 to 10 inches deep. When the temperature in the bed recedes to about 70 degrees, break up spawn in pieces about the size of a walnut, and insert to a depth of half an inch in the manure and about 10 inches apart, pressing down firmly to obtain good contact. Two weeks later place a layer of good sandy loam to a depth of 1 inch over the bed. Cover the bed with newspapers, which should be kept damp, but no water dripping from them. After six weeks tiny mushrooms will appear, when the paper must be removed. Now water the bed with a light sprinkling, just sufficient to keep the soil moist, and keep the bed in that condition throughout the cropping period, which should be about three months. Over-watering is fatal, and will destroy the spawn.—"The Australasian."

The 1935 Brisbane Exhibition.

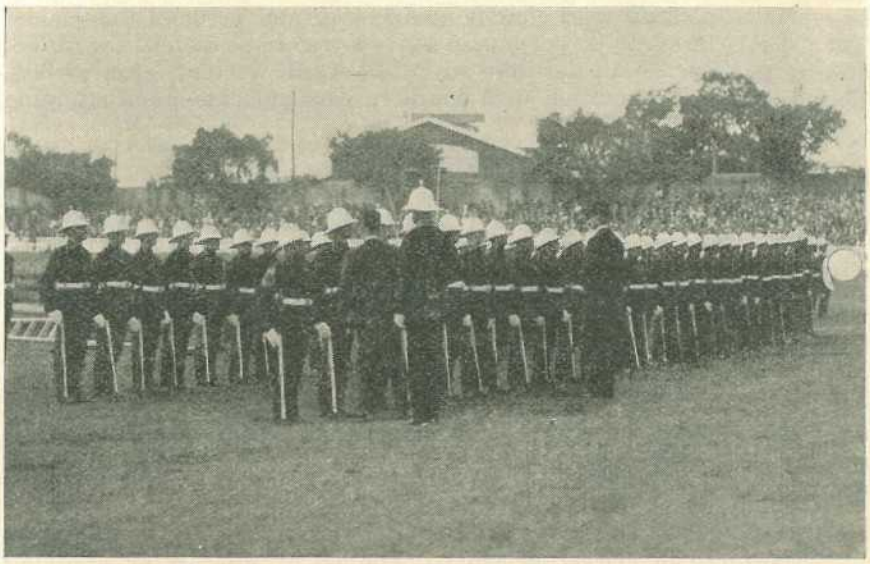

PLATE 105.—THE GOVERNOR'S GUARD OF HONOUR AT THE OPENING CEREMONY.

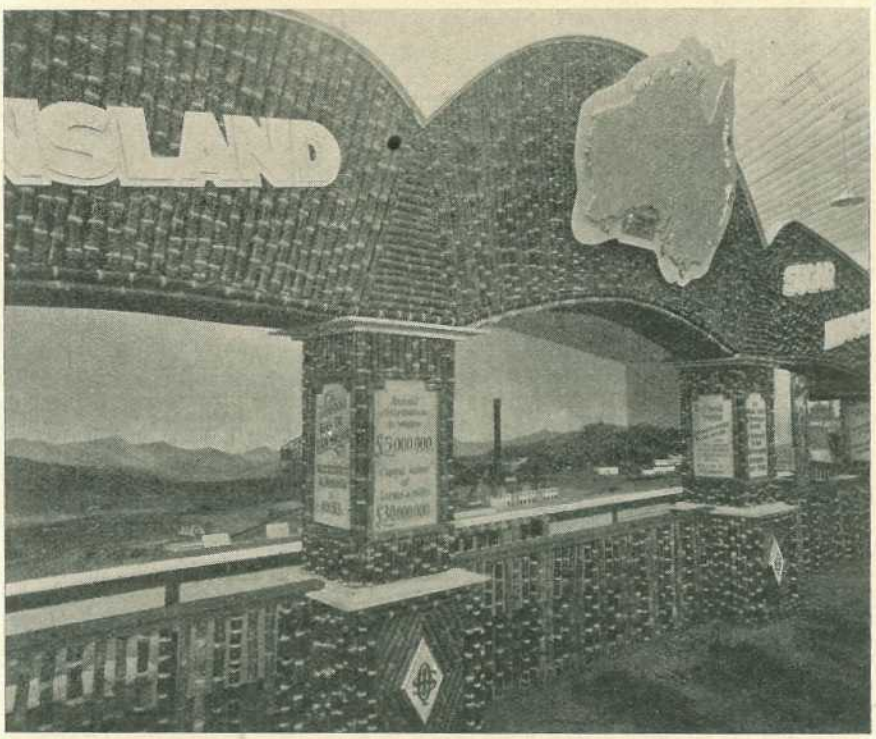

PLATE 106.—THE IMPRESSIVE DISPLAY ARRANGED BY THE SUGAR INDUSTRY.

This year's sugar exhibit at the Brisbane Show surpassed all previous displays in its range and interest. It illustrated very effectively the national, economical, and social importance of the sugar industry. To even the experienced canegrower its educational value was immense, while to others it was an amazing and striking representation of Queensland's chief agricultural enterprise in all its branches.

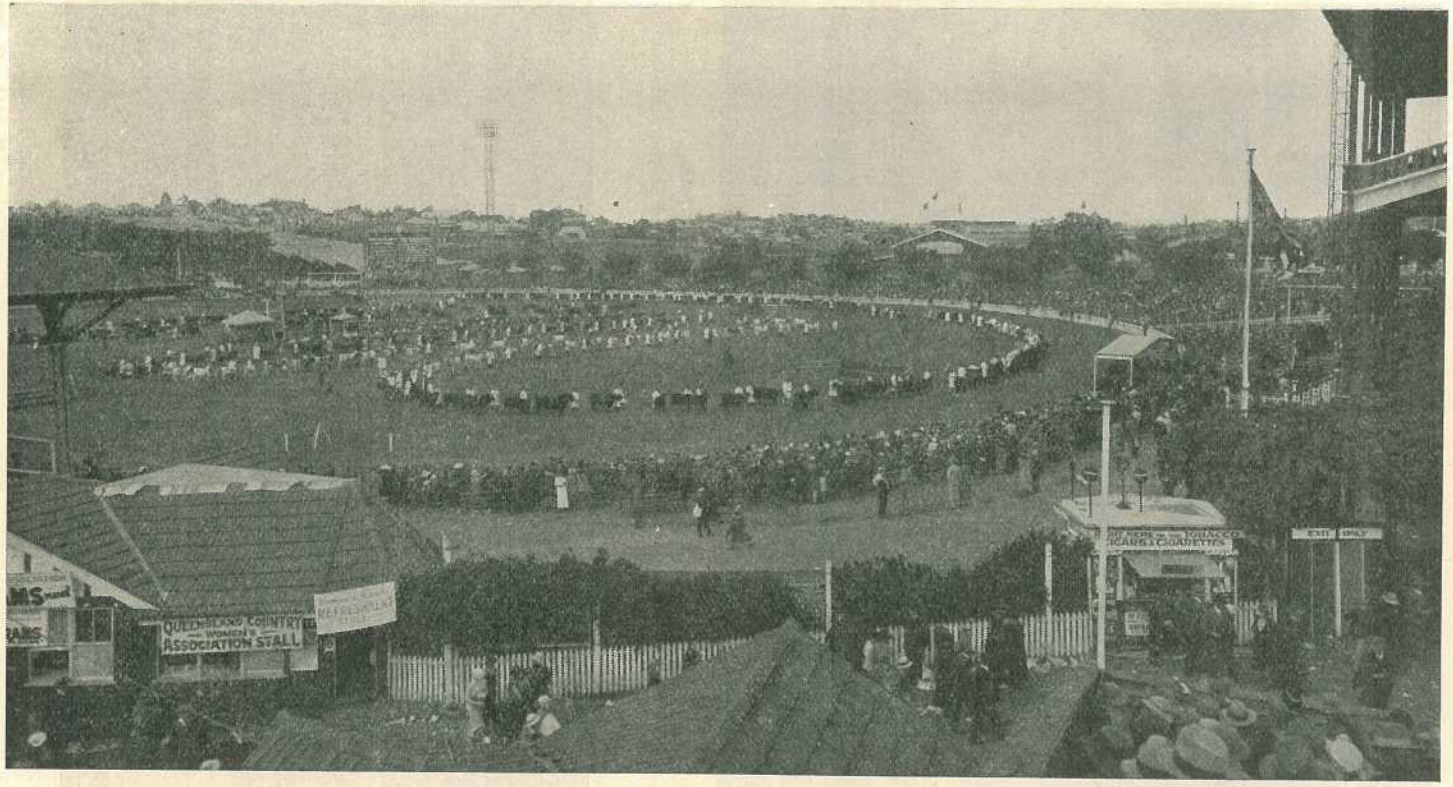

PLATE 107.—GRAND PARADE, BRISBANE EXHIBITION.

The Brisbane Show is regarded as one of the finest Stock Shows in Australia. The estimated value of the farm animals paraded for judgment at this year's Exhibition was £250,000.

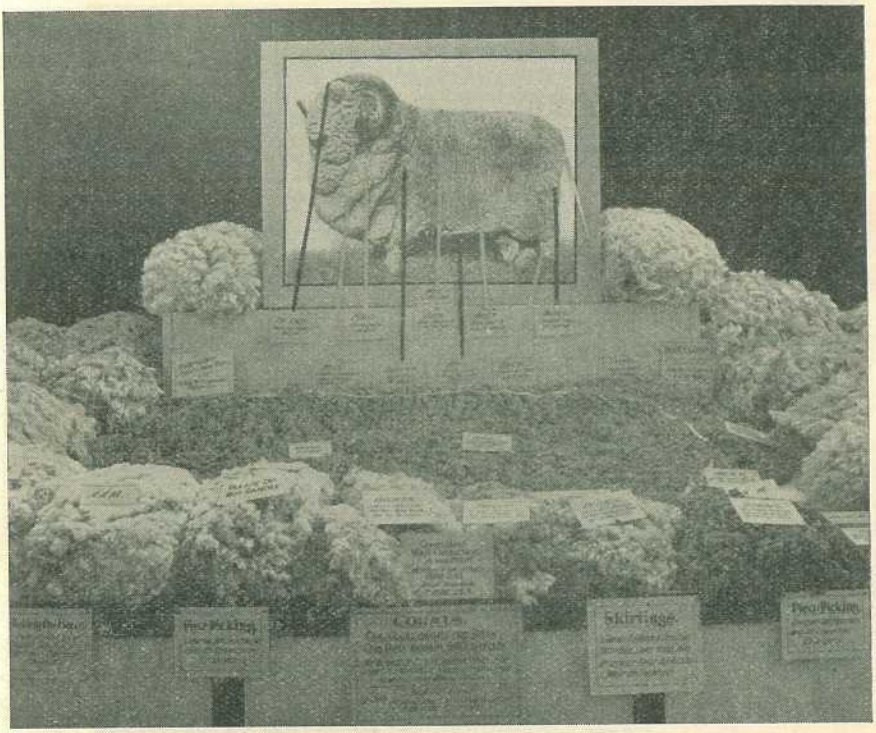

PLATE 108.—A STUDY OF "COUNTS" AND CLASSES.

Queensland's wealth in fine merino wool was well represented in the exhibit in the Departmental Court.

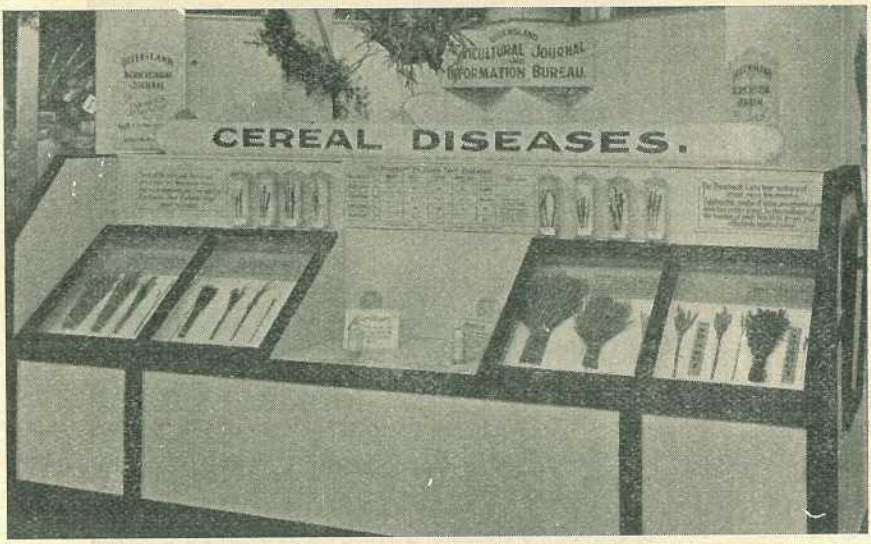

PLATE 109.—A LINK BETWEEN THE LABORATORY AND THE LAND.

This and other interesting displays of the Entomological Branch of the Department of Agriculture and Stock illustrated effectively the application of science to the problems of the primary industries.

PLATE 110. —THE "JOURNAL" AT THE BRISBANE SHOW.

The young officer in the picture is Mr. T. Abell. Mr. Arthur Crees was the officer in charge of the Bureau which was the distributing centre of information on the activities of the Department of Agriculture and Stock—a service much appreciated by visiting farmers.

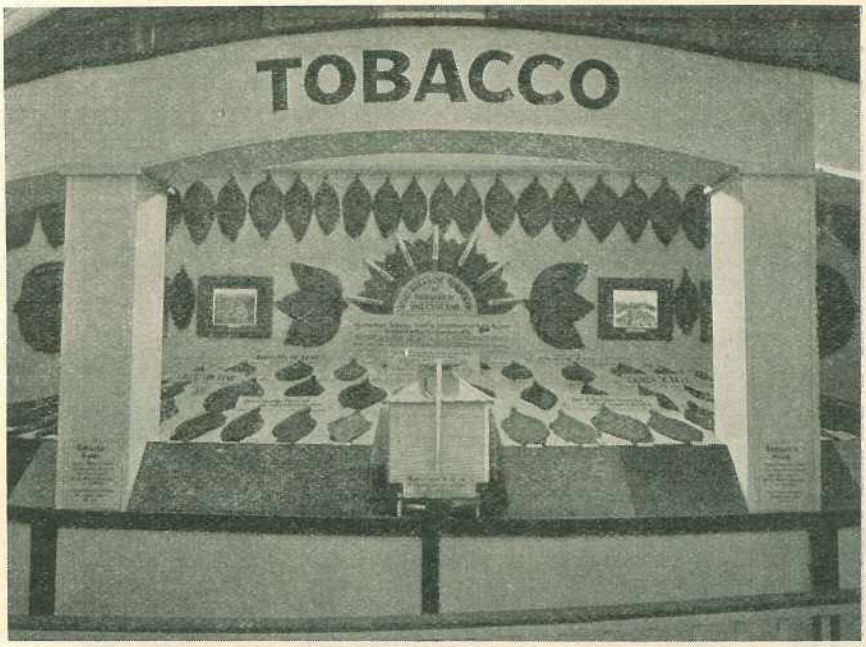

PLATE 111.—THE TOBACCO TROPHY.

Samples of soil types, varieties of fine Queensland leaf, and a model flue-curing barn were the main features of this interesting display.

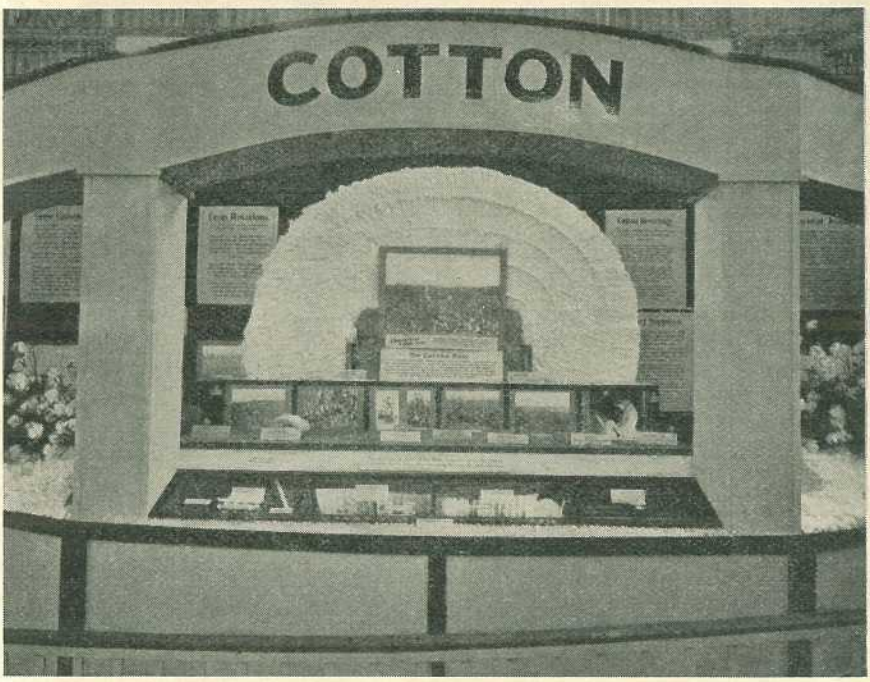

PLATE 112.—THE COTTON CORNER OF THE AGRICULTURAL COURT.

Cotton growing is developing steadily to the status of a major industry in this State. Australian looms are supplied largely with Queensland lint of high spinning quality.

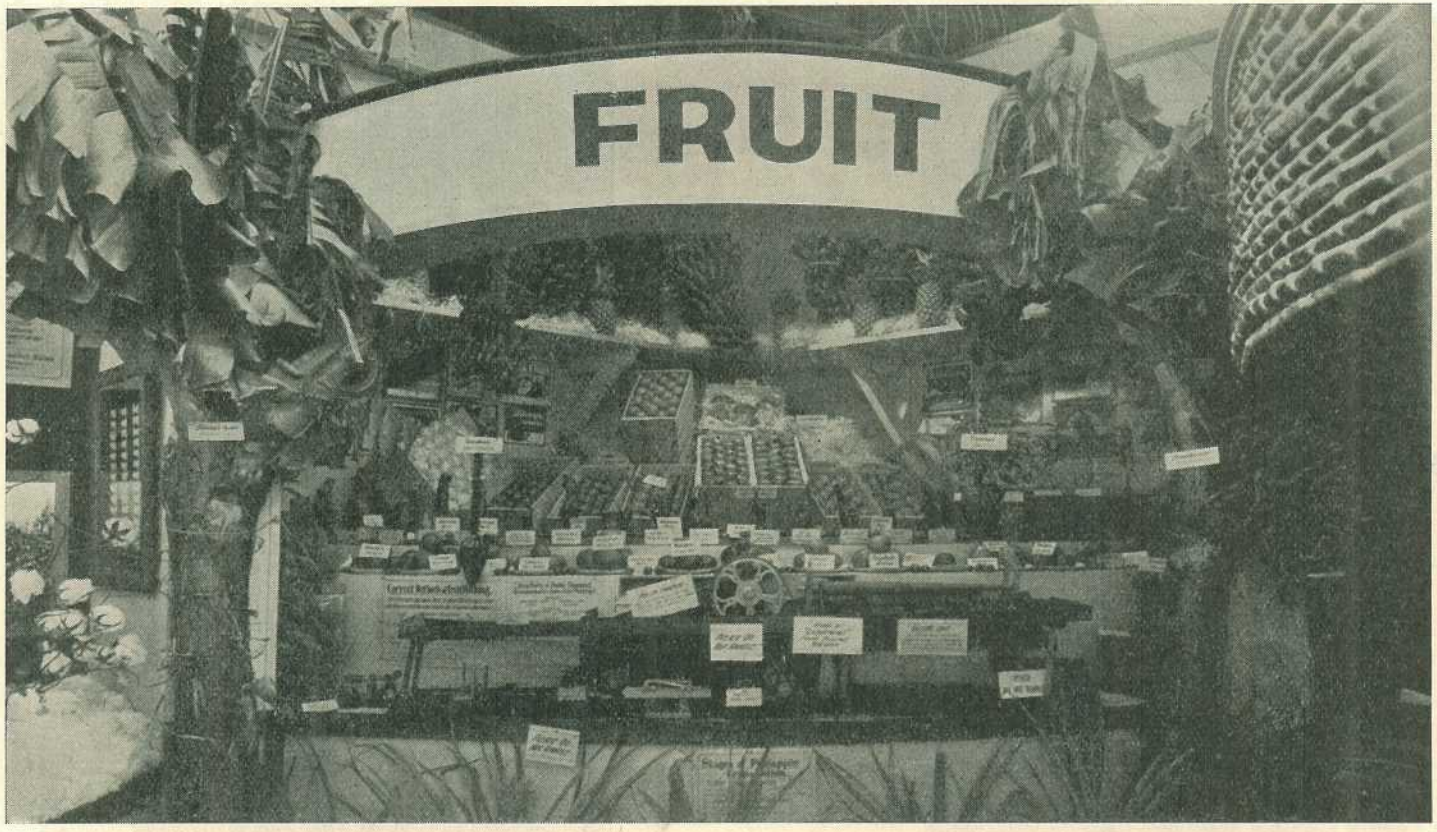

PLATE 113.—A POPULAR CORNER IN THE AGRICULTURAL COURT.

Both temperate and tropical fruits, which are produced abundantly in Queensland, were well represented in this Departmental display. Other sections of the Show contained large collections of fruit, remarkable in their range, variety, and excellence.

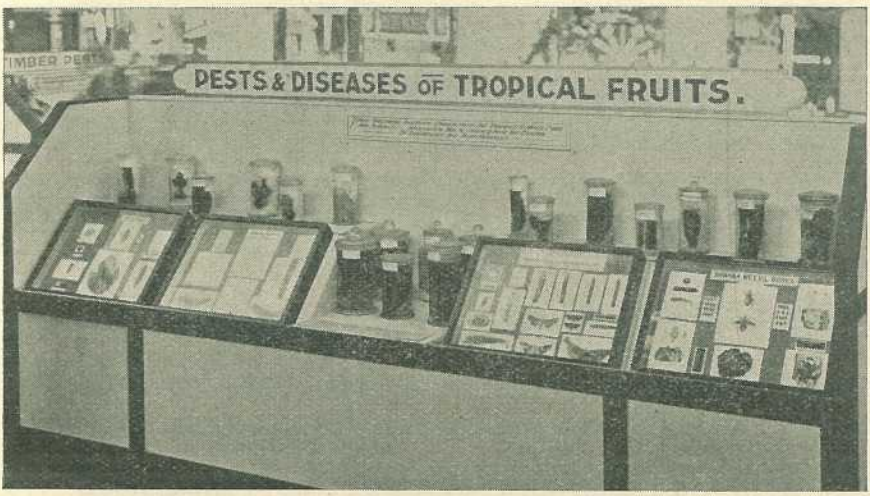

PLATE 114.—SCIENCE IN AGRICULTURE.

PLATE 115.—SCIENCE IN AGRICULTURE.

The value of Economic Entomology and Vegetable Pathology in our rural economy was illustrated interestingly and effectively in the Departmental Court.

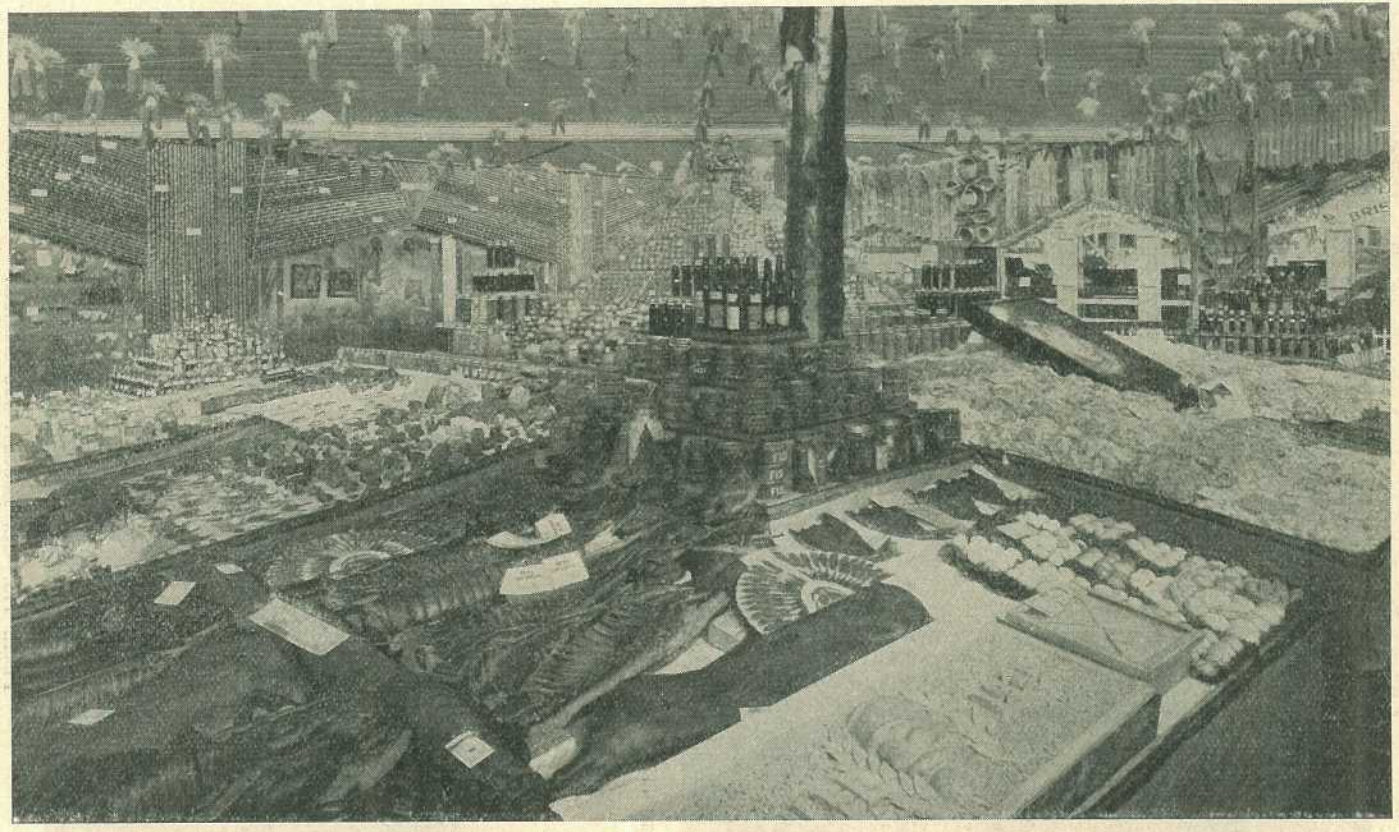

PLATE 116.—WINNING "A" GRADE DISTRICT EXHIBIT.
Comprehensive and impressive display from the Northern Rivers District of New South Wales.

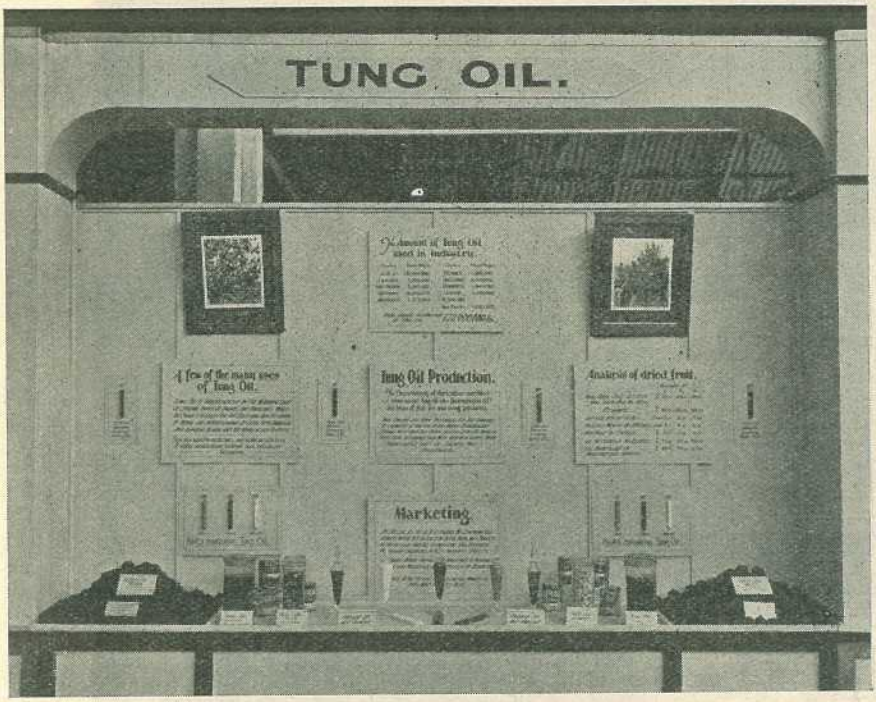

PLATE 117.—THIS PANEL IN THE AGRICULTURAL COURT WAS A CENTRE OF ATTRACTION TO SHOW VISITORS.

PLATE 118.—AN EDUCATIONAL EXHIBIT.

The importance of Forest Entomology to Queensland's valuable timber industry was well illustrated in this and other cabinets in the Court of Agriculture.

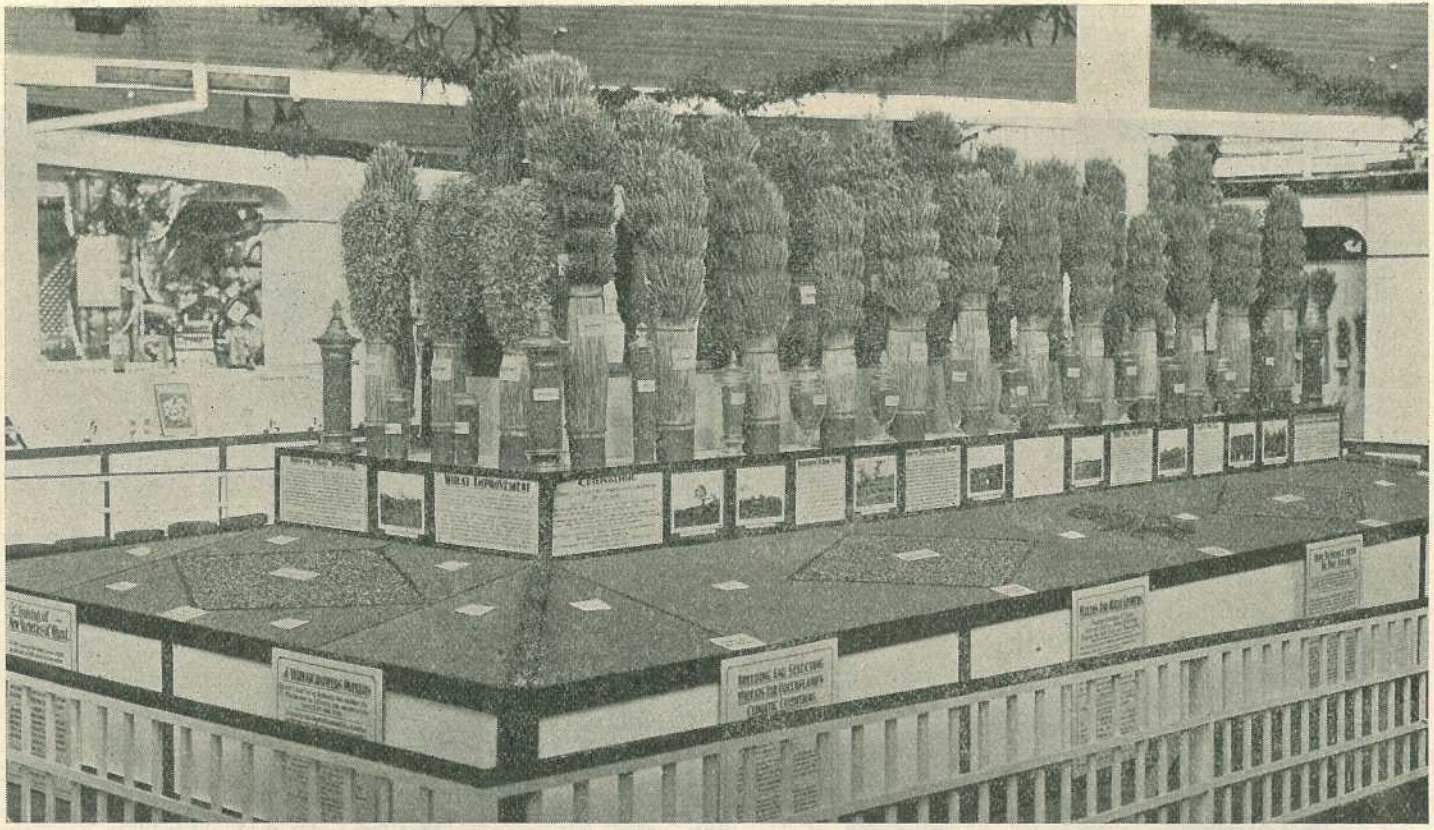

PLATE 119.—THE WEALTH OF QUEENSLAND'S GREAT GRAIN LANDS.

The central trophy in the Agricultural Court was evidence of the plant breeder's success in evolving wheats suitable to Queensland's conditions of summer rainfall. It illustrated also the progress made in maize production and the propagation of new varieties.

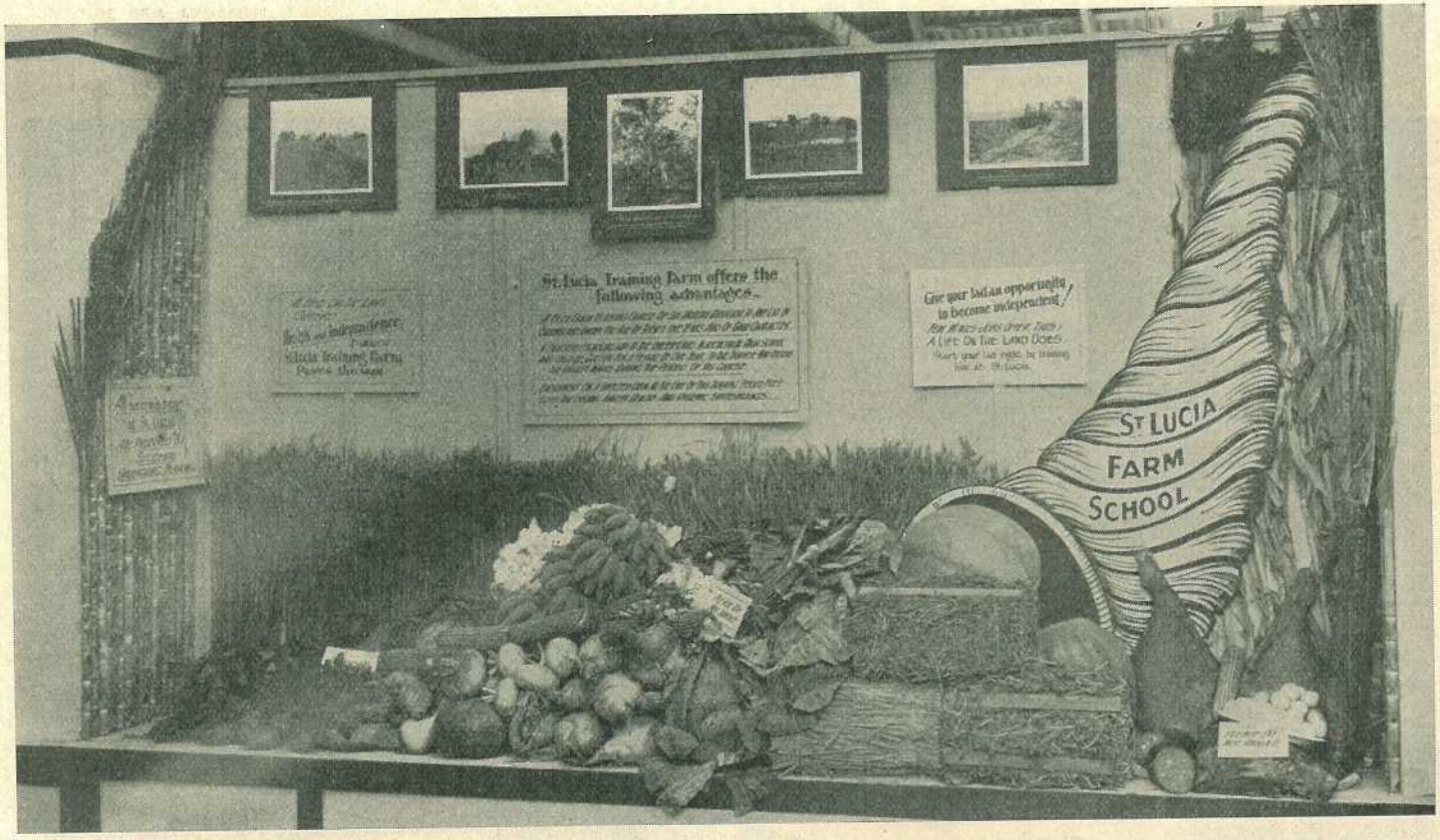

PLATE 120.—EXHIBIT FROM ST. LUCIA FARM SCHOOL.

Young farmers displayed with pride some of the first fruits of their training and field work. St. Lucia Farm Training School, situated in University grounds on a fertile Brisbane River frontage, is proving an important factor in the solution of the problem of jobless youth in Queensland. The boys receive an excellent training, amid delightful surroundings, in the rudiments of agriculture, and on the completion of a six-months' course are absorbed immediately in rural industry. The demand for St. Lucia trainees already exceeds the supply.

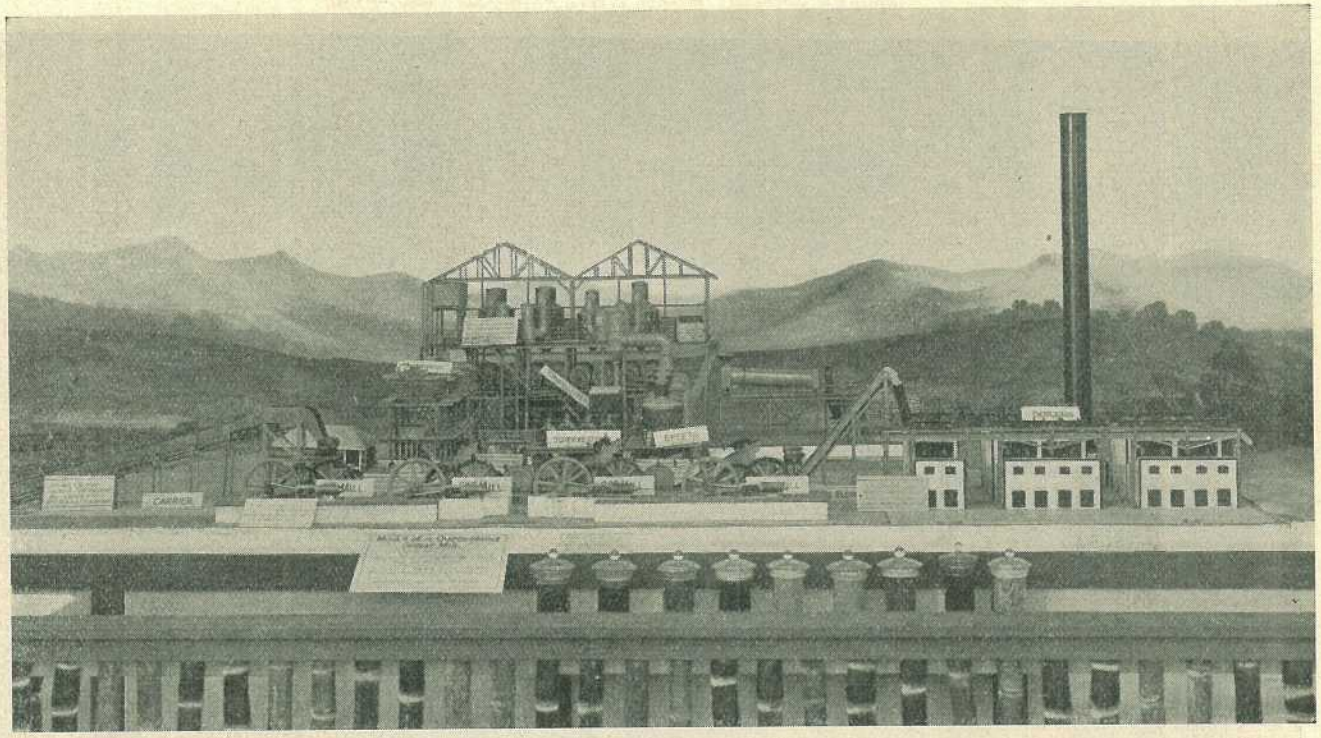

PLATE 121.—A WORKING MODEL OF A QUEENSLAND SUGAR MILL.

Built to scale, this miniature mill was one of the main features of a very fine sugar exhibit that attracted great public interest daily throughout Show week.

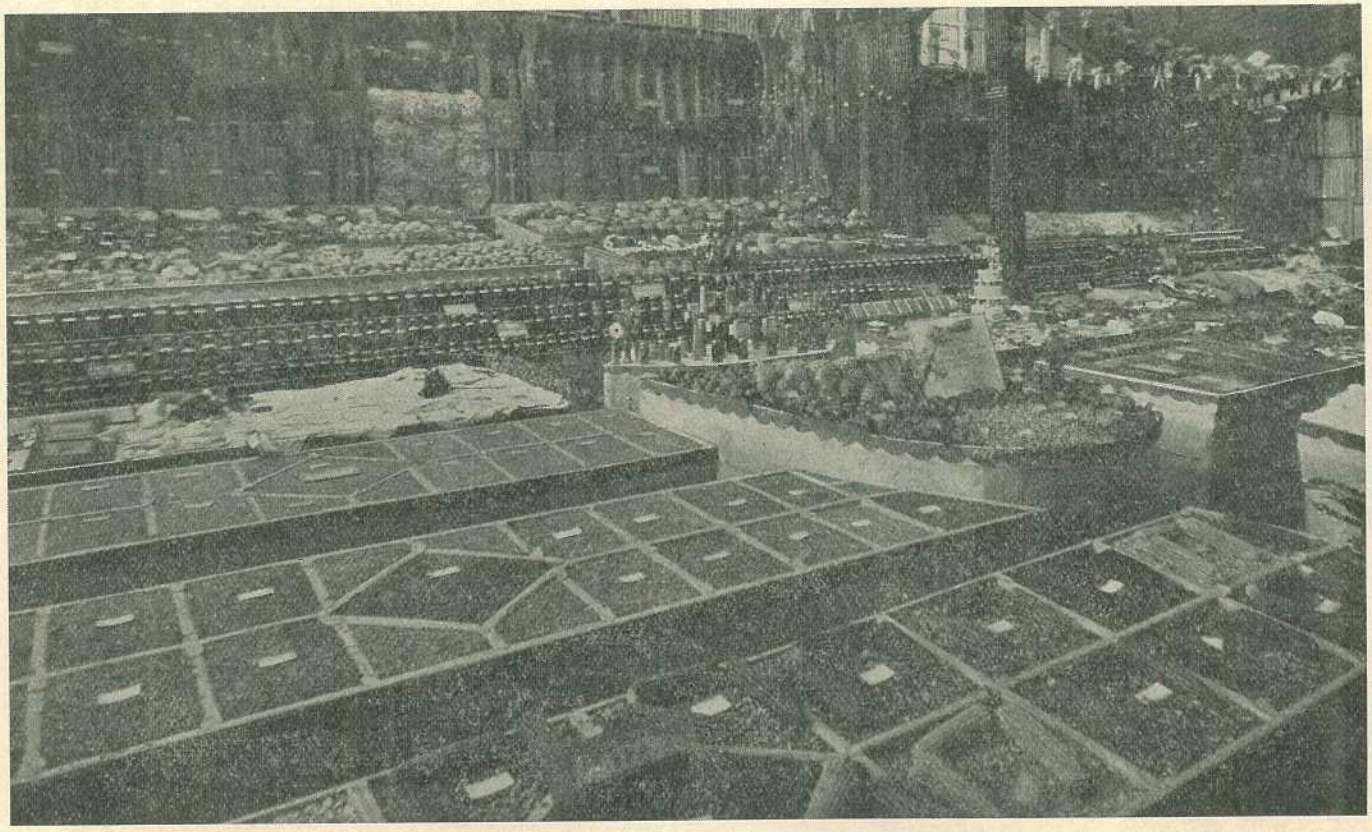

PLATE 122.—WINNING "B" GRADE DISTRICT EXHIBIT.
A remarkable representation of the immense wealth of the Nanango (South Burnett) District.

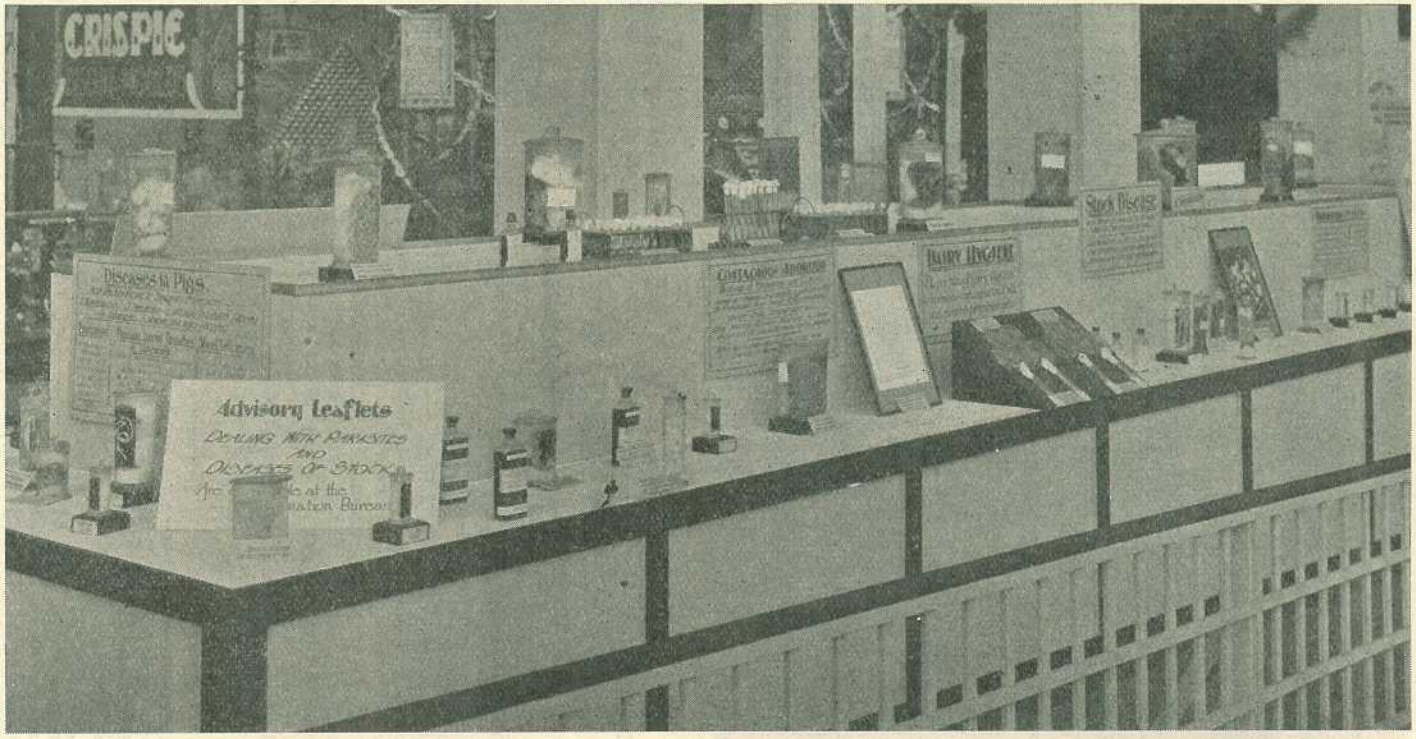

PLATE 123.—SECTION OF THE EXHIBIT FROM THE ANIMAL HEALTH STATION.

The value of veterinary research in its many branches was well illustrated in this display in the Court of the Department of Agriculture and Stock. Queensland, however, is one of the healthiest stock countries in the world.

PLATE 124.—PANEL OF NATIVE GRASSES.

Studies of indigenous and introduced grasses and edible shrubs are among the most important branches of the research work of the Department of Agriculture and Stock.

FEATS OF HORSEMANSHIP.

Mr. A. W. Lade (Denilquin, N.S.W.) has the following interesting notes in the "Questions and Answers" column of "The Australasian" of 13th July:—

"Mr. Basil Hall, in 'The Australasian' of 29th June, has touched on a subject which interests me very much. In the hope that they may be of some use to him, I have copied out two authentic accounts of an outstanding nature. On reading them one can but wonder if such men, horses, and sheep could be found in the land to-day."

Extract from an obituary notice of Mr. Langloh Parker, in the "Pastoralists' Review," August, 1903:—" . . . He was a man of high honour and great power, a splendid judge of stock, and generally popular, and his ride of 320 miles in 24 hours, with seven changes of horses, from Yanga to Deniliquin, is one of the historic traditions of pastoral New South Wales."

Note.—It would be interesting to know more details of this truly great ride. It must have taken place in the '60's or '70's, when Mr. Parker was a much younger man. Further particulars from other readers would be of general interest.

Extract from "Sheep Breeding," by "Bruni" of "The Australasian" (2nd edition, 1890), page 354:—"In 1885 a drover named Richard Coulter started from Deniliquin in charge of 466 Tandara rams, his destination being the Afton Downs Station, near Hughenden, in Northern Queensland. The season was one of the worst ever known, and the distance the sheep had to travel was 1,700 miles. In many places there was not a blade of grass to be seen, and for 300 miles the sheep lived on scrub cut down for them. By the exhibition of rare skill and judgment Coulter managed to deliver every ram at the Queensland station, and throughout their long journey the sheep averaged nine miles a day."

Note.—This is not so spectacular as some of the cattle-droving feats, but for sheer merit is hard to beat.

PLATE 125.—ST. LUCIA FARM SCHOOL.

Showing officers' and trainees' quarters, including new dormitory (left centre). The lagoon is a sanctuary for aquatic bird life which abounds on its banks. It is also the water supply for an irrigated garden which supplies the farm kitchen with vegetables the whole year round.

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 Advance Register of the Herd book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, the Ayrshire Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of July, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (over 5 Years), Standard 350 lb.				
Beauty Valera	M. C. and A. M. Sullivan, Pittsworth	13,319·18	573·524	Royalist of Strathdu
Empress 17th of Sunnyside	P. Moore, Wooroolin	11,674·81	461·693	Prince of Avonel
Meadow Vale Ladybird 3rd	C. O'Sullivan, East Greenmount	8,510·85	384·545	Plumstone of Meadow Vale
Hillvale Baby	J. H. Weber, Peak Crossing	9,080·11	373·124	Marvel of Greyleigh
Belinda of Nestles	H. M. Graham, Goomeri	8,724·28	365·332	Nelson of Darbalara
Model of Kia Ora (267 days)	J. H. Weber, Peak Crossing	9,693·97	361·329	Red Knight of Greyleigh
Happy Valley Myrtles Molly	R. R. Radel, Biggenden	8,661·7	355·547	Molly's Hero of Glenthorn
Lovely 3rd of Alva Glen	G. H. Knowles, Nanango	9,651·65	355·142	Cashier of Greyleigh
Waverley Beauty	R. Scott, Toogoolawah	10,692·2	351·971	Banker of Oakvale
Senior, 4 Years (over 4½ Years), Standard 330 lb.				
Glenore Vida	H. M. Graham, Goomeri	8,161·84	347·276	Starlight of Sherwood
Junior, 4 Years (under 4½ Years), Standard 310 lb.				
Home Hill Doris	E. O. Althouse, Cloyna	8,114·43	324·577	Sir James of Oakvale
Kalinga Bloom	E. O. Althouse, Cloyna	7,778·77	310·414	Bruce of Gulvallis
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Glencairn Peach	H. M. Graham, Goomeri	7,747·57	322·529	Roslyn of Woodmerle

Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Blacklands Red Plum 6th	M. C. and A. M. Sullivan, Pittsworth	13,807·33	460·63	Hugo of Blacklands
Glenore Dainty	A. M. Johnson, Gracemere	9,775·6	343·968	Sunnyview Union Jack
Fairlie Princess 17th	C. B. Mitchell, Fairlie, Warwick	6,571·69	282·504	Rosenthal Handsome Boy
Brundah Isis 2nd	Mrs. K. Henry, Greenmount	7,540·25	274·077	Osiris of Greyleigh
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Gentle 2nd of Alfa Vale (365 days)	W. H. Thompson, Nanango	13,424·26	631·752	
Murray's Bridge Charm II.	Mrs. K. Henry, Greenmount	8,098·2	346·919	Charmer of Murray's Bridge
Rhodesview Strawberry 2nd	W. Gierke and Sons, Helidon	8,413·24	317·235	Rhodesview Red Knight
Lovely 7th of Alva Glen	G. H. Knowles, Nanango	7,884	299·454	Nell's Son of Alfavale
Frankvale Kitty	Mrs. L. J. McCauley, Mundubbera	7,950·39	294·382	Hot Stuff of Blacklands
Glen Cairn Daisy	H. M. Graham, Goomeri	6,673·93	282·909	Roslyn of Woodmerle
Junior, 2 Years (under 2½ Years), Standard 230 lb.				
Daphne of Valera (271 days)	M. C. and A. M. Sullivan, Pittsworth	10,368·18	387·671	Blacklands Daphne Boy
Navillus Nancy	E. W. Jackson, Nobby	8,112·41	302·084	Midgets Sheik of Westbrook
Beauty 2nd of Alva Glen	G. H. Knowles, Nanango	7,249·25	297·674	Nell's Son of Alfavale
Rhodesview Queenie 16th	W. Gierke and Sons, Helidon	6,836·88	288·104	Rhodesview Red Knight
Evelyn II. of Navillus	E. W. Jackson, Nobby	7,018·25	278·409	Midgets Sheik of Westbrook
Fairlie Princess 20th	C. B. Mitchell, Fairlie, Warwick	6,147·09	274·025	Miner of Fairlie
Navillus Olive Palm	E. W. Jackson, Nobby	6,755·78	262·249	Midgets Sheik of Westbrook
Navillus Fancy II.	E. W. Jackson, Nobby	6,568·5	254·862	Midgets Sheik of Westbrook
Glen Cairn Beauty	H. M. Graham, Goomeri	6,621·28	254·54	Roslyn of Woodmerle
Happy Valley Maureen	R. R. Radel, Biggenden	5,944·5	251·573	Happy Valley Donaster
Navillus Melba	E. W. Jackson, Nobby	6,040·02	244·148	Midgets Sheik of Westbrook

FRIESIAN.

Mature Cow (over 5 Years), Standard 350 lb.				
Inavale Grace 8th	A. O. Stumer, Boonah	10,722·25	394·183	Anama Drikjes Pride

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AYRSHIRE.				
SENIOR, 4 YEARS (OVER 4 YEARS), STANDARD 330 LB.				
Fairview Josies Maid	R. M. Anderson, Southbrook	10,403·2	427·579	Longlands Bonnie Willie II.
GUERNSEY.				
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Willowbrae Mascot	H. T. Blanch, Eudlo	5,685	301·373	Willow Brae Laddie
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Lottie of Southport	H. T. G. Gibson, Kingaroy	6,243·5	402·437	Werribee Twylish Starbright King
Mayflower of Southport	H. T. G. Gibson, Kingaroy	6,659·1	397·113	Werribee Twylish Starbright King
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Brooklands Desert Majesty	W. C. Conochie, Sherwood	8,138·25	438·812	His Majesty of Dalebank
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Brooklodge Melba	J. Cummings, Nerang	5,811	343·721	Carlyle Empire's Songster
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Trecarne Jean	R. A. Slaughter, Clifton	5,681·03	309·159	Mascot of Brassaldale
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Cabulcha Milroy	J. M. Newman, Caboolture	5,699·55	291·512	Cabulcha Bright Star
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
White Rose of Hamilton (268 days)	J. Wilton, junr., Raceview	8,059·68	525·845	Retford May's Victor
Aileen of Sunnyview	A. Geritz, Goomeri	6,288·3	340·468	Golden Noble of Hillview
Glengariffe Noble Countess 11th	Cox Bros., Witta	5,251·9	269·996	Retford Royal Atavist
Abbeystead Sylvia	J. Newman, Caboolture	4,640·9	252·936	Trinity Ginger Boy

JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.

Trinity Spotted Lily	J. Sinnamon and Sons, Moggill	7,144·42	429·071	Some Hope
Brooklands Royal Plate	W. S. Conochie, Sherwood	6,919·65	338·975	Retford Earl Victor
Inasfayl Noreen	McGeehan Bros., Kairi	5,663·7	320·595	Inasfayl Primrose Boy
Maiwand Verbena	Queensland Agricultural High School and College, Gatton	5,308·63	299·695	Holly Rex
Kathleigh Betty	F. W. Kath, Ellesmere	6,166·6	296·333	Retford King's Thorn
Kathleigh Nettie	F. W. Kath, Ellesmere	5,689·9	288·519	Retford King's Thorn
Dawn Victors Princess	A. L. Walker, Dawn	5,304	280·709	Retford Glory's Victor
Trecarne Magnetette	R. A. Slaughter, Clifton	4,365·78	264·327	Trecarne Royal Boy 2nd
Wyreene Duchess II.	J. B. Keys, Gowrie Little Plains	4,586·38	253·215	Lyndhurst Majesty
Glengariffe Noble Foxglove 5th	Cox Bros., Witta	4,481·35	242·137	Retford Royal Atavist
Shamrock II. of Woodlands	J. M. Newman, Caboolture	3,903·65	232·466	Prospect of Woodlands

PLATE 126.—OPENING UP FRESH FURROWS, ST. LUCIA FARM SCHOOL.

Answers to Correspondents.

BOTANY.

Grasses and Clovers.

GRASS CLUB (State School, Nogo Junction, via Ceratodus, N.Q.)—

1. Perennial prairie grass (*Bromus marginatus*) is very similar in appearance to the ordinary Prairie grass, which is one of the best winter fodders in Queensland. It is, however, a true perennial species, producing a great deal of leafy fodder, and is well worthy of encouragement. It will probably be found that it does not succeed well except when it is cultivated after planting.
2. Annual prairie grass (*Bromus unioloides*), a native of North America, and now widely cultivated in most warm temperate countries as a pasture grass, particularly for dairy cattle. It produces a great deal of leafy fodder, and is quite naturalised in Queensland. When not cultivated, it is generally found around stockyards, home gardens, &c., or anywhere where the ground has been disturbed, rather than in ordinary pastures.
3. Perennial rye grass (*Lolium perenne*). Perennial rye grass can be distinguished from other rye grasses by its perennial character. It is one of the oldest grasses in cultivation as a fodder, and is practically the standard grass of most temperate countries, such as England, New Zealand, parts of North America, &c. Under Queensland conditions it is not truly perennial in habit. To assist its spreading, and to ensure its forming a permanent sward, it is said it should be fed off the first year before seeding.
4. Cocksfoot (*Dactylis glomerata*). A perennial grass, with an erect stem 1 to 2 feet high, sometimes larger on exceptionally good soils. It is tufted in habit, and does not creep like perennial rye grass. It has done quite well in some Queensland localities, and is worth encouragement.
5. Wimmera rye grass (*Lolium subulatum*). This grass first came to notice as a winter grass in the Wimmera district of Victoria, hence its local name. In the Southern States it is often sown with wheat as a cover crop, the combined crop being cut for hay or fed off in the ordinary way.
6. Western Welth's rye grass. This is a strain of the Italian rye grass that of recent years has become increasingly popular in the Southern States of Australia and in New Zealand, both for grazing and for hay.
7. Cluster clover (*Trifolium glomeratum*). An annual clover that often comes up spontaneously in Queensland. It is characterised by the flowers and seeds being borne in little globose heads along the stems, hence the local name. We think it is one of the best of annual clovers for Queensland conditions, and stock seem particularly fond of it.
8. Burseum clover (*Trifolium alexandrinum*). This is a tall-growing clover that has been cultivated on the Darling Downs from time to time, and does fairly well. It has gone out of favour in Queensland, probably for the reason that it is not suitable for grazing, but is mostly grown for hay. Where it will grow, generally speaking, lucerne does as well and is much better for the purpose. The only slight advantage it may possess over lucerne is that it produces early winter feed.
9. Alsike clover (*Trifolium hybridum*). This clover is a perennial, and very similar to the common white clover in general appearance, but is easily distinguished by its pink or red flowers. We have had very little experience with it in Queensland, but in the Southern States it is said to be one of the first clovers to succumb rapidly on the approach of hot, dry summer weather.
10. Bokhara clover (*Melalotus alba*); a lucerne-like plant with a rather sweetish and distinctive scent. Both annual and perennial forms are in cultivation. We have not seen very much of it in Queensland, but it has been grown quite extensively in New South Wales, and is one of the favourite leguminous crops in the United States.

Books in which you would find much useful information are—"Grasses and Fodder Plants of New South Wales," by E. F. Breakwell, obtainable from the Government Printer, Sydney, price 6s. 6d. posted—although this deals mainly with New South Wales, the vast majority of species dealt with also occur in Queensland—and "Grass Plants and Green Crop Manuring," price 1s., obtainable from Messrs. Arthur Yates and Sons, Limited, Post Office Box 2707C, G.P.O., Sydney.

Desert Poison Bush. Turpentine Grass. "Desert Mitchell Grass."

B.W. (Maxwelton)—

1. Heart Leaf Poison Bush or Desert Poison Bush, *Gastrolobium grandiflorum;* the poisonous principle is an alkaloid—gastrolobium. The alkaloid is not destroyed by drying, and dried leaves may be almost or quite as toxic as the living. Failure to recognise this has sometimes led people to allow sheep to graze in paddocks where the gastrolobium bushes have simply been cut down and allowed to wilt. The plant is one of the most serious poisonous plants we possess, and much more remains to be discovered concerning it, particularly at what stage of its growth it is most serious. Some graziers believe that the plant is worst following a burn, but this may be due to the fact that animals eat more of the tender young shoots following a burn than they would of the somewhat dry and harsh adult leaves. Gastrolobium is one of the few plant poisons for which an antidote is known. The use of Condy's crystals (permanganate of potash) administered as a drench, is said to be a sure and safe treatment, although, of course, it must be administered before the poison has taken full effect. D. A. Herbert, in a valuable bulletin on the poisonous plants of Western Australia, quotes several cases of the successful use of the antidote in that State, and recommends as effective doses for sheep and pigs 10 grains (about as much as will comfortably lie on a sixpence), for horses 15 to 20 grains, and for cattle 30 to 50 grains. He states that the action of the antidote is more rapid when the stomach is in an acid condition. There are two or three methods of attaining this end. The use of lime juice or vinegar has been recommended, but the experiments of Chestnut and Wilcox, Americans working on allied leguminous plants, show that aluminium sulphate is the most satisfactory substance. The genus *Gastrolobium* is very strongly developed in Western Australia, and about fifteen species or different sorts are known to be poisonous to stock in that State.
2. *Triodia* sp., a species of turpentine grass or spinifex, only of value when very young or in seed, the seed heads being a valuable fodder.
3. *Bothriochlea* sp., sometimes called the desert blue grass. We would say this is the best grass in the desert country, and quite a valuable fodder. It is sometimes called "Desert Mitchell," though it is not a Mitchell grass, and is more closely allied to the blue grasses.

The specimens were not very satisfactory for analysis.

Ball Nut.

H.A.J. (Maryborough)—

The specimen represents the ball nut, *Macadamia praealta*, a species with an extremely limited range in South Queensland. As you suspect, it is a very closely allied plant to the common Queensland nut, or Australian bush nut, *Macadamia ternifolia*. It is not known to be poisonous, but its very bitter taste will always mitigate its value as a nut. As some of these bitter kernels of *macadamia* and allied plants possess a prussic-acid-yielding glucoside, we have passed your specimen on to the Agricultural Chemist, Mr. Gurney, and if he is able to find anything in it we will let you know.

Mat Grass.

H.W.P. (Pomona)—

Your specimen represents the mat grass or carpet grass (*Axonopus compressus*), to which much publicity has been given in recent years. There are two forms of it—the broad-leaved and the narrow-leaved, and your specimen represents the former, which is generally regarded as the better of the two. Mat grass, particularly the broad-leaved form, has a definite value, we think, on second-class or poor country. It should not be allowed where possible, however, to get into better country, such as paspalum pastures, because these if closely grazed soon become overrun by the grass, which very much reduces their carrying capacity. In fact, many farmers are so concerned over the spread of this grass along certain parts of the near North Coast, particularly in paspalum pastures, that they consider it a distinct menace. The only satisfactory method of eradication is to attack it when it first appears, and apparently this is possible in your case.

Some Grasses of Mackay District Identified.

CLUB SECRETARY (Sybil Creek State School, Finch Hatton, Q.)—Your specimens have been determined as follows:—

1. *Eragrostis pilosa.* A kind of Love grass. Most of the Love grasses are useful constituents of the average native mixed pasture. This particular one is commonly met with as a weed of cultivation, along roadsides and in similar situations.
2. *Digitaria* sp. Most of the Digitaria grasses are fairly useful fodders.
3. *Eriochloa* sp. The Eriochloa grasses are sometimes known as Early Spring grasses or Dairy grasses. However, neither of these names is particularly appropriate. They are all useful pasture grasses.
4. *Eragrostis elongata.* A kind of Love grass. See notes on No. 1.
5. *Paspalum orbiculare.* Generally regarded as an inferior grass and not freely eaten by stock.
6. *Paspalum dilatatum.* This is the common Paspalum grass of coastal Australia. It is the chief dairy grass of Queensland.
7. *Sorghum fulvum.* Brown Sorghum. A native species of whose fodder value little is known.
8. *Sporobolus Berteroanus.* Parramatta grass. Generally rejected by stock and practically useless as a fodder.
9. *Themeda australis.* Kangaroo grass. A native grass which is quite a good fodder when young, but which becomes harsh and unpalatable at maturity. It disappears very quickly under stocking.

Saltbush. Frost-resistant Rhodes Grass.

T.G. (Nerang)—

We have spent a little time over the specimen of Saltbush, but fail to recognise it. It looks like the Barrier saltbush, *Enchylaena termintosa,* but it might be a species of *cochia.* You had better send a specimen along as soon as it is in fruit, which would probably be about October or November. Regarding the winter-growing or frost-resistant Rhodes grass, this is *Chloris distichophylla.* It is a native of Brazil, and has been grown here in Queensland for a number of years, mostly as an ornamental plant, but it seems to possess quite good possibilities as a fodder. The following description of the plant has been drawn up by one of our assistants, Mr. S. L. Everist, from material in our collections:—*Chloris distichophylla* is a densely tufted grass with short stout rhizomes, from which are given off numerous very much flattened leafy shoots. The roots are fibrous and numerous, and give the grass a very firm hold upon the ground. The young shoots are produced upon the outside of the clumps, and so help increase the size of the tufts. The leaves are given off very close together from a short, rigid, upright stem. The leaf sheaths, which are purple at the base, are broad, much flattened, and sharply keeled, and are conspicuously distichous. The leaf blades are fairly long and rigid, smooth, and quite free from hairs. They are green in colour, and markedly folded throughout their life, although they may become slightly flattened when old. The seed stalk is long and upright, and gives off at the top numerous long, slender, flexuous, closely clustered branches. Upon these branches are borne numbers of small, flat, brown spikelets or "seeds." Each of these bears a fringe of white hairs upon both edges. They fall off readily when the seed head is mature.

Guinea Grass.

H.J.C. (Wondai)—

The specimen represents Guinea grass, *Panicum maximum,* a grass well worthy of encouragement, we think, as a fodder for dairy cattle. It is a perennial species, generally looked upon as tropical, but it seems to stand through the winter months as well, almost, as anything. The percentage of fertile seed is generally small, but this may be due to the fact that it does not keep very well, and if it is intended to propagate it from seed, seeds should be sown practically directly after gathering. It is very palatable to all classes of stock, but is more of a grass of cultivation than of the ordinary pasture. A small paddock, however, of it for periodical cutting or grazing, we should say, would be a sound asset.

Tick Trefoil.

R.S.P. (Yungaburra), N.Q.—

Your specimen represents *Desmodium triflorum*, a species of Tick Trefoil, common in coastal Queensland, but widely spread throughout the Pacific and Malayan regions. It is a valuable fodder plant, but in closely grazed pastures grows rather close to the surface to give stock a decent bite. We have, however, seen it in lightly grazed paddocks forming, with paspalum and couch, an excellent pasture. When once introduced into a locality it generally spreads naturally. Its name arises from the fact that the small pod breaks up into one-seeded pieces, each covered with minute hairs or bristles, which cling to the hairs of animals, clothing, &c.

Poa Aquatica.

J.K.L. (Wooloowin)—

In our opinion *Poa aquatica* is quite unsuitable for growing about Port Darwin. It thrives very well in some of the swamp lands of Victoria, and has done wonderful work in reclaiming some country about Bacchus Marsh and other places. We have not seen any of it growing well in Queensland, and attempts mostly have failed. The only record that we have of its doing well is from a correspondent at Ravenshoe, North Queensland, and this locality, as you know, is high and quite cool. The best grass, we think, for growing in swampy land about Darwin would be *brachiaria mutica*, or, as it is generally known in Queensland, *panicum muticum*. This grass does not produce a great quantity of fertile seed, but is usually propagated in the same way as *poa aquatica*, by joints put in the mud, or just simply thrown into the water.

Grasses from South Burnett Identified.

Winter Fodder Project Club (Goomeri)—

(1) *Sporobolus elongatus*. Rat's tail grass. A common grass in Eastern Australia, but of little use as a fodder.

(2) *Rhynchelytrum repens*. Red Natal grass. An introduced grass now very abundant in coastal Queensland. It is not generally relished by stock, but is useful in the form of chop-chop.

(3) *Agropyron scabrum*. Wheat grass. A weed in parts of Queensland, and usually regarded as of little value.

(4) *Bothriochloa intermedia*. Forest blue grass. A native grass fairly common in forest country and along watercourses. In some parts of Queensland it is looked upon as an excellent fodder grass.

(5) *Bothriochloa decipiens*. Bitter or pitted blue grass or red grass. This is an inferior grass which has over-run much country in Eastern Australia. In the Southern States it has been found that top-dressing the pastures with superphosphate to encourage the growth of clovers tends to eradicate this grass.

(6) *Cyperus gracilis*. A sedge, not a true grass.

Zamia (Grass Tree) Poisonous to Pigs.

An inquirer from the North asked recently if the small tree-like fern usually referred to as grass tree, and which produces a type of nut called zamia, is poisonous to pigs, or causes them to develop rickets.

Replying to the inquiry, Mr. C. T. White, F.L.S., Government Botanist, stated that all members of the Zamia family are dangerous when considered in their relationship to stock foods. Quite a number of them occur in different parts of Queensland, some of them quite large. The one referred to in this inquiry is probably *Bowenia spectabilis*, a zamia or cycad of fernlike appearance, bearing a cone of nuts which fall round the base of the plant. Trouble in this case may be caused either through eating the young shoots of the plant, or the ripe seeds when they fall from the plants. The poisonous nature of these plants has now been proved definitely by feeding tests, and it would appear to be dangerous to allow pigs to run in country where zamia nuts are in abundance.

One of the species of zamia which occurs in New South Wales caused severe losses in travelling sheep recently. These sheep had been used to hand feeding of maize and other concentrated foods. In travelling through a patch of zamia country they ate a number of the nuts, and severe losses occurred.

If in doubt as to whether any plant or seed is dangerous, immediate action should be taken to forward specimens, roots, stems, leaves, flowers, fruits, to the Government Botanist.

General Notes.

In Memoriam.

ADAM McGOWN, M.R.C.V.S.

The death of Mr. Adam McGown, formerly of the veterinary staff of the Department of Agriculture and Stock, which occurred at Bundaberg on 23rd August, is recorded with deep regret.

The late Mr. McGown was born in the North of Scotland 59 years ago, and graduated at Edinburgh in May, 1898. After practising in Falkirk in his homeland for a number of years, he came to Queensland and entered the Public Service subsequently as a veterinary inspector and became later a Government veterinary surgeon and Quarantine officer. He qualified as an expert under the Slaughtering Act, and served also as a member of the Stallions Board for a lengthly period. Three years ago he resigned to engage in private practice in Bundaberg where he became well known for his skill as a veterinary surgeon and highly esteemed as a citizen.

While in the Department of Agriculture and Stock, Mr. McGown's professional work took him over a wide area of the State, in which his skill and advice were regarded as being of great value. He was keenly enthusiastic in all matters appertaining to his special duties, which brought him into close and intimate contact with graziers and other stock owners who held a high opinion of his abilities. His genial manner and other fine qualities won for him many friends. Many ex-students of the Queensland Agricultural College, where he lectured regularly on veterinary subjects for a considerable time, deplore his untimely passing. A lover of horses, Clydesdales had for him an especial attraction and he was a recognised authority on the breed.

At the funeral service which took place at the Crematorium, Mount Thompson, Brisbane, on 24th August, there were present, in addition to near relatives, representatives of the Department of Agriculture and Stock and of the ex-students of the Queensland Agricultural College. The late Mr. McGown is survived by his widow and a daughter, Mrs. E. Marlay, and to them deep sympathy is extended.

WIRELESS TALKS TO FARMERS.

Through a mistransposition of subjects in the radio lecture list published in our last issue, a risk of misunderstanding has arisen.

The corrected lecture list for the remainder of the present broadcasting term is, therefore, given below:—

Tuesday, 10th September—"Fungicides and Disease Control," Part III. J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 12th September—"Chloris Grasses." S. L. Everist, Assistant to Botanist.

Tuesday, 17th September—"Manures and Fertilizers." E. H. Gurney, Agricultural Chemist.

Thursday, 19th September—"Salt Bushes." C. T. White, Government Botanist.

Tuesday, 24th September—"Kilkivan to Kingaroy—An Epic of Pioneer Settlement." J. F. F. Reid, Editor of Publications.

Thursday, 26th September—"Brains in Farming." J. F. F. Reid, Editor of Publications.

Staff Changes and Appointments.

Acting Sergeant F. G. Boyle, of Mareeba, and Constable C. H. Smith, Eton, have been appointed also Inspectors under the Slaughtering Act.

Mr. E. J. Taylor, Amamoor, has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, and will be attached to the Zillmere Bacon Factory.

Mr. P. Round has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, and is attached to Pittsworth.

Mr. G. H. Curry, of Lake Barrine, and Mr. C. J. O'Brien, of Lake Manchester, have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

Messrs. T. P. McGrath, J. McI. Davidson, P. F. Goodwin, A. Hoffman, A. James, P. K. Garvey, and H. Armstrong—school teachers in the Cleveland District—have been appointed honorary rangers under the Animals and Birds Acts.

Mr. J. F. H. Clark, Inspector of Stock, Gladstone, has been appointed also an Inspector under the Dairy Produce Acts.

Messrs. M. H. Muller and J. W. Winlaw, Inspectors of Dairies at Mundubbera and Monto, respectively, have been appointed also Inspectors under the Brands Acts.

Mr. N. Bennett, manager, Racecourse sugar mill, has been appointed millowners' representative on the Racecourse Local Sugar Cane Prices Board, vice Mr. J. A. Michelmore, resigned.

The Officer in Charge of Police, Duaringa, has been appointed also an Inspector under the Brands Acts.

Mr. H. A. Taylor, Inspector under the Fertilizers, the Pure Seeds, the Stock Foods, the Pest Destroyers, and the Veterinary Medicines Acts, Department of Agriculture and Stock, has been appointed Inspector and Examiner under the abovementioned Acts, and Mr. R. J. Holdsworth, Assistant, under the Pure Seeds Act, has been appointed Inspector under the Fertilizers, the Pure Seeds, the Stock Foods, the Pest Destroyers, and the Veterinary Medicines Acts, Department of Agriculture and Stock.

Messrs. C. Bonne, A. Byrne, and P. C. Boettcher have been appointed Assistant Cane Testers at the Proserpine, Millaquin, and Bingera mills, respectively.

State Wheat Pool.

The State Wheat Pool Election Regulations have been amended to provide that the existing members of the Wheat Board shall be continued in office until the 31st August, 1935, and that the succeeding Board shall hold office from the 1st September, 1935.

This action has become necessary following the recent death of Mr. Booth, one of the nominees for the election of members set down for the 30th July. A fresh election has been ordered, and will be conducted on the 30th August next.

Animals and Birds Sanctuaries.

Orders in Council have been issued in pursuance of the provisions of the Animals and Birds Acts, declaring Daley's Lagoon, Upper Ripley, and Oakwood Lagoon, Euramo, the latter the property of H. N. Lund, Tully, to be sanctuaries under the Acts. Honorary rangers have been appointed in respect of Daley's Lagoon sanctuary —namely, Messrs. R. Varley (Peak Crossing) and W. B. and A. E. Hall (Ripley).

Preservation of Hides.

Regulation 36 under the Slaughtering Act, relative to the preservation and production of hides and skins, has been rescinded, and a new regulation substituted. The Regulation provides that the occupier of a slaughterhouse shall keep at the slaughterhouse the skins or hides of stock for seven days after slaughter, unless such skins or hides have been inspected earlier, and shall produce them to an inspector on demand. No skins or hides shall be removed during the period of detention, nor any brands or marks thereon defaced or removed.

Every person who slaughters stock at any place other than a slaughterhouse shall keep the skins or hides at such place for fourteen days after slaughter, unless an inspector has inspected them, and shall, on demand, produce the skins or hides to an inspector. Similarly, the skins or hides shall not be removed during the period of detention, nor shall the brands thereon be defaced or removed.

Banana Industry Protection Board.

An Order in Council has been issued in pursuance of the provisions of "*The Banana Industry Protection Act of* 1929," providing for a levy on banana-growers to be used in the maintenance of the Banana Industry Protection Board. This levy is similar to that issued last year, and is at the rate of 2d. in the £ on the net proceeds of all bananas marketed in the bunch, and 1½d. per case for all fruit marketed in the case. This levy will be operative for a period of twelve months from the 1st August next.

Dairy Products Stabilisation Act.

An Order in Council has been issued further amending section 10 of the Dairy Products Stabilisation Act. This section at present provides a penalty of £500 for an offence against the provisions thereof, and the amendment approved to-day will provide penalties for breaches similar to those applying in the Victorian Dairy Products Act.

The amendment provides that a manufacturer who, in contravention of the provisions of the section, sells at any time an amount of dairy products in excess of the amount permitted under the section, shall be liable—

In the case of butter, to a penalty of not less than £4 and not more than £6 for every cwt. or part of the excess amount; and

In the case of cheese, to a penalty of not less than £2 and not more than £3 for every cwt. or part of the excess amount.

Cream Grades.

Regulations under the Dairy Produce Acts have been amended to provide that there shall be three grades of cream, designated "Choice Grade," "First Grade," and "Second Grade," respectively.

Cream which is affected by putrefactive decomposition or is considered by the owner of a factory to be unfit for the food of man shall not be designated by grade but shall be rejected.

The basis of payment for cream graded either as choice grade or first grade cream shall be—for all cream graded as choice grade cream, the owner of the factory shall pay ½d. per lb. commercial butter content over and above the price paid by him for cream graded as first grade; and for all cream graded as first grade he shall pay 1d. per lb. commercial butter content over and above the price paid by him for cream graded as second grade cream.

Committee of Direction of Fruit Marketing.

Regulations under the Fruit Marketing Organisation Acts have been issued relative to the electorates for the election of the Banana, Pineapple, Citrus, Deciduous, and Other Fruits Sectional Group Committees. For the purpose of electing members of the various Sectional Group Committees, each of the Local Associations and groups of Local Associations set out in the regulations shall constitute the various electorates, and shall elect to hold office until the completion of the next election of members of the Sectional Group Committees the number of members respectively set opposite to the name of the Local Association or Group of Local Associations.

Dairy Products Stabilisation Board.

An Order in Council has been issued in pursuance of the provisions of the Dairy Products Stabilisation Act, extending the operations of the Dairy Products Stabilisation Board until the 30th September next. This Board consists of the members of the Butter Board, two representatives of the Cheese Board, and the Director of Marketing.

Levy on Pine Plywood.

Regulations have been approved under the Primary Producers' Organisation and Marketing Acts, empowering the Plywood and Veneer Board to make a levy at the rate of 3d. per 100 feet face measurement on all pine plywood to which the Orders in Council made under the provisions of the Acts apply and extend, delivered by a grower between the 3rd May, 1935, and the 2nd May, 1936, for the purpose of establishing and maintaining a fund for subsidising growers for plywood despatched outside the Commonwealth. This levy has already been in force, but with the extension of the Board until May, 1936, it has been necessary to also formally extend the levy regulations.

A Beerwah Sanctuary.

Timber Reserve R. 311, parish of Durundur (Beerwah district) has been declared a sanctuary for the protection of native animals and birds.

Pineapple Levy.

A regulation has been issued in pursuance of the provisions of the Fruit Marketing Organisation Act extending for a further twelve months the Pineapple Levy Regulation which was published in the *Gazette* of the 30th June, 1934, and which empowers the Committee of Direction of Fruit Marketing to make a levy on pineapples. A proviso is added this year that no levy shall be collected on single-case consignments of pineapples or upon single cases of pineapples which form part of a consignment with other fruits.

Peanut Board.

An election for the appointment of a grower's representative on the Peanut Board for Districts Nos. 1 and 2 (Wienholt and Nanango) and Central Districts will not be necessary this year as the present members, Messrs. C. F. Aderman, Wooroolin, and R. R. Nothling, Hut Creek, Ambrose, have been returned unopposed. They will be reappointed for a further term of two years as from the 28th August.

The Passing of a Great Agriculturist—Walter Scott Campbell.

The death of Mr. Walter Scott Campbell at Sydney on 25th July removes one of the founders of Australian agricultural policy and the last original pupil of Sydney Grammar School. Although Mr. Campbell was in his 92nd year, he had taken a keen interest in agriculture, natural history, and horticulture up to the time of his death. Physically well preserved and endowed with a remarkably retentive memory, Mr. Campbell made his first trip to England at the age of 90. His last public service was quite recent, when he prepared a report for the consideration of the Commonwealth Wheat Commission.

In 1877 he reported extensively on agricultural conditions in New South Wales, being the first expert to indicate the dairying possibilities of the North Coast.

The son of Francis Campbell, a noted physician of early Sydney, Mr. Campbell was a native of Maitland, and was born in 1844. He attended a school at Parramatta conducted by Dr. William Woolls, and later became No. 17 boy at Sydney Grammar School, of which he was the last surviving original pupil.

After the introduction of Sir John Robertson's Free Selection Act there was urgent need for the training of young surveyors, and Mr. Campbell was one of those chosen for the work. In 1861 he joined the Government service as a temporary cadet, and thirteen years later had been promoted to successive positions, until he became chief draughtsman. In 1893 he was appointed chief clerk in the Department of Agriculture and Forestry. Subsequently he was appointed chief inspector of agriculture, and in 1903 director of forests and agriculture, a position he held until his retirement in May, 1909.

It was mainly due to his efforts that the New South Wales system of experiment farms was established. He co-operated strongly with William Farrer in his wheat-breeding experiments.

After his retirement Mr. Campbell conducted a mission of inquiry on agricultural prospects in the Northern Territory on behalf of the Government. During a recent tour abroad Mr. Campbell studied the methods of agriculture in other countries, and recalled how, at El Cantro, on the Mexican border, he visited a Government experiment farm, and upon inquiring the name of the wheat which was growing in one of the experimental rows, he was informed to his great surprise that it was White Federation. This variety, now world famous, was evolved by Farrer in New South Wales, to take the place of Steinwedel, then largely grown in dry districts.

Mr. Campbell was a past president and fellow of the Royal Australian Historical Society, for which, when not in his garden, overlooking Vaucluse road and Sydney Harbour, he delighted in writing historical papers.

Mr. Campbell was also keenly interested in agricultural development and progress in Queensland, and was a regular reader of this Journal, with which he maintained a valued correspondence.

Butter and Cheese Boards.

Orders in Council giving notice of intention to extend the operations of the Butter and Cheese Boards until the 30th September next have been issued.

Rural Assistance Board.

An Order in Council has been issued, in pursuance of the provisions of "*The Rural Assistance Board and Agricultural Bank Acts Amendment Act of* 1934," constituting the Rural Assistance Board and appointing the following to be members of such Board as from the 1st August, 1935:—

Messrs.—

H. C. Quodling (General Manager, Agricultural Bank), Chairman;

R. Wilson (Assistant Under Secretary, Department of Agriculture and Stock), Deputy Chairman;

A. C. Palmer (Manager, Head Office Staff, Agricultural Bank); and

R. L. Murray, A.F.I.A. (Senior Inspector of Accounts, Audit Office).

Extending Operations of Butter and Cheese Boards.

Orders in Council have been issued, in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, extending the operations of the Butter and Cheese Boards until the 30th September, 1935, and continuing in office until such date the present members of such Boards. These are:—

Butter Board.

Messrs. J. Purcell (Toowoomba) (chairman), W. J. Sloan (Malanda), R. M. Hill (Bororen), J. McRobert (Maryborough), T. F. Plunkett (Beaudesert), A. G. Muller (Fassifern Valley, Kalbar), and E. Graham (Director of Marketing).

Cheese Board.

Messrs. H. T. Anderson (Dalby) (chairman), T. Dare (Narko), A. J. Harvey (Pittsworth), D. G. O'Shea (Southbrook), A. Pearce (Coalstoun Lakes), and E. Graham (Director of Marketing).

Pioneer Mill Levy.

Regulations have been issued, in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, empowering the Pioneer Mill Suppliers' Committee to make a levy at the rate of thee-farthings per ton on suppliers of sugar-cane to the Pioneer mill, for the purpose of defraying the costs of employing a farmers' representative at the mill. Fifty per cent. of the suppliers to the Pioneer mill may lodge a petition, on or before 23rd September, on the question as to whether the levy shall be made.

Council of Agriculture.

The regulation issued on the 25th July last, covering the personnel of the Council of Agriculture, and made in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, has been amended to provide that the Barley Board's representative on the Council shall be Mr. Edward Fitzgerald, of Felton.

Sanctuary at Darlington.

The property of Mr. N. C. Markwell, at Darlington, near Kerry, has been declared a sanctuary for the protection of native animals and birds, and Mr. Markwell has been appointed an honorary ranger in connection therewith.

Barley Board.

An Order in Council has been issued giving notice of intention to extend the operations of the Barley Board for the period from 24th April, 1937, to 23rd April, 1942. A petition for a ballot on the question as to whether the Board shall be continued may be lodged on or before the 16th September.

Close Season for Quail in Southern Queensland.

An Order in Council has been issued, in pursuance of the provisions of the Animals and Birds Acts, varying the close season for quail in Southern Queensland by providing that it shall commence on 1st September, 1935, instead of the 1st November, 1935.

Rural Topics.

God, The Creator.

"Beholding, and mindful of all this great wealth, there rings with these thoughts also the thought that there is much here that suggests God the Creator reveals some features of His Power, His Wisdom, and His Goodness.

"Back of the loaf is the wheat and the flour,
And back of the flour the mill,
Back of the wheat is the sun and the shower,
The rain and the Father's will."

—From the official address of welcome to the Governor, Sir Leslie Orme Wilson, on the occasion of the opening of the Brisbane Show.

Boar Weighs 896 lb.

"What a size! How can he move about? How much does it take to feed him? What a whopper!" These remarks were overheard near the pen of Norfolk King David V., a hugh Large White boar, the property of the Gatton Agricultural College, and exhibited at the Royal National Show.

The boar weighs 896 lb. and was champion of the Exhibition last year. Many a prime bullock does not come up to his weight. In the awards he was unplaced this year, but his son, Gatton David, owned by Mr. J. A. Heading, of Murgon, secured first prize and the championship. Gatton David is nearly as heavy as his father, his weight being estimated at 800 lb.

A Good Litter of Large Whites.

Mr. and Mrs. A. G. Stewart, of the Cedar Pocket district, Queensland, have sent us in the following record of the litter of their large white sow "Lady Fay," the litter being two months old at date of first weighing. Individual weights:—Boars: 43, 49, 46, 35, 37, 38 lb.; sows: 44, 45, 40, 48 lb.; a total weight for ten pigs of 425 lb., an average weight of 42½ lb. at two months of age.

These pigs did not have what is usually referred to as special or expensive feeding, but they had the benefit of the milk from the sow, plus a balanced cereal mixture, fed *ad lib.*, as the young pigs required it.

The litter was farrowed on 22nd May, 1935, and consisted of eleven pigs, of which one was killed at birth. This is a good record for pigs at the age stated.

A Cheap Paint for Iron Roofs.

Because of the continual contraction and expansion, as the result of extremes of heat and cold, and the absence of good grip or key, ordinary house paint is not suitable for galvanised iron roofs, and it is always advisable to use paint specially manufactured for the purpose. A cheap paint for corrugated iron roofs may be made by mixing together 14 lb. of cement to 1 gallon of boiled linseed oil. This should be kept thoroughly stirred and applied in warm weather.

Horses—Watering Hints.

Right throughout the summer season the horses that are working require considerably more water than at other times, and if denied plenty of water suffer just as acutely from lack of a drink as does a human being under the same circumstances. Now there is a considerable difference of opinion as to how horses should be watered during hot weather, and in many cases drinking is not allowed whilst at work or at times whilst sweating.

The best plan to follow, however, is to never let the horse become unduly thirsty, but to allow to drink frequently, when the weather is really hot, whilst actually at work.

To keep the animal off water for some hours whilst hard at work, and then to allow of drinking freely, is quite apt to cause stomachic trouble, but when allowed to drink frequently, and as much as may be desired, no trouble will be set up, and the animal will work all the better for the concession, and will also benefit in health. —J. T. B. in "Farm, Field, and Fireside"—(England).

Stockowners Warned Against "Cure-alls."

From time to time advertisements and reports of lectures have appeared in the press urging dairy farmers to administer drenches to their cows at various periods, but particularly in connection with calving and the suspected occurrence of various infectious diseases. Generally, no information is supplied indicating what the drench consists of, nor what particular abnormal condition it is supposed to remedy.

The Department of Agriculture (N.S.W.) has frequently drawn the attention of stockowners to the undesirable habit of indiscriminately giving to cattle drenches of unknown contents without expert advice. The normal, properly fed and managed animal should require no medicine whatever, either in the shape of a drench or any other form. If the animal is ill, then appropriate drugs in drench or other form may be utilised to overcome distressing symptoms and to assist in rectifying deranged conditions in the internal organs, but these drugs must be administered with some regard to the actual condition existing.

The wide claims made in connection with many drenches should be quite sufficient to render stockowners dubious; many border on the miraculous. If, for instance, a claim is made for a certain drench that "it is of great value in cases of constipation" and nothing more, then the claim might be accepted as it is probably true. If, on the other hand, the drench is claimed to be a "sure cure for constipation, diarrhœa, all blood diseases, spavin, and cough," then the stockowner should seriously ask himself whether such claims are possible.—"A. and P. Notes," N.S.W. Department of Agriculture.

The Waler in India.

It is not only as a remount that the Australian horse exercises a leading role in India, but in the show ring and in the field of sport he is also well to the fore. At the Delhi Horse Show for the past two years the champion saddle horse was an Australian owned by H.E. the Viceroy of India.

In recent years enthusiastic efforts have been directed towards the breeding and improvement of the horse in India. A number of Government studs have been formed which are mostly under military supervision. For this purpose stallions have been imported from England, and a few from Australia.

Arab stallions are also employed in the scheme. In view of the hardiness of the Waler (despite the fact that it is contended he is not equal to the standard of past days) it is a matter of surprise that more stallions are not secured from Australia. One would think that horses bred and reared under the conditions ruling here would be more suitable than sires introduced from England. They would acclimatise better and quicker than those hailing from a cold country, while in comparison with the rearing of thoroughbred stallions in England the Australian product should stand up to conditions in India better than his English brother.

If our utility horses are the most suited to the needs of the army in India, surely the male source from which they sprung should also be best suited for the improvement of the native horse stock of India!—"Country Life."

Disappearing Wild Life—Pests Increase.

Mr. A. S. Le Soeuf, Curator of Taronga Park, in an address at a recent meeting of the Rangers' League, deplored the rapid extinction of wild life—the end of the age of wild animals. He said that Governments must try to stem the exploitation of the heritage of wild animals.

The beautiful big grey kangaroo, one of the most typical of Australian animals, might be said to live on sufferance, he said, as all the land on which it lived had been taken up for settlement. The koala might be said to be living only in the same way. The introduction of the fox had resulted in ground animals being cleared out. In the bush the mistletoe was spreading and doing enormous damage by killing trees, whereas formerly the native animals had been numerous enough to keep the balance. He believed that opossums and koalas ate the seeds of mistletoe, and their disappearance had allowed it to go ahead. Quail, which ate the blowfly, so destructive in Australia, were shot in large numbers. Wonderful areas had been set apart for the preservation of game, but they meant absolutely nothing, as there was nobody to police them. In the clearing of the forest lands properly proportioned breaks should be left so that birds could nest, and magpies and various others could eat the grasshoppers. The grasshopper pest of last year was one of the results of the destruction of bird life.

International Committee for Inter-Co-operative Relations.

The Seventh Session of the International Committee for Inter-Co-operative Relations was held at the International Labour Office in Geneva during the last quarter of 1934.

This committee was established as a result of the examination by the World Economic Conference of 1927 of the whole question of improving the agricultural situation. The conference had found that the position of the farmer was bound up with the general problem of economic rationalisation, and that an appreciable change could be brought about by creating effective links between agricultural and distributive co-operative societies. Accordingly, it had passed a resolution calling attention to the importance of inter-co-operative relations. As this resolution was in harmony with the aims of both the International Co-operative Alliance and the International Commission of Agriculture, these two organisations took the initiative of setting up the International Committee for Inter-Co-operative Relations.

Since its constitution, the committee has set itself the task of encouraging the formation of national groups composed of both agricultural and distributive co-operative societies, wherever it has seemed advisable to do so. In its first six sessions, it also undertook studies of various important problems relating to the marketing of wheat, eggs, and dairy produce—the last-mentioned item with particular reference to the New Zealand Produce Association. At its seventh session, the committee expressed its satisfaction at the constant increase in the number of organisations carrying on national inter-co-operative activities, and took steps to ensure closer contacts with these organisations. It considered the work of co-operative wheatstoring societies in France as well as the measures taken under the milk marketing schemes in England, Northern Ireland, and Scotland. The committee then decided upon a survey of the various forms of intervention practised by public authorities in the organisation of the marketing and distribution of agricultural produce, and upon an examination of the effects of such intervention on the development of co-operative organisations. An inquiry into the part played by agricultural and distributive co-operative societies in the national and international butter trade was brought to a conclusion; and the committee made a series of recommendations for a better regulation of local, national, and international marketing in the interests of the producers and consumers of agricultural products. A draft arrangement calculated to promote joint action between the International Co-operative Wholesale Society and the International Commission of Agriculture was also approved.

The Value of Silage.

The market value of silage is not fixed, as is the case with hay. In nearly every case the fortunate farmer who possesses it regards it as of so much value to himself that he will not sell it. It has, however, a very definite market value. Considered from the point of view of its actual food constituents it may not be so valuable as hay, but its succulence is an important feature, and renders it of considerable value, particularly in time of drought, when succulent feed is the very class of which there is a special scarcity.

Farmers are beginning to appreciate the real monetary value of a supply of silage—not merely its value as fodder, but the profits accruing from the enterprise made possible by the reserve of feed.

Propagation of Saltbush.

The re-establishment of saltbush is no more difficult than the laying down of pastures, judging by the experience of Mr. D. A. Wettenhall, of Jerilderie (N.S.W.). Up to the present, the usual method of propagation has been to raise seedlings in nursery plots and transfer the young plants to their permanent positions. This is slow, and often involves a high percentage of losses.

According to Mr. A. W. S. Moodie, Assistant Agrostologist, New South Wales Department of Agriculture, all Mr. Wettenhall did was to collect the seed, disc and harrow the area immediately before sowing in early May, and use the wheat drill for distributing the seed. The seed germinated as freely as Wimmera rye grass, and an excellent stand has been obtained.

Mr. Moodie holds that the plan adopted by Mr. Wettenhall indicates that it is practicable to establish large areas of saltbush provided the individual is willing to harvest his own seed and to protect the sown areas from stock until the plants are well grown. Strips planted along the fences and protected by temporary wires would provide an excellent drought standby. This was the method adopted on the Jerilderie property.

Points of a Good Laying Hen.

The main outward indications of a good layer are large, prominent eyes, giving an alert appearance, face free from wrinkles and undue feathering, skull fairly fine yet strong, body deep and wide showing capacity and stamina, and an active robust appearance.

On being handled, the abdomen of birds which are in laying condition should be full and soft, the skin being of fine texture and the pelvic bones fairly wide apart, thin and pliable; but too much stress should not be placed upon the condition of the pelvic bones, as many good layers would not stand up to such a test as applied by those who rely mainly upon this factor in selection. The condition of the abdomen and pelvic bones is largely dependent upon whether the bird is actually laying or not. When in full lay the whole abdomen is expanded, but as soon as she ceases laying, even temporarily, there is a contraction of these parts, and this must be taken into consideration in handling the birds.

Saltbush Propagation Experiments.

From the comments of Mr. A. W. S. Moodie, Assistant Agrostologist of the New South Wales Department of Agriculture, on an experiment conducted by Mr. D. H. Wettenhall, of Jerilderie, and to which reference was made in a recent issue of the "Sydney Morning Herald," it seems at least a distinct possibility that present-day methods of sowing ordinary crop plants may be successfully employed in regard to the saltbushes in low-rainfall areas.

Mr. Wettenhall was convinced that the saltbushes were worthy of attention for pasture improvement purposes, and especially the "Old Man" species, Mr. Moodie said. He collected several bags of seed, and, using the wheat drill for distributing the seed, succeeded in obtaining an excellent stand. The land was disced and harrowed immediately before the sowing in early May. The seeds had germinated as freely and readily as would be the case with grasses such as Wimmera rye grass.

Mr. Moodie said that, in the past, many graziers had attempted to establish saltbushes by raising seedlings in nurseries, then transferring the young plants to the grazing paddocks. The area which could be treated in this way was necessarily limited. Many plants died, and it was difficult to protect them from stock. Consequently, while all admitted the great value of the plants, few serious attempts had been made to re-establish them on areas where they had formerly flourished.

The methods used by Mr. Wettenhall indicated that it was practicable to establish large areas of saltbush provided the individual was willing to harvest his own seed and to protect the sown areas from stock until the plants were well grown. Strips planted along the fences and protected by temporary enclosures would provide an excellent drought standby. This was the method adopted in the present instance.

Wool Classing.

All wool, whether merino, comeback, or crossbred, when evenly classed, sells better than irregularly classed clips. It is important to have medium quality merino fleeces packed separately from those of fine quality. Strong, straight-haired merino fleeces should be kept apart from the other sorts, and should be packed separately regardless of th fact that they may be of good length and weight. Heavy yolky and black-tipped fleeces should be packed separately from the best wool of a clip. Buyers complained last season, say the brokers, that in some cases heavy conditioned fleeces had been packed in the top lots. The greatest care should be taken to have the various lots of comeback and crossbred clips kept as even as possible for quality and length.

Buyers also complained last season of the lack of care in skirting the fleeces of some of the smaller clips. The principal complaint was that locky and inferior pieces adhered to many of the fleeces. Deeper and more careful skirting, particularly around the breech, is recommended.—"The Australasian."

A Red Poll Cow's Record.

A Red Poll cow in the Ranksborough herd of Mr. Owen H. Smith, of Langham, Oakham (England), who is president-elect of the Red Poll Cattle Society, has established a breed record. His nine-years-old cow Basildon Rosalind 3rd has with her last three calves given 52,589½ lb. of milk, her last three records being 20,960¾ lb. in 1934, 19,083¾ lb. in 1933, and 12,554 lb. in 1932. In weight this means 23 tons 9 cwt. of milk in three years, which is a good performance for a cow of the dual-purpose breed.

To Bend Metal Pipes.

Get some dry, clean sand. Prepare a tapered wooden plug and drive tightly into one end of the pipe, after making sure that no foreign substance is in it. Stand on end and pour in sand, tapping gently to get it down until it is filled to within an inch of the top. Make a dozen or fifteen thin softwood wedges 6 inches long, and drive them 4 inches into the piping until the end is completely blocked, so that the sand cannot escape. The piping is now, to all intents, solid, and may be heated, and bent to the desired angle like ordinary bar iron. Do not use damp or wet sand, or when it is heated it will burst the piping or blow out the plugs.

Value of Pig-Recording.

A very successful pig breeder of the Waikato, New Zealand, Mr. C. P. Harington, is a staunch advocate of pig-recording, and at a recent meeting of breeders he stressed the vital importance of this great aid to maximum production. Pig-recording, said Mr. Harington, was the medium by which was measured the prolificacy of sows. In the Waikato Recording Club 2,500 sows had been recorded, and after four years weaner weights had been increased up to 48 lb., which was truly a remarkable figure in comparison with the figures of other countries. That had been achieved by the use of meat meal and by creep feeding. The heavy weaner was the key to successful production. Unless there was a record of performance behind them, pedigrees were not worth anything, for production was the only true gauge. Farmers who had recorded were now far ahead of those who had not. Pedigree plus performance would always pay better than pedigree alone. If breeders did not record they were working in the dark. The new Waikato Pig-recording Association would put recording on the map, and the work would become as indispensable as herd-testing.

Stock Transport by Motor Truck.

A writer in "The Australasian"—H.B.J.—gives the following interesting account of the transport of twelve steers in a motor truck over a distance of 600 miles:—

An indication of the potentialities of the motor truck for transport of cattle over long distances in country not served by railways was recently provided by an interesting transport experiment. With the object of ascertaining how cattle would travel by motor truck, 12 steers were transported in a motor truck from near Mount Leonard Station, in Central Australia, to Broken Hill, a distance of 617 miles. The journey was accomplished in the fast time of three days, and the cattle were delivered at Broken Hill in good condition. If the beasts had been brought down by road the journey would have taken about ten weeks, but in this case, owing to the existing drought conditions, the steers, because of lack of feed en route, would have perished on the way to Broken Hill. It is claimed that this is the longest distance that cattle have been transported in Australia by motor vehicle.

The experiment was conducted on behalf of the Mount Leonard Pastoral Company (Q.), the transportation being carried out by Glassons Motors, of Broken Hill. This firm had a special body fitted to a 10-ton Leyland truck. The vehicle is a six-wheeler, equipped with 10-inch sectioned Dunlop tyres, thus ensuring comfortable and speedy travel over rough tracks. The tare of the 43-h.p. truck is 9 tons, and, with the cattle aboard, about 18 tons. The outfit, with its live load, left Mount Leonard at 11 a.m. Friday and was in Broken Hill (617 miles) on the following Monday at midday. According to the stock inspector (Mr. G. B. Johnston), the steers arrived in beautiful condition, suffering no ill-effects from their long journey by motor.

The success of the undertaking is one of vital interest to pastoralists far removed from railheads, and particularly those located in parts of the hinterland subject to droughts. It is of interest to mention that a 6-ton Brockway truck with an articulated trailer carrying a special two-tier body, 25 feet long by 10 feet wide, is also being used very successfully by Glasson Motors for transport of sheep over long distances. The outfit is equipped with 10½-inch sectional Dunlop balloons on the front axles and twin 8-inch Perdriaus on rear axle of truck. The trailer axle carries wheels with 10-inch Perdriaus, the object of the big tyres being the elimination of jolting and shock while carrying loads of sheep over long stages. At present this outfit is transporting about 1,000 sheep a week, the two-deck body comfortably holding from 250 to 300 sheep. These travel distances up to 300 miles in good shape.

The opinion of those associated with this transport experiment is that in the near future the motor truck, with suitably equipped special bodies, will be used extensively for carrying live stock from outlying districts.

Plate 127.—Looking across Lake Cootharaba from Boreen Point, South Queensland.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planed in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A NEW DANGER TO CHILD-LIFE IN QUEENSLAND.

THE greatest danger to our children is that so many of them are badly fed. You may give a child as much food as he can eat, his appetite may be satisfied, but he may be ill-nourished and have a very poor resistance against disease. So long as you keep to the simple natural foods in right proportions, you are safe. To feed children on artificial processed foods is always dangerous, and many suffer from this. Recently there has been introduced into Queensland an artificial food more dangerous than any we have had before, and specially dangerous to Australian children, because so many of them get too little milk, and many depend on butter to supply that deficiency.

The Virtues of Milk.

The chief virtues of milk are three. (1) It is the best source of lime, which is necessary for the growth of bones and teeth. Cow's milk contains more lime than does lime-water. (2) It contains the most valuable proteins (body-building food). (3) It contains good quantities of the vitamins A and D. Vitamin D is necessary to prevent rickets, not an uncommon disease in Queensland. Lack of Vitamin A causes many diseases—inflammation and suppuration of the eyes, pneumonia, ulceration of the stomach and bowels, stone and suppuration of the kidneys, and other serious and fatal illnesses. There is no food that will replace milk for children, but these two vitamins are contained in butter.

Why Butter is a Peculiarly Important Food in Australia.

Unfortunately most Australians do not believe in milk for themselves, and many do not know how important it is for their children. They don't like milk, but they do like butter, and this favourite food is not stinted, when they can afford it.

Dripping as a Substitute.

If a mother cannot afford to buy enough butter for her children she should substitute dripping for some of it. Dripping is very cheap and contains both vitamins, though in smaller proportions than does butter. If the children have good digestions for fat, they can get a fair amount of the vitamins from dripping. Some do not like dripping and are tempted to buy margarine, which may be substituted for butter without the children knowing it.

The Margarine Menace.

Margarine is a mixture of vegetable and animal fats. It has no fixed composition, and the manufacturer can vary it at will. The vegetable fats are for cheapness; some animal fat and perhaps a little milk or

butter is worked in to give it the right taste, and it is carefully coloured to look like butter. There is nothing harmful in margarine itself, but to give it as a substitute for butter is extremely dangerous.

They found this out in Denmark. In that country during the war butter went to such a high price that the farmers sold every bit of it. Their own children were fed on skimmed milk and margarine. The results were terrible. The children were poorly nourished and fell ill. Many lost one or both eyes from inflammation. Many died. A medical inquiry discovered the reason for this terrible illness, and that it could be easily prevented by giving whole milk, butter, or cod liver oil to supply the vitamins. These were the worst cases. A slighter degree of shortness of vitamins causes a condition that may be difficult to detect, but is serious. Such cases are already present in Queensland, and the use of margarine will make them more numerous and more serious.

There is at present no law to prevent margarine being coloured to look like butter; consequently it is the duty of every mother to protect her children against this new and real danger. Do not wait until we suffer from an outbreak of illness so dreadful as they had in Denmark.

IN THE FARM KITCHEN.

POTATO TIPS.

It is much easier to peel potatoes in warm water. Before they are fried or baked they should be dried in a cloth.

Champ.

This is a Northern Ireland dish, and often served alone:—Boil some potatoes, mash them with hot milk and butter, mix some cooked peas, and small onions with the potatoes. Serve with pepper and salt. (In the case of the peas, use fresh if you have them, otherwise tinned or dried will do.)

Anna's Potatoes.

This is a French way of cooking potatoes, and is called Pommes Anna by the French people. Butter a pie dish, or basin, or cake tin; peel and cut some potatoes very thin, wash and dry them, and mince some onions very fine; put a layer of the thin slices of potato in the dish, each slice singly and overlapping the other until the bottom of the dish is quite covered; add a thin layer of minced onion, season with pepper and salt, and sprinkle with a very little butter.

Repeat these layers until the dish is full, pressing each layer down firmly. Bake in a moderate oven for one hour. Turn out. It should be a nice firm cake, and should be cut in wedge-shaped pieces like a cake.

A little grated cheese sprinkled over each layer and on top turns this into a very delicious dish for supper or high tea.

Made only with potatoes, onions, and seasoning, this pie is delicious, with either cold or hot roast meat.

Potato Pancakes with Cheese.

Peel and grate six raw potatoes; season with salt and pepper, moisten with a teacupful of milk, and mix the whole with three yolks of eggs, 1 oz. butter, and a breakfastcupful of breadcrumbs. Then add four tablespoonfuls of grated cheese and enough flour to make a smooth batter. Fry in a frying-pan in a little more butter or bacon fat than is used for sweetpan cakes. When browned on both sides, dust the top with grated cheese, fold, and serve.

Potato Cheese-cake.

Wash and mash about four potatoes with 2 oz. sugar, 2 oz. butter, one egg, lemon peel and lemon juice to flavour. Use to fill pastry-lined patty pans, as you would lemon curd.

THE GARDEN COMPOST HEAP.

THE garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, vegetable tops, &c., should all be used in this manner, but the coarse, woody stalks of strong-growing plants should not be used.

The production of artificial manure from garden waste, straw, &c., consists in the decomposition, by fungi and bacteria, of much of the plant material. The nitrogen in the process is converted from an inorganic to an organic form, and is present in increased amount in the material finally produced. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. This damage is due largely to a lack of available nitrogen in the soil. Such poor-quality materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume all the available nitrogen. This competition for soil nitrates results in the nitrogen starvation of crop plants.

The usual process of allowing plant refuse to decay without any chemical treatment results in a very acid product, providing no immediately available nitrogen. With nitrogen-poor plant residues it becomes necessary to add available nitrogen to the heap, as well as lime, which prevents the development of acidity, and phosphate, which is required in the nutrition of the organisms. With nitrogen and mineral-rich materials such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material, the use of lime alone should be sufficient to enable rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base, and of such size that the final height is about 3 feet. Spread the chopped-up material in layers several inches deep, treating each layer in the following manner:—

Snow over with ground limestone (5 lb. per 100 lb. material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia may be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that it will not be lost. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and loss of material by bacterial action, the heap can ferment under the untreated capping, which can be used as a base for the next heap. The heap should be kept damp, but water should not be added in quantity sufficient to cause drainage from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Artificial manure properly prepared is very similar in chemical composition to composted horse manure, and gives equally good results in promoting plant growth.

FERTILITY OF THE HOME GARDEN.

INTENSIVE gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management should not only make allowance for the present crop, but should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil of organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

Organic matter has an important function in the growth of plants as a source of carbon dioxide, in improving the physical condition of the soil, in increasing the water-holding capacity, allowing root penetration, and modifying extremes of soil temperature. In addition to providing some of the mineral constituents required in greatest amount, organic matter provides certain rare and little understood elements, usually not considered in the preparation of artificial fertilizers. Heavy

soils in which the fine particles accumulate in large masses, and crack badly on drying, can only be improved in texture by liming when acid, and the addition of organic matter to prevent the clods from cementing.

In general, the richer the food of animals in fertilizing substances the richer their excreta, particularly the liquid portion. This contains most of the potash and a great deal of the nitrogen, but only a small amount of the phosphate which passes through their bodies; further, it contains these substances in a form ready for the immediate use of the plant. It is therefore important to realise that unless precautions have been taken to include it with the solid excreta, most of the valuable fertilizing constituents have been lost.

The kind of animal affects the fertilizing value of manure. Horse manure is richer and more readily decomposed than cow manure, since the mineral requirements of the milking cow are much greater than those of the horse. Poultry manure, when fresh, is a rich fertilizer compared with horse or cow manure; it contains more than twice as much nitrogen and phosphate, but has only about the same amount of potash. The bulk of its nitrogen is present in an easily available form, hence it is a quick-acting or forcing nitrogenous manure.

Animal manure as commonly procurable has not been carefully conserved against the loss of fertilizing constituents, and unless the liquid portion has been included, a considerable portion of the nitrogen present is not of use to plants. It must be regarded as an unbalanced fertilizer, and the fertilizer balance can be greatly improved by the separate use of superphosphate, and sulphate or chloride of potash.

Where the organic matter of the soil is maintained by using manure, a degree of fertility will be maintained, but an annual application of 100 to 150 lb. per 100 square feet will be necessary.

LIME FOR THE GARDEN.

LIME fulfils many functions which are essential to soil fertility. Its most useful action is in neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime, through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime. The forms of lime used for counteracting soil acidity are hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked lime is formed by the action of water on burnt or stone lime, and forms a very fine powder which can be efficiently spread. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, and can nearly always be relied on to give as quick and good results as slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of carbonate of lime are required to supply as much "effective" lime as 3 lb. of slaked lime contains.

The soil to be limed should be dug over and reduced to good tilth, the lime uniformly spread, and then lightly worked into the top several inches of soil. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can only be approximate.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or still more sandy soils can receive lighter dressings of approximately half the amount for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not always necessary to add sufficient lime to completely neutralise soil acidity, as most garden plants grow well on slightly acid soils. This slightly acid condition will only result in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to completely neutralise acidity. Whilst many plants grow best on neutral soils or on slightly alkaline (opposite of acid) soils, a considerable number of plants will tolerate fairly acid soils. The latter are not adversely affected by being grown in limed soils, though many plants which require a good lime supply may fail on acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very Tolerant.—Parsley, potato, radish, strawberry, sweet potato, tomato, cowpea, maize, millet, oats, rye.

Tolerant.—Bean, Brussels sprouts, carrot, choko, cucumber, endive, kohl rabi, pea, pumpkin, rhubarb, squash, turnip, watermelon, crimson clover, vetch.

Sensitive.—Broccoli, cabbage, cauliflower, eggplant, sweet corn, barley, rape, red clover, sweet clover, wheat, white clover.

Very Sensitive.—Asparagus, beet, celery, lettuce, onion, parsnip, spinach, lucerne.

Evidence is available to show that excess of lime under certain conditions may depress plant growth. Overliming may result when the calculated amount of lime is applied to the surface zones of soil, and not worked to the proper depth. Overliming injury is produced only on heavily-limed acid soils, and not on non-acid soils, or soils which have previously been limed. This injury is not permanent and is usually overcome by the time the first crop is removed. Lettuce and lucerne are crops which may suffer from bad lime distribution.

Large additions of organic matter such as compost, manure, &c., are very effective in reducing overliming injury, and this fact is of importance in indicating that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary. Where very heavy dressings of lime are necessary, it may be advisable to apply lime in two successive seasonal applications. After the preliminary liming, the lime added in a well-made compost will go far to counteract natural losses of lime from the soil.

POTATO INSPECTION.

Following a conference between the Ministers for Agriculture of Victoria and Queensland a few months ago, an interchange of departmental experts has been arranged in an effort to overcome the problem caused by the refusal of the Queensland department to accept certificates of cleanliness and quality for Victorian potatoes issued by officers of the Victorian Department of Agriculture. An officer of the Queensland department is already in Melbourne observing conditions under which certificates are issued in Victoria and the methods of loading and transport. The senior inspector of the Victorian department (Mr. N. McKay) was in Brisbane during August and will report on the methods employed here. When the reports of both officers have been received and their suggestions considered, an agreement is likely between the two States. It is thought that the Victorian department will be asked to modify its system of inspection and issue of certificates. Victorian growers have complained that the sending of potatoes to Queensland cannot be continued unless the Victorian certificate is final. They regard the risk of sending potatoes to Queensland only to have them refused admittance by the Queensland inspectors as too great.

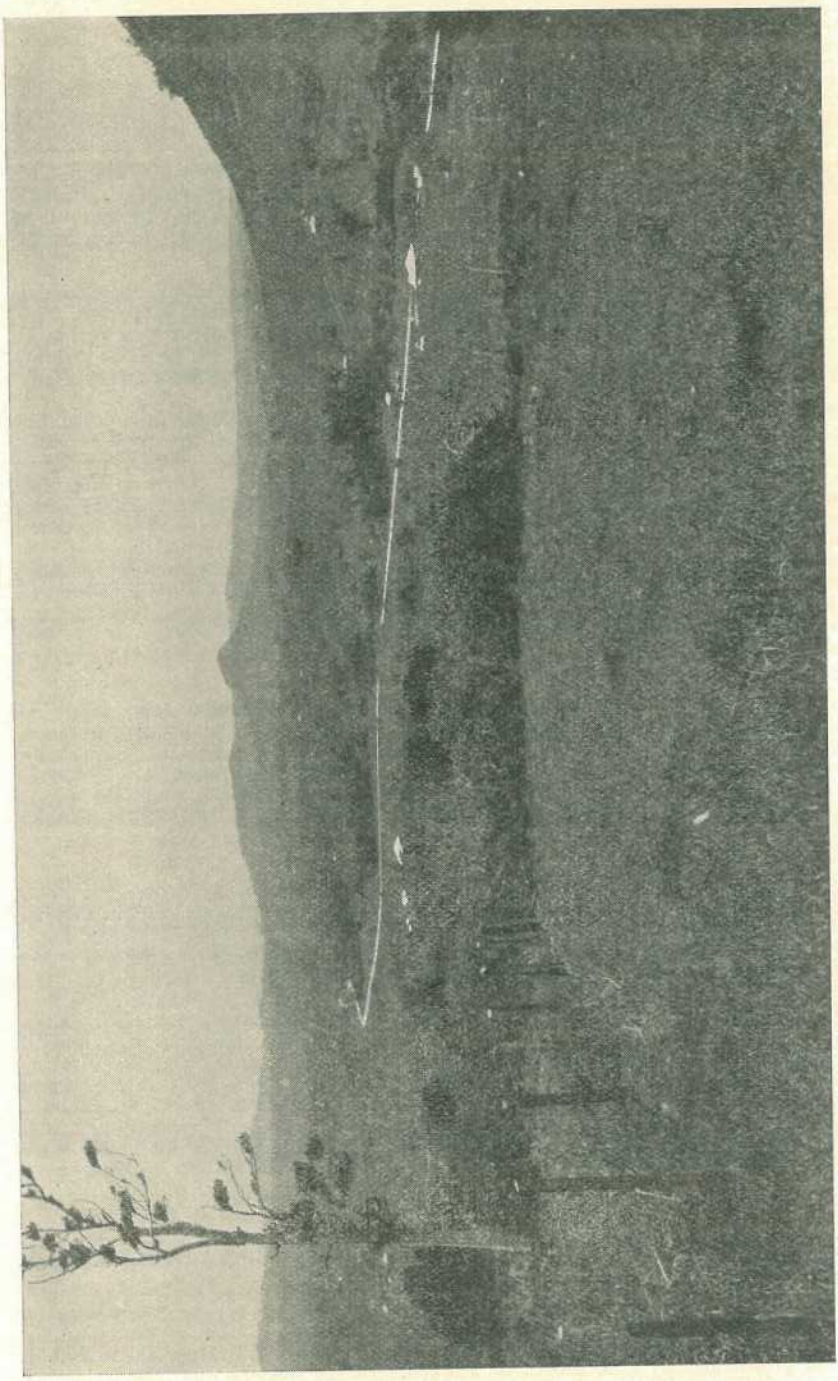

PLATE 128.—THE FERTILE PINBARREN VALLEY ON THE NEAR NORTH COAST, Q.

Orchard Notes for October.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Grape vines require careful attention, and if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during the month. See that the land is properly prepared and that good, healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by this Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

WHAT THE YELLOW WRAPPER MEANS.

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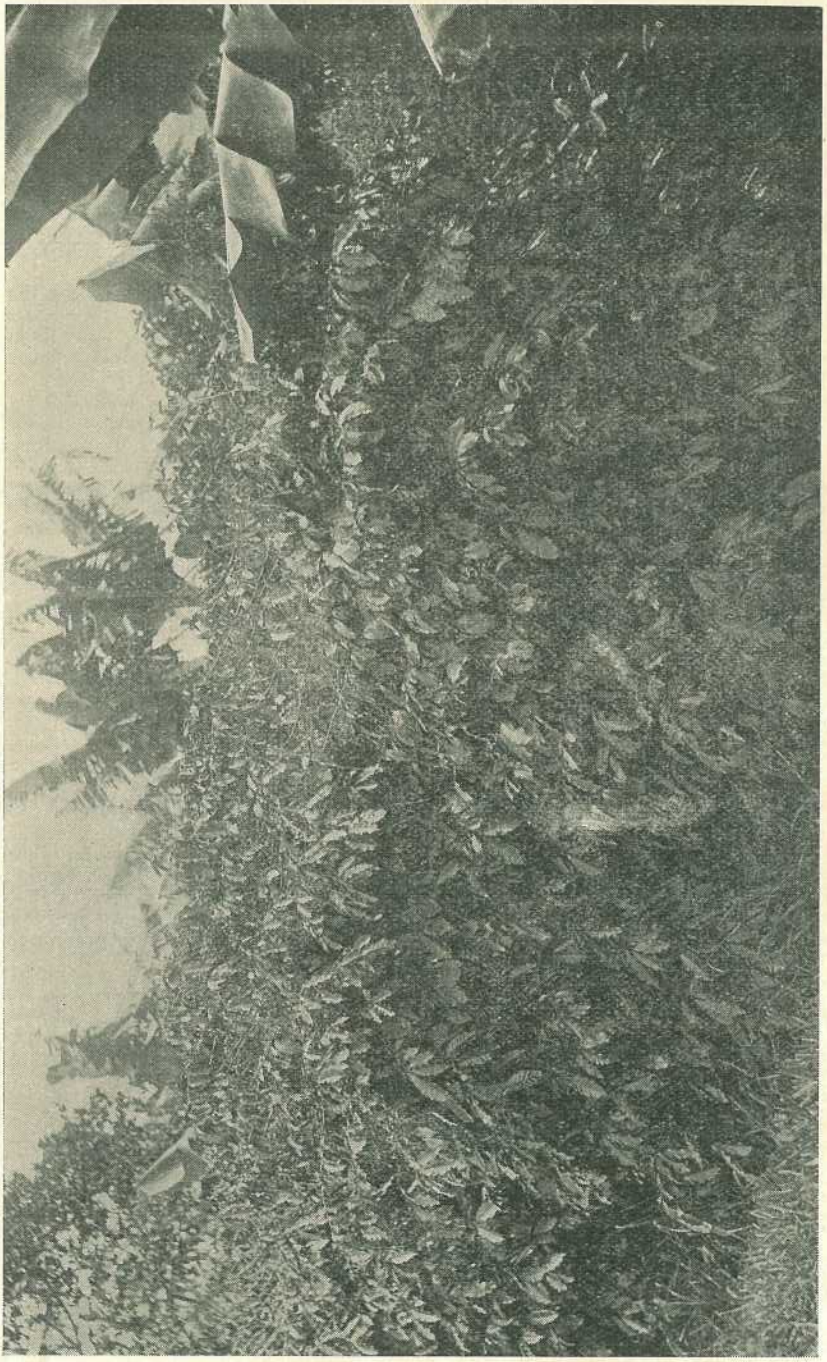

PLATE 129.—BERRY-LADEN COFFEE PLANTS ON A BUDERIM MOUNTAIN ORCHARD.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1935.	July, 1934.		July.	No. of Years' Records.	July, 1935.	July, 1934.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·02	34	0·34	1·61	Clermont	1·00	64	3·70	0·33
Cairns	1·55	53	0·41	1·25	Gindie	1·08	36	3·49	0·75
Cardwell	1·37	63	0·50	1·38	Springsure ..	1·17	66	4·51	1·17
Cooktown	0·95	59	0·06	0·25					
Herberton	0·86	49	0·07	1·43					
Ingham	1·56	43	3·94	3·16					
Innisfail	4·62	54	3·31	5·29					
Mossman Mill ..	1·25	22	1·32	1·71	*Darling Downs.*				
Townsville	0·62	64	0·59	0·81					
					Dalby	1·74	65	1·52	2·78
Central Coast.					Emu Vale	1·59	39	1·66	3·16
					Hermitage	1·77	29	1·44	3·33
Ayr	0·69	48	0·78	0·52	Jimbour	1·54	47	1·04	1·85
Bowen	0·95	64	0·34	0·32	Miles	1·64	50	1·86	2·50
Charters Towers ..	0·63	53	1·75	0·69	Stanthorpe	2·04	62	2·14	3·44
Mackay	1·71	64	1·46	0·59	Toowoomba ..	2·10	63	2·01	3·81
Proserpine	1·59	32	0·52	1·65	Warwick	1·85	70	1·60	3·44
St. Lawrence ..	1·38	64	3·13	0·68					
South Coast.									
					Maranoa.				
Biggenden	1·37	36	2·85	2·13					
Bundaberg	1·80	52	5·37	1·45	Roma	1·47	61	1·92	1·63
Brisbane	2·24	84	2·06	5·11					
Caboolture	2·19	48	2·59	4·47					
Childers	1·67	40	3·99	1·40					
Crohamhurst ..	2·96	42	5·11	6·16					
Esk	1·97	48	2·44	3·15					
Gayndah	1·46	64	2 21	2·03					
Gympie	2·14	65	2 82	2·64	*State Farms, &c.*				
Kilkivan	1·62	56	1·54	2·72					
Maryborough ..	1·89	64	3·86	2·17	Bungeworgorai ..	1·43	21	..	1·47
Nambour	2·68	39	4·30	4·05	Gatton College ..	1·40	36	1·93	2·85
Nanango	1·67	53	1·49	3·26	Kairi	1·11	21	..	0·97
Rockhampton ..	1·75	64	4·28	0·42	Mackay Sugar Experiment Station	1·53	38	1·53	0·60
Woodford	2·38	48	2·95	3·86					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1935.

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.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·94	78	61	82	6	47	9	60	6
Herberton	..	71	49	81	30	39	30	7	2
Rockhampton	30·06	74	51	81	30	41	5	428	4
Brisbane	30·09	68	48	74	17	38	16	206	9
Darling Downs.									
Dalby	30·11	66	38	72	12, 20, 30	26	25	152	6
Stanthorpe	..	58	32	65	30	19	18	214	13
Toowoomba	..	61	40	69	30	28	5	201	5
Mid-Interior.									
Georgetown	29·98	80	55	87	31	45	28, 29	79	3
Longreach	30·06	71	44	81	16	36	24	137	3
Mitchell	30·11	64	38	75	29	25	25	205	6
Western.									
Burketown	30·00	79	56	87	20, 30	51	8, 9, 25	..	..
Boulia	30·06	71	47	87	29	38	25, 26, 27	..	..
Thargomindah	30·09	64	46	77	18	36	24	94	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	September. 1935.		October. 1935.		Sept., 1935.	Oct., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·9	5·35	5·34	5·51	7·23	7·3
2	6·8	5·35	5·32	5·52	7·53	7·44
3	6·7	5·36	5·31	5·53	8·27	8·32
4	6·6	5·36	5·30	5·54	9·5	9·26
5	6·5	5·37	5·29	5·55	9·45	10·22
6	6·4	5·37	5·27	5·56	10·35	11·23
						p.m.
7	6·3	5·38	5·26	5·56	11·32	12·28
					p.m.	
8	6·2	5·38	5·25	5·57	12·34	1·35
9	6·1	5·39	5·24	5·57	1·39	2·42
10	6·0	5·39	5·23	5·57	2·47	3·48
11	5·58	5·40	5·22	5·58	3·54	4·55
12	5·57	5·40	5·21	5·58	5·5	6·5
13	5·56	5·41	5·20	5·58	6·11	7·14
14	5·55	5·41	5·19	5·59	7·22	8·24
15	5·53	5·42	5·18	5·59	8·31	9·29
16	5·52	5·42	5·17	5·59	9·39	10·29
17	5·51	5·42	5·16	6·0	10·44	11·23
18	5·50	5·43	5·15	6·0	11·44	a.m.
19	5·49	5·43	5·14	6·1	a.m.	12·11
20	5·48	5·44	5·12	6·2	12·40	12·51
21	5·47	5·44	5·11	6·2	1·31	1·27
22	5·45	5·45	5·10	6·3	2·16	2·0
23	5·44	5·45	5·9	6·3	2·54	2·29
24	5·43	5·45	5·8	6·4	3·28	2·59
25	5·42	5·46	5·7	6·5	3·58	3·27
26	5·41	5·46	5·6	6·6	4·27	3·59
27	5·39	5·47	5·6	6·6	4·56	4·31
28	5·38	5·47	5·5	6·7	5·24	5·5
29	5·37	5·48	5·4	6·7	5·55	5·43
30	5·36	5·48	5·4	6·8	6·29	6·31
31			5·3	6·9		7·23

Phases of the Moon, Occultations, &c.

6 Sept.	☾ First Quarter	12	26 p.m.
13 ,,	○ Full Moon	6	18 a.m.
20 ,,	☽ Last Quarter	12	23 a.m.
28 ,,	● New Moon	3	29 a.m.

Perigee, 13th September, at 4.6 a.m.

Apogee, 26th September, at 2.36 p.m.

On the 24th the Sun will arrive at what is technically called the First Point of Libra, exactly halfway around the sky from the First Point of Aries. These are the points where the ecliptic crosses the Celestial Equator and are really situated in the constellations Virgo and Pisces. On this occasion the Sun will cross the Celestial Equator southward and the length of the day increase from 12 hours (Equinox) to nearly 14 on the 24th of December.

Mercury sets at 6.50 p.m., 1 hour 25 minutes after the Sun on the 1st; on the 15th it sets at 7.36 p.m., 1 hour 54 minutes after it.

Venus sets at 6.31 p.m., 56 minutes after the Sun on the 1st; on the 15th it rises at 4.53 a.m., 1 hour before the Sun, and sets at 4.58 p.m., 44 minutes before it.

Mars rises at 9.39 a.m. and sets at 11.7 p.m. on the 1st; on the 15th it rises at 9.16 a.m. and sets at 10.55 p.m.

Jupiter rises at 9.39 a.m. and sets at 10.51 p.m. on the 1st; on the 15th it rises at 8.48 a.m. and sets at 9.7 p.m.

Saturn, apparently in Aquarius, rises at 5.26 p.m. and sets at 6.18 a.m. on the 1st; on the 15th it rises at 4.26 p.m. and sets at 5.19 a.m.

Mars and Jupiter, only a little more than 2 degrees apart on 28th August, will be 4½ degrees apart on 15th September, still in Libra.

The Cross will be at its highest point, due south at 2 p.m. on the 1st and at the lowest point 2 a.m.; it will therefore disappear at Warwick about midnight on the 1st; an hour earlier on the 15th and 2 hours earlier at the end of the month.

The Moon's path in September will be—In Virgo from 8 p.m. on the 1st to 4 p.m. on the 3rd; in Libra till 9 a.m. on the 5th; in Scorpio till 3 a.m. on the 6th; in Orphincus till 10 a.m. on the 7th; in Sagittarius till 1 a.m. on the 10th; in Capricornus till 6 p.m. on the 11th; in Aquarius till 9 a.m. on the 13th; in Pisces till 9 p.m. on the 15th; in Aries till 1 p.m. on the 17th; in Taurus till 10 p.m. on the 19th; in Gemini till 11 a.m. on the 22nd; in Cancer till 5 a.m. on the 24th; in Leo till 1 a.m. on the 27th; and again in Virgo till the end of the month.

5 Oct.	☾ First Quarter	11	40 p.m.
12 ,,	○ Full Moon	2	39 p.m.
19 ,,	☽ Last Quarter	3	36 p.m.
27 ,,	● New Moon	8	15 p.m.

Perigee, 11th October, at 2.36 p.m.

Apogee, 23rd October, at 11.24 p.m.

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

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

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