ANNUAL RATES OF SUBSCRIPTION.

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

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Event and Comment.

Sugar Scientists in Brisbane—First World Conference in Queensland.

THE International Society of Sugar Cane Technologists will commence its fourth triennial conference at Brisbane, on Tuesday, 27th August. The conference will be the first meeting of that important body in any country of the British Empire, and the first world congress of any kind to be held in Queensland. Plans are now complete for what should be a highly successful gathering, from which great and lasting benefit to the Australian sugar industry is expected to accrue. The Society, a very active and influential body, was an outcome of the Pan-Pacific Conference at Honolulu in 1924. Since then its triennial conventions have been held at Cuba, Java, and Porto Rico. The choice of Brisbane as the venue of an international conference so early in the history of the society is regarded as a distinct compliment to Queensland and a definite recognition of the high standard of technical efficiency attained by the Australian sugar industry. This is especially so when we consider that our production amounts to only 2 per cent. of the world's aggregate output of cane and beet sugar combined, and only 3 per cent. of the world's cane sugar total. The distinction bestowed on Queensland is, therefore, obvious, and it is appreciated fully by all concerned, including the State Government, which will supply a special

train to convey the overseas delegates on a tour through the sugar districts at the conclusion of the conference. The tour will commence on 4th September, and the first halt will be at Bundaberg. In the surrounding district the visiting scientists will see cane growing under subtropical conditions. Bingera mill and plantation, Fairymead, Millaquin, and the local experiment station have been listed in the itinerary. Sarina will be the place of an extended stay, and there the Plane Creek mill and the power alcohol factory will be the chief centres of interest. A week-end will be spent in the Mackay district. From there the special train will go on to Ayr, where the visitors will be shown modern milling plants in operation, the fertile lands of the Burdekin Delta, and the remarkable irrigation system by which they are watered. From Ayr the train will proceed to Ingham for an inspection of the two C.S.R. Company's mills, Macknade and Victoria. Afterwards, the party will be taken by launch through the Hinchinbrook Passage to Cardwell, the train going on to that port in the meantime. Tully district, where Queensland's largest sugar mill is situated, will next claim the attention of the tourists. From there they will go on to Innisfail, viewing the richly-dowered Johnstone River country en route. Cairns will be the base for further excursions to the Babinda, Hambledon, Mulgrave, and Mossman mills, as well as to the experiment stations that serve the needs of the far northern areas. Atherton Tableland and its wealth of scenic beauty and a subsequent brief voyage to the Barrier Reef will provide the something different so necessary for the success of such a tour. The special train will leave Cairns on 17th September on its return to Brisbane, where it will arrive at 9 a.m. on Thursday, 19th September.

The conference will be opened officially on Tuesday, 27th August, by the Governor, Sir Leslie Wilson, and will be preceded by a civic reception by the Lord Mayor of Brisbane. Many notable representatives whose names are known throughout the sugar world will be present, and the countries that will be represented include Great Britain, the United States, South Africa, British West Indies, India, Holland, Java, the Phillippines, and Hawaii.

The visit of some of the leading authorities on sugar production and manufacture will obviously be of immense benefit to Queensland sugar technologists, who will thus have an opportunity of meeting and mingling with men who count in the sugar industry abroad.

Many important papers have already been received, and they cover various aspects of the genetics, pathology, entomology, and cultivation of sugar-cane, as well as sugar manufacture. In addition, reports will be submitted by special committees on identification and description of the original cane varieties; uniformity in reporting factory data; soil studies; and the technique of field experiments.

The coming congress will mark an important stage in the progress of the sugar industry in Australia. Its success is already assured. Not the least of its advantages will be the impressions of a thriving and well organised industry that the visiting delegates must carry away with them. The field and factory efficiency of the industry in the only country in the world that produces cane sugar by white labour in accordance with white labour standards, surely cannot fail to impress any impartial and comprehending observer.

The National Value of Sugar.

AN official table showing the increase in population in far northern sugar districts during the last twelve years is of particular importance at this time. Covering the northern or tropical portion of the State, the table is based on the returns of the 1933 census. During the period since the previous census was taken, the population increased to 96,808, or 87.5 per cent. of the coastal population, equal to an added 45,186 in the twelve years. Here are the comparative census returns:—

	1921.	1933.
Cairns (City)	7,455	12,004
Mackay (City)	6,320	10,660
Ayr	6,262	12,085
Cairns (Shire)	5,737	10,378
Tully	370	4,412
Mossman	1,350	2,902
Ingham	5,503	10,199
Innisfail	5,549	12,774
Mirani Shire	3,439	4,405
Pioneer Shire	5,701	9,927
Plane Creek	1,635	3,121
Proserpine	2,291	3,941

The increase in population for the whole of Australia during the same period was 29·94 per cent.; that of Queensland was 25·06 per cent. This shows how the tropical north has far out-paced every other agricultural portion of the Commonwealth. There are now six sugar centres from Mackay north with populations exceeding 10,000 people, and even to cane farmers it will come as a surprise that Ayr, Ingham, and Innisfail (Johnstone River district) carry populations of that number. The Ayr district now exceeds Mackay city area in population, as does Ingham and Innisfail. Of course, if the population of Mackay's tributary territory were added to that of the Mackay urban area the population of the whole district would be much greater than any of the other cane-growing districts, with the exception of Cairns; but that fact does not detract from the remarkable development that has taken place in the Burdekin, Herbert, and Johnstone River valleys. As pointed out in the pamphlet issued recently by the Minister for Trade and Customs justifying the Sugar Agreement, the national aspect of the sugar industry is further illustrated by the fact that most of the fertile coastal lands of the North would be depopulated if there were no sugar industry, and further that a good deal of the development in the North Queensland back country would not have occurred if it had not been for the settlement of the sugar lands along the far northern coast. It is also stated that residents of Northern sugar areas constitute the largest white population in the world living in the tropics, whose health, virility, and physique are not excelled by any other group of Australians. So far as Queensland is concerned, sugar production utilises no less than 20 per cent. of the cultivated land, the value of the sugar-cane is nearly 60 per cent. of the value of all Queensland agricultural production, and is 20 per cent. of Queensland commodities of all kinds. Its annual wages bill is valued at £5,000,000. That it is a white man's industry is proved by the fact that 79·8 per cent. of the persons engaged on farms and mills are British born—that is to say four-fifths of them are not only white, but British-born. Of the remainder, 10·1 per cent. are naturalised Britishers, and only 10·1 per cent. are foreigners, and they, no doubt, are Australian citizens in the making.

Insect Enemies of Lantana.

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

THE Department of Agriculture and Stock has recently received a considerable number of inquiries on the subject of insect enemies of lantana, keen interest evidently now being manifested in the possibility of the satisfactory biological control of that introduced plant. The time, therefore, seems opportune for a brief review of what has been attempted and what has been achieved in the control of lantana by the introduction of some of its more important insect enemies. Several of these have already been established in certain of the countries to which lantana has spread, and in which it either threatens to become or has already become a serious weed pest. Before discussing the insects themselves mention must, however, be made of the present status of lantana in Queensland.

Status of Lantana in Queensland.

The species of lantana at present under consideration is *Lantana camara,* a plant that is now very widely distributed throughout coastal and near-coastal Queensland, infestation extending from the New South Wales border to the most northerly settled portions of the State. This plant is a native of the tropical and subtropical regions of America, but it has been introduced to many other tropical countries where its presence is now generally regarded as a menace. It was introduced because of its attractiveness as an ornamental shrub and, so far as is known, its original sponsors never claimed that it possessed any distinct merit as a green manure or a soil renovator. In Queensland it is definitely regarded as a weed pest in dairying and grazing districts, where it has also been associated on frequent occasions with losses of stock. Furthermore, it has spread rapidly in certain reafforested areas in the State, and the cost of keeping the weed in check on such land is extremely high. The weed is of no consequence in agricultural areas as it is readily held in check wherever cultivation is regularly practised, while in some avenues of primary production it is regarded favourably as a soil renovator, banana growers frequently utilising it for such a purpose. Viewed as a whole, however, lantana is an undesirable introduction, hence the recently manifested interest in its control by the use of introduced insect enemies.

Hawaiian Introductions.

The first move in the campaign for the biological control of lantana was made as long ago as 1902 when a number of insect enemies of the weed were introduced from Mexico to the Hawaiian Islands. Lantana had by then spread alarmingly in the grazing areas of that country and, with the enterprise characteristic of its settlers, Hawaii decided to institute the first attempt at biological control of a weed pest. An entomologist was accordingly dispatched overseas in search of the necessary insects. A large number of these were soon found associated with lantana in Mexico, and during 1902 attempts were made to introduce no fewer than twenty-three of these beneficial species. Success was achieved in the case of eight species, the feeding habits of which are briefly as follows:—The larvæ of two small species of pretty blue butterflies feed on the clusters of flowers. The larvæ of a small species of

moth tunnel in the young twigs and also attack the clusters of flowers and the developing berries. The larvæ of another moth attack the flowers, while the larvæ of a third species of moth mine in the tissue of the leaf between the upper and lower surfaces. The nymphs and adults of a small bug, commonly known as the lantana leaf bug, characteristically suck the sap of the foliage, thereby causing appreciable and repeated leaf fall leading to a reduction in flowering. The remaining two enemies successfully introduced in 1902 are the stem gall fly, the larvæ of which feed within the young twigs, and the well-known lantana seed fly, the maggots of which feed within the lantana berries.

The reader will note that the main function of all the species, with the exception of the lastmentioned, is to directly or indirectly reduce the production of berries, while the function of the lastnamed insect is to reduce the germination of the seeds of such berries as are formed and to render the berries less attractive to fruit-eating birds likely to disseminate the seed.

Introductions Elsewhere.

Several of these enemies of lantana have been subsequently introduced to other countries, Fiji, India, and Australia having been assisted in this manner. The lantana seed fly is established in this State and steps are now being taken to introduce the lantana leaf bug to Australia, hence these two species are of most immediate interest to Queenslanders, and the rest of the discussion in this brief article will be devoted to them.

Lantana Seed Fly.

The lantana seed fly, *Agromyza lantanæ* Froggatt, was established in Queensland as far back as 1917, and colonies of this insect were subsequently sent to various lantana-infested districts throughout the State. The present position is that this small fly has been found wherever the entomologists of this Department have searched for it, and it is considered highly improbable that there is any lantana-infested area in which it does not now occur. Frequent requests are received for colonies of the seed fly, but it is believed that little useful purpose is now served by further distributions.

The lantana seed fly is a very small black insect which lays its eggs in the lantana berries, egg-laying being generally restricted to a single egg in each berry. After the usual incubation period a small maggot emerges from the egg and commences feeding in the outer pulp of the berry, the seed also being usually subsequently attacked. Infestation can be detected by the presence of brownish areas on the otherwise green berry, which on being cut open will be found to contain the seed fly maggot with its tunnels showing clearly in the pulp or seed. The slender, whitish maggot is about one-tenth of an inch in length when full grown. It then pupates in a yellow pupal case inside the berry in which it fed. The tissues of the maggot undergo a complete reorganisation in the pupal stage as a result of which the small, unimpressive-looking fly is produced. A considerable number of generations occur in Queensland in the course of a year, the time required for a single generation being much shorter during summer than is the case in the colder months of winter.

The presence of this fly in Queensland can obviously exercise no adverse influence whatever on the health of already established lantana plants, as its activities are confined entirely to the berries. The feeding of the maggots within the berries does, however, lead to a reduction in

the percentage of germination of the seeds. Furthermore, infested berries are not so attractive to fruit-eating, seed-distributing birds as those that develop normally without infestation. The general effect of the presence of this beneficial insect is to slow down the rate of spread of the lantana, but without the assistance of other insects it cannot prevent the spread of the weed. Unfortunately, there are no introduced insect enemies restricting the production of berries in Queensland, and in view of the fairly prolific nature of lantana seed production it is considered that the establishment of the lantana seed fly has by no means solved the problem of the biological control of that serious weed pest. It is believed, however, that the small expense involved in its introduction by the State Department of Agriculture and Stock has been justified, particularly in view of the fact that it may now receive assistance from other introduced insect enemies likely to reduce the production of lantana berries.

Lantana Leaf Bug.

The lantana leaf bug, *Teleonemia lantanæ* Distant, is rather a pretty, greyish-brown insect, measuring an eighth of an inch in length, its shape being somewhat elongate oval. Like most of its relatives, this insect feeds both in the adult stage and in its immature or nymphal stages by piercing the surface of the foliage of its host plant and extracting the plant sap through the punctures thus formed. When conditions are favourable to its propagation extensive and repeated defoliation may occur, flowering and berry production being thereby checked. The flowers may also be attacked, but foliage feeding is typical of this bug.

This species is under consideration for introduction to Australia, the work being in the hands of the Division of Economic Entomology of the Council for Scientific and Industrial Research. The Council has in recent years devoted much attention to the problem of weed pest control, and the search for beneficial insects to be used in the campaign against weed pests is now a function of Federal institutions, hence the proposed introduction will be handled by the Council.

Readers are reminded that some little time must necessarily elapse before this insect can be colonised in Australia. It must be tested against common economic plants before being liberated in order to ensure, so far as it is possible to do so, that it will not be a menace to any branch of primary production. Even when it has passed such tests some time must also elapse before large colonies can be bred up for liberation.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

(*Continued from page 14, volume XLIV.*)

RELATION OF THE BORER TO RAIN FOREST AREAS.

THE actual insect population on the wing must always be determined by seasonal factors in the first instance, but even during the summer months subsidiary influences come into play which may affect the degree of infestation. The insect population, irrespective of seasonal conditions, is limited by the available breeding material for the species, hence in areas subject to logging, the pin-hole borer population which infests tree residues will be numerous. Many of the areas from which timber supplies are at present being drawn in North Queensland have been logged for some years and insect attacks are now severe.

During 1933 trees were felled in January, February, and March for observational purposes, sapwood being exposed to facilitate attacks by *C. grevilleæ*. During those months the borer population as measured by log infestation was uniformly high yet the attacks on these three trees differed significantly. The first tree cut in January suffered heavy infestation; the second, 2 chains away from the first, escaped with light attacks; while the third tree, cut in March and only 4 or 5 chains away was riddled with borers. It is possible that the second tree fell within the limits of the chemotropic attraction exerted by the first tree while the third fell outside it. The second tree would then be felled in an area from which most adult *C. grevilleæ* had been drawn by the first tree, leaving the free-living Crossotarsan population at a relatively low level. This, together with the increase of free-living adults through fresh emergences might explain the phenomenon. If this is so, one must conclude that the limit of chemotropic attraction is not more than two or three chains.

The limits of such attraction have been checked by dumping logs at intervals outside the rain forest area during the present summer, when conditions were favourable to infestation. Logs have been cut and hauled to dumps 1 chain, 5 chains, and 80 chains from the rain forest boundary. Immediate infestation was delayed for a few weeks owing to the excessively wet weather, but fresh susceptible surfaces were exposed periodically to maintain the attraction of the log material for the insect. When temperatures resumed their fine-weather level, infestation within the rain forest was high and that on the nearest dump moderate. The infestation at the 5-chain limit was, however, negligible, while logs at the farthest dump remained free from attack.

The importance of chemotropic influences can be deduced from numerous observations, the concentration of infestation at bark edges where sap exudations are greatest, the heavy infestation of bark once the superficial layers are removed, and so on. As logs lying in rain forest clearings are attacked, open spaces in themselves are not inimical to the movements of the insect. Susceptible material thus appears to draw insects from the rain forest environment. The chemotropic pull, for *C. grevilleæ* at least, also seems to be much less than is commonly supposed. The distance over which chemotropic attraction is effective

will, however, doubtless vary with the freshness of the tree or log, being greatest when the sap is running freely. In view of this, the experimental limit beyond which logs were not attacked may in practice be exceeded, as the log material had been cut for some weeks before infestation was possible. Still the essential point remains that similar material in the rain forest suffered heavy infestation, and suggests that judiciously placed ramps may be of some use in minimising borer losses.

Natural Breeding Centres in the Rain Forest.

The pin-hole borer, *C. grevilleæ*, is essentially a rain forest species, and natural breeding material must be available for its continued propagation. Where large-scale logging is in progress, tree residues are strewn throughout the area. These residues consist, as a rule, of the upper part of the tree trunk, together with the head, the amount of trunk depending on the girth of the tree and the minimum size of the logs which can profitably be cut from it. Sometimes 20 feet or more of the trunk may remain, but usually the bark is undamaged, for the head of the tree clears a track for the bole during its fall. The examination of these log residues brings some interesting facts to light.

As the trunks of mature trees are heavily barked, infestation of the bole is infrequent for, under natural conditions, deterioration of the bark may not involve any great amount of splitting. Infestation of the bole in tree residues by *C. grevilleæ* is, therefore, less important than that of various shot-hole species which freely penetrate intact bark.

As *C. grevilleæ* readily enters logs or tree residues only through exposed wood, access is largely restricted to fractures or fresh sapwood from which the bark has been torn. Most trees, when they strike the ground, take the initial strain of impact through one of the larger limbs, which may be partly severed from the main trunk. The fracture normally appears at or just above the fork, and often cuts right into the limb and sometimes into the centre of the bole itself. The greater part of residue infestation takes place in the vicinity of these fractures. As the insect normally works across the grain, only a limited area may be affected, though, if the infesting population is high, there may be some development of the burrow system along the length of either the bole or the limb. The area affected is seldom considerable, and may not exceed 6 feet in length.

All residues may not show the usual infestation, those from trees felled during the winter months being uninfested, while those cut during the remainder of the year may suffer severely.

Under natural conditions, breeding would be restricted to trees which are brought down during cyclonic blows or other mishaps with similar effects, provided the timber were still sound. In compartments which are logged irregularly from year to year, a cumulative increase of the borer population above that usual in the natural rain forest seems inevitable, for log residues contain wood better suited to the requirements of *C. grevilleæ* than naturally dying trees which must form a large proportion of those collapsing in unlogged areas.

RELATIONSHIP TO OTHER BORERS.

Though *Crossotarsus grevilleæ* has been treated in this paper as an entity suitable for independent discussion, very few logs suffer attacks from this species alone. Actually, though its importance for

the veneer manufacturer is greater than that of any other insect, the symptoms of attack by shot-hole species are more obvious in most uncut logs. Shot-hole borers are for the most part much larger insects, and the accumulation of debris at the burrow mouths immediately attracts attention. They are, however, essentially softwood feeding insects, though they may occasionally venture into faulty and decaying heartwood. In this respect they are quite unlike *C. grevilleæ*, which freely penetrates the heartwood of all important cabinet wood logs in North Queensland; hence, while shot-hole species may be of appreciable importance in plywood manufacture, where the whole of the log has a high sales value and sapwood represents a fair proportion of the log volume, they can never ruin a log so effectively as *C. grevilleæ*.

The more important shot-hole species in the North are *Platypus australis* Chap., *P. omnivorous* Lea, and *P. semigranosus* Samp. Other species occasionally frequent logs in association with these, but not as dominant forms. All, unlike *C. grevilleæ*, freely penetrate the bark, though usually an interval has to elapse after felling before attack is possible on a large scale. They may also penetrate exposed sapwood. There is little if any apparent association between the activities of any two species, though sometimes *C. grevilleæ* gains access to sapwood through bark burrows of *P. australis*. Here *C. grevilleæ* enters the log through the external opening of the shot-hole borer and, branching out from the entrance tunnel, initiates a burrow system of its own. The relationship is a simple one, the shot-hole species merely giving *C. grevilleæ* indirect access to the sapwood.

Of the pin-hole borers, *Xyleborus hirsutus* Lea, *X. compressus* Lea, *Xyleborus* sp., and *Platypus* sp. may be found in logs subject to *C. grevilleæ* infestation. *X. hirsutus* and *X. compressus* are essentially sapwood feeding species which normally penetrate the log directly through the bark. *Xyleborus* sp., a very small insect, may, however, heavily infest exposed sapwood, especially under shade conditions, and as the burrow dimensions are similar to those of *C. grevilleæ*, confusion between the two is easily possible. Like other species in the genus Xyleborus, it is a sapwood feeding type.

Platypus sp., a small pin-hole borer similar in size but morphologically quite distinct from *C. grevilleæ*, possesses habits somewhat analogous to it. In the rose butternut, *B. involucigera*, the most important known host, the burrow system penetrates the whole of the log. The dimensions of the burrows are alike, pupal chambers have the same disposition in the heartwood and, without live material, distinctions between the two burrow systems would be difficult. Normally this insect is a rarity on logs cut for commercial purposes, and it apparently prefers dying trees as hosts. At all events, though minor infestation has been frequently observed in logged timber, heavy attacks have been noted in one instance only. A rose butternut collapsed during a cyclonic blow in 1934, and though alive prior to its fall, the stump showed signs of advanced decay. This tree was infested through the whole length of the bole, both heartwood and sapwood being riddled by its complicated burrow system. Dying trees are apparently particularly subject to attack, and infestation normally takes place through the bark.

It is thus clear that *C. grevilleæ* is unique among the Platypodids in North Queensland rain forests, as some of its habits have no known

parallel in the life histories of other species. These differences have considerable bearing on the control of the insect and are discussed in some detail later.

SUGGESTED MODIFICATIONS IN LOGGING PRACTICES.

Under ordinary circumstances, logging is concentrated in the drier months of the year as haulage conditions during the wet summer months tend to hamper the movement of timber. In spite of this, the commercial demand for logs may compel cutting and hauling through the whole of the year, even though the roads are almost impassable. Hence a part of the annual output of timber is cut during the borer active months, though its proportion to the whole varies from year to year. Summer logging always carries an element of risk for, though logs may be cut, further rains may prevent their removal, and the timber remains in the rain forest environment for some considerable time. When hauled directly after cutting to the station ramp for railing and milling at early date, the time interval in which the borers can work is limited and the ultimate loss may not be great. With high infestation and a long delay before milling, the whole of the sapwood may be destroyed if shot-hole infestation is dominant, while the whole of the log may be ruined for veneer work if *C. grevilleæ* has gained access to the sides. As milling dates can seldom be definitely known when the logs are cut, various methods have been adopted to cope with the difficulty. Sometimes the bark is left intact, save for the strip removed to facilitate girth measurement, or sapwood may be either completely or partly dressed from the log. Sapwood removal is frequently adopted to minimise freight charges in long-distance transport.

Some obvious precautions should lie behind any large-scale logging programme. If practicable, logging should be confined to the winter months, when haulage conditions are reasonably good and logs can be removed from the rain forest quickly. Inferior logs cut from overmature or faulty trees should be milled locally, so that the best use can be made of second grade timber without incurring freight charges on inferior wood. In all cases the logging history of the timber should be known. Without this there is no certain method of estimating the probable borer loss, as the ultimate wastage can only be approximately inferred from external features. These external features merely indicate the extent of the infestation, but when the period of the attack is correlated with the known habits of the insect, log values can be better estimated.

Merits and Demerits of Bark Removal.

As already pointed out, the intact bark of commercial logs prevents infestation by *C. grevilleæ,* even when the population on the wing is at its height. Once the bark begins to break away from the sapwood, infestation may take place. The loosening of the bark occurs naturally in many species some months after felling, and may be hastened by rough handling during haulage in which strips of bark are torn from the surface of the log. Trees felled in midwinter have been found shedding bark during the summer months to expose sapwood which was immediately attacked by *C. grevilleæ;* hence there can be no certainty that a winter felled log will prove immune to borer injury if left in or near the rain forest with the bark intact. Ordinarily negligible infestation would take place at the ends and the outer parts of fissures when the log was cut. Some months later supplementary infestation occurs

when the bark breaks down; hence intact bark may facilitate delayed infestation. Had the bark been removed when the logs were cut, subsequent immunity from attacks by *C. grevilleæ* would have been ensured by the superficial drying of the sapwood.

A log cut during the summer and handled in the same way would shed its bark during the winter months when few insects are on the wing, and would consequently suffer little injury. It follows that barking projects for logs compulsorily held in or near the rain forest should only be sanctioned during the winter months, when the bark may be stripped from logs if necessary. In summer, the bark must be left intact until the activity of the insect is on the wane, when barking can be carried out with reasonable safety.

In any case, special treatment within the rain forest should not normally be necessary, as sound harvesting practice requires the immediate transport of logs to ramps outside the forest area.

Location of Ramps.

The utility of bark removal presumes the dumping of logs in or near the rain forest. Sometimes this is unavoidable, but where practicable logs should be hauled outside the forest area as soon as they are cut. The borers which attack North Queensland cabinet woods are most common in the rain forest, and invade open country only under special conditions. In the North, where rain forest has been destroyed to permit agricultural development, logging is chiefly carried out in the little exploited country bordering farming areas, but even within the settled areas clumps of standing rain forest occur. These small areas are really subsidiary breeding grounds for the borer species, and have the same significance for the forester as larger areas where logging is in progress. Normally open country on which agricultural pursuits are practised is pasture or cropped land from which the original flora has been entirely removed. Logs can be dumped in it with comparative safety, as there is no floating insect population capable of attacking timber recently removed from the rain forest. Experimental work has shown that logs may be conveniently dumped in such open country without risk of entomological complications, the safe limit from the rain forest being in the vicinity of half a mile.

On the coast, most of the rain forests being logged are bordered by hardwood Eucalypt country, the ramps being mainly situated in the latter. The susceptibility of log material to infestation by the more important rain forest species, including *C. grevilleæ*, is negligible in hardwood forest, with the exception of *Xyleborus hirsutus*, which is commonly found in Eucalypts. This species may thus become a menace to cabinet woods stored on hardwood forest ramps. Of the three main types of ramps, those in open country are the most desirable, those in the rain forest definitely dangerous unless protected by a canopy, while those in hardwood forests vary with the floating population of *X. hirsutus* to which the logs are subjected. Where practicable, logging programmes should use the first of these.

Utility of Open Country Ramps.

Ramps serve a double purpose. They are convenient breaking points for the different phases of transport, facilitating the change-over from bullock teams to motor or rail, and they give easy access to the timber for grading and inspectional purposes.

With even reasonable precautions, a certain amount of insect infestation may take place before logs reach an open country ramp and, while sound logs may be forwarded immediately, others require further handling at this stage. If the insect infestation is recent, the insects and the defective timber may be cut out with an adze, the advisability of the operation depending entirely on the quality of the log and the uses to which it may subsequently be put. Should sapwood species only be in possession, and the proportion of sapwood to the whole of the log small, treatment of any kind may be unnecessary. Were the timber a softwood suitable for ply purposes and subject to heavy shot-hole borer infestation, it might be profitable to cut away the affected outer wood to ensure that the rest of the log will be sound when milled. If *C. grevilleæ* has taken possession of the log, both sap and heartwoods may ultimately be destroyed. Adze dressing may then be desirable, for the infested wood can be removed and the risk of further loss obviated, a loss which would be inevitable were no steps taken to remove and destroy the insects. Frequently this type of inspection is practised in the mill yards before sawing, after purchase and delivery of the logs. Unfortunately, while such an examination may obviate faulty handling at the mill, it cannot affect any loss sustained through the purchase of logs for cabinet wood purposes which ultimately cut into second class constructional timber. The thorough inspection which can safely be made on open country ramps should eliminate losses of this type.

Measuring as at present practised frequently takes place in the rain forest, a strip of bark some 6 inches in width being removed from the circumference of the log to allow the free use of a tape. Apparently a sapwood girth measurement is a necessary factor in the present methods used for volume computations. Insect infestation through these barked strips is common, and *C. grevilleæ* may gain access to logs which would otherwise be immune from its attacks. Once established, this insect works through the log in a radial direction, and the timber when cut for veneer shows flaws which have to be removed. Wastage of this type is directly attributable to the measuring of logs in the rain forest. To obviate such losses, it is suggested that when practicable, measurements should be taken at ramps situated in open country where the risk of insect attack is negligible. If measurements must be made in the rain forest, an alternative system of volume computation may be devised in which bark measurements can be substituted for sapwood measurements. In any case, working conditions in the rain forest militate against the accurate measurement of logs and, quite apart from entomological considerations, suggest a more general policy of ramp measurements and inspection.

Canopy Ramps in the Rain Forest.

Sometimes the dumping of logs within the rain forest is due to lack of co-ordination between cutting and haulage, especially if wet weather hinders the rapid transport of logs. These logs may be located near the tree from which they have been cut or at intermediate ramps in the rain forest. In either case, borer species will be numerous and the timber liable to heavy infestation, hence every effort should be made to avoid delay in the haulage of logs to the outside of the worked area.

In some State forests, ramps of one type or another are unavoidable if efficiency is to be maintained, for the distance from open country is more than a reasonable haulage stage. The data for *C. grevilleæ*

permits a suggestion which may have some practical utility when the inner recesses of the rain forest are being exploited. Mass infestation by this species occurs at rain forest temperatures in the vicinity of 82° F., and infestation at lower temperatures is on a much attenuated scale. Similar influences, though not so well defined, apparently affect some of the more important shot-hole species, for canopied logs suffer much less than those in rain forest clearings. Rain forest ramps at present in use are invariably in cleared areas, and heavy infestation usually occurs during the summer months.

Temperatures under canopy are much too low for mass infestation of logs by *C. grevilleæ* and attacks by this species, if any, are on a much attenuated scale; hence if heart wood protection is required, logs suitable for veneer purposes may be safely stored in canopied ramps. They may still suffer infestation by sap wood feeding species. In experimental material comprising five log types with some sap wood exposed to infestation, the insect attack has been due to insects which are rarely found on logs handled in the ordinary way. Thus an insect fauna in which *Platypus* sp. and *Xyleborus* sp. are dominant is substituted for the normal *C. grevilleæ* — *P. australis* — *P. omnivorous* association. The former lacks any heart wood infesting species and the two sap wood feeding forms are less destructive than either *P. australis* or *P. omnivorous;* hence canopied ramps may be of some service in eliminating heart wood injury and lessening the incidence of sap wood destruction.

In practice, some level area near one of the feeder roads would be chosen for a canopied ramp, the undergrowth which makes no great contribution to canopy being cleared so that teams can freely operate. Heavy canopy is, of course, to be preferred, but under ordinary rain forest conditions, both mature and semi-mature trees would form the essential elements. The actual form of the canopied area is largely dictated by the common usage of bullock teams for haulage purposes and an illustrated example is shown. Variations could be introduced to meet the needs of any particular situation.

The suggested ramp (Plate VI., Fig. 4) consists of a branch to the main feeder road with turning facilities for bullock teams at its furthest point. Alcoves sufficiently large to accommodate the ordinary sized logs are cleared at the sides by the removal of undergrowth and may be sufficiently deep to house some eight or nine logs. Both the branch road and its associated alcoves are then under complete canopy. Logs when cut would be hauled to a convenient canopy ramp and thrown off at the entrance of one of the alcoves, to be later drawn into position by means of haulage tackle hitched to a suitable tree. Each alcove would be either filled with freshly cut logs or its contents shifted to open country ramps at the one operation to avoid the accumulation of logs of different ages in the one alcove.

The regularity shown in the illustration would hardly materialise in practice, for the direction of branch paths and the precise location of alcoves would depend on the distribution of the more important canopy elements; but provided bullock teams can work comfortably, regularity is quite a secondary consideration. Normally canopy ramps would improve in efficiency from year to year as the overhead closure becomes more effective.

The Utility of Trap Trees.

Trap trees are sometimes used to lower the free-living insect population which would otherwise attack logs used for commercial purposes. The method originated in countries where harvested trees grow in pure stands either naturally or following sylvicultural practices adopted when plantations were established. In North Queensland the areas being exploited consist mainly of mixed rain forests in which many species of trees at all stages of development make up the flora. Logging is therefore scattered over large areas and trap trees can only be of limited utility.

The trap tree method may, however, be useful when virgin areas are about to be intensively logged for a short period as, for example, in exploiting areas shortly to be used for reafforestation purposes. Once a reafforestation project has been approved, logging operations are centred on the area prior to the felling and burning of small non-commercial timbers. Such an intensive logging programme may begin in the summer months to allow its completion before clearing commences and borer losses may then be minimised by the cutting of trap trees some six weeks before harvesting work is initiated.

Trap trees comprise the more susceptible species of less than commercial girth and white silkwood or quandong may be cited as types. The bark may be partly removed at the time of felling, trees being cut at intervals of some 5 chains throughout the area. These will attract the free-living adults of both shot-hole and pin-hole species and thus lower the insect population on the wing when logging begins.

The method has decided limitations in North Queensland where the mixed flora and the uneven demand for available mature timbers causes irregular exploitation of the logging areas.

SUMMARY AND CONCLUSIONS.

I. *Crossotarsus grevilleæ* Lea is the most important Platypodid borer to the manufacturer of veneer from North Queensland rain forest cabinet woods, as it may penetrate the whole of the log if milling is delayed. The host plant range is a wide one.

II. The sexes are separable on morphological characters. The female is larger than the male and prior to entering the log possesses a large forwardly projecting appendage to each mandible. These appendages are shed when burrowing begins.

III. The male initiates the burrow but subsequently the female extends it through both the sap and heart woods with the collaboration of larval progeny. Eggs may be laid discontinuously by the parent female for a period of some twelve months, and larval development requires a similar period before pupation takes place in typical Platypodid grouped chambers. The adult progeny finally excavate exit tunnels to either the surface of the log or fissures which lead to the outside. Burrows at the sides of commercial logs are initiated only through exposed sap wood and the openings are concentrated on the latero-dorsal surface in barked logs. Some infestation may also take place at the sawn ends.

IV. The initial attraction to the log seems to be chemotropic and crushed wood suffers the heaviest attack. The chemotropic stimulus is also present in the bark but is usually effective only when the superficial layers are removed or injured.

V. The burrow system may exploit the whole cross section of the log, but burrow paths lie approximately in the one plane, cutting across the grain of the woods. If the insect population is high, *C. grevilleæ* may excavate burrows on the surface of the sap wood and re-enter the wood further along the log.

VI. In the rain forest, the insect population is kept high by the free reproduction of *C. grevilleæ* in tree residues. Wood surfaces suitable for infestation are exposed at fork fractures induced by the fall of the tree.

VII. Bark resistance in commercial logs to *C. grevilleæ* infestation is due to the physical properties of the superficial layers. The main body of the bark, at least in the walnut bean, is attractive to the insect and heavy infestation, though limited burrow extension, is possible within it. The behaviour of the insects in induced bark infestation is in some ways quite different from that in sound wood.

VIII. Mass infestation of log surfaces takes place when temperatures are in the vicinity of 82°F. At lower temperatures the attack is on a much attenuated scale. The seasonal activity of the pest and its importance in climatically distinct logging areas conforms with the known temperature requirements of the species.

IX. Logs held under complete canopy where temperatures seldom rise above 80°F. are rarely attacked. Similarly, logs more than 5 chains outside the rain forest escape infestation. In the latter case, the chemotropic stimulus peculiar to the felled log or sap wood surfaces of barked logs is insufficient to draw the insect from the rain forest area.

X. Logging practices to minimise losses from *C. grevilleæ* are discussed. Co-ordination of cutting and haulage to ensure rapid transport to open country ramps, the conversion of some existing ramps to open country ramps, and the systematic measurement of logs outside the rain forest are considered desirable. Rain forest ramps, if indispensible, should be of the canopied type.

Acknowledgments.

These investigations have required constant collaboration with officers of the Sub-Department of Forestry. The writer is particularly indebted to them for information on harvesting practices and for undertaking haulage and other operations incidental to the experimental work. The systematics of *C. grevilleæ* have been simplified by the late Mr. A. M. Lea, and some of the biological problems investigated were designed to clear up confused points of mutual interest. The excellent illustrations by Mr. I. W. Helmsing are a very valuable supplement to the paper. Critical discussions on the subject matter with the Chief Entomologist, Mr. Robert Veitch, have been most stimulating and to him the writer is indebted for the many official facilities placed at his disposal.

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Tuberculosis.

By K. S. McINTOSH, H.D.A., B.V.Sc., Animal Health Station, Yeerongpilly; and J. C. MAUNDER, H.D.A., B.V.Sc., Veterinary Officer, Brisbane.

TUBERCULOSIS is a contagious disease affecting animals, poultry, and man. Of the domesticated animals those most commonly affected are cattle and pigs, but it has also been noted in horses, dogs, and cats. Sheep and goats are very rarely affected.

The cause of the disease is a germ known as the *Tubercle bacillus*. This germ, when exposed to the direct action of sunlight, is killed in two hours, but under natural conditions it is enclosed in discharges or manure which act as a protection against the sun's rays enabling it to persist for months on pastures, &c. It is not killed by freezing, but the treating of contaminated milk to 180 deg. Farenheit for ten minutes will kill the germ.

Three types of *Tubercle bacillus* are recognised, but some types are capable of infecting other animals as well as their usual host, as shown in the following table:—

Bovine type may cause tuberculosis of—

Cattle	Horses	Rare
Pigs	Cats	
Humans	Sheep	
	Goats	

Human type may cause tuberculosis of—

Humans	Poultry	Rare
Pigs	Dogs	
	Cats	

Avian type may cause tuberculosis of—

Fowls
Pigs

This is very important, as we shall note later, particularly with regard to control of the disease in animals and its importance from a public health standpoint.

Methods of Infection.

The germ gains entrance to the body of the animal in the following ways:—

(1) Inhalation.—The *Tubercle bacillus* withstands drying quite well, so that the inhalation of dust, dry particles of dung, dry milk, sputum discharges, &c., which are contaminated with the germ is a common method of infection. This is particularly so in the case of cattle and human beings. Inhaling the breath of animals whose lungs are affected is another possible way of contracting the disease.

(2) By the mouth.—This is the commonest method of infection in pigs, fowls, and probably cattle. The contaminating material is the same as that described under the previous heading, with the addition of milk and diseased meat. The presence of tuberculosis in pigs found after slaughter is a very useful indication of its presence in the dairy herd. The infection of pigs may be caused by feeding them tubercular milk or by allowing them access to diseased carcasses

or manure from diseased cows. When tuberculosis is found in pigs its origin should be sought among the dairy cattle. It should be borne in mind, however, that pigs may also contract the avian (fowl) type, and if fowls and pigs intermingle there is a possibility that the infection may be coming from that source.

(3) Other methods of infection are *via* wounds, from mother to the unborn young, from bull to cow during service. These methods are fortunately unimportant, and we may regard the two main ways by which the animal contracts the disease as inhalation and by the mouth.

Symptoms.

Cattle.—The symptoms of tuberculosis in cattle may easily be confused with those of other diseases, but although it is not always possible to make a definite diagnosis on the symptoms suspicious cows may frequently be detected.

It is important to realise that many cattle affected with tuberculosis show no symptoms whatever, while in others the disease is fairly obvious.

Tuberculosis is a chronic disease and not always fatal in domestic animals.

Slow progressive emaciation, harsh staring coat, and poor milk yield are often indicative of tuberculosis.

There is often a soft, moist, persistent cough most noticeable when the beast is disturbed. Snoring or grunting in the throat are often a sign that the glands in the throat are affected. Snoring should not be confused with a "snuffling" noise originating in the nose, and caused by a thickening and inflammation of the nasal mucous membrane (nasal granuloma).

The commonest sites of lesions in cattle are the lymphatic glands. These are roundish bodies, most of them situated internally, but some of them in the tissues underlying the skin. Reference to the accompanying diagram shows the position of these more common superficial glands.

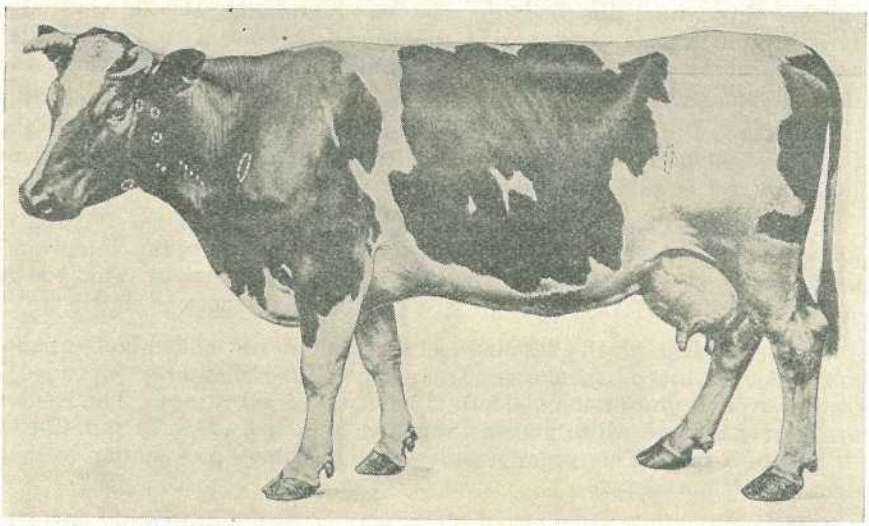

Plate 33.—Superficial Lymph Glands of Cow projected on Surface of Body.

The superficial lymphatic glands may be felt with the fingers, particularly when they are diseased. Tuberculosis of these glands causes a gradual, non-painful swelling.

The udder is sometimes affected with tuberculosis, where it causes a progressive hardening of one or more quarters without pain or heat and without much change in the milk. These cows are particularly dangerous, as the milk always contains the Tubercle bacillus, and if fed to pigs or child exposes them to a very grave risk of infection.

Later the udder becomes enlarged and extremely hard, while the milk yield is considerably diminished. Other symptoms of tuberculosis are persistent diarrhoea, frequent bulling, enlarged testicles. These are not very diagnostic, however, as they may be caused by such a variety of other diseases.

Pigs.—Emaciation may be noted, but in most cases the disease is not seen until inspection after death or slaughter.

Fowls.—Loss of weight, gradual emaciation, weakness, lowered egg production, pale comb, and ruffled feathers are the first symptoms. The fowl maintains a good appetite throughout. Later the birds become very drowsy and keep apart from the remainder of the flock. Sometimes the skin and joints are affected. Birds do not die rapidly but linger on for weeks or months.

Post Mortem Appearances.

Cattle.—The disease is characterised by the formation of abscesses in the lungs, lymphatic glands, or mammary glands which contain yellowish cheesy pus. In old-standing cases there is often a gritty substance in these cheese-like masses due to a deposit of lime salts.

If the lining of the chest or abdomen is affected numerous grape-like or pearl-like nodules are observed clustered on the inner wall of the chest or abdomen. If these be cut open they will be found to contain small pockets of cheesy pus similar to that already described. Another form of infection is known as military tuberculosis when the germs are carried throughout the body by the blood stream. Death is usually fairly rapid in such cases, and if the animal be opened countless millet seed-like abscesses will be seen throughout the organs, particularly the lungs, liver, and kidneys.

Occasionally abscesses are also present in the liver, kidneys, muscle, testicles, and heart. Tubercular pus has no disagreeable smell, and in this way can be differentiated from pus caused by other germs.

Pigs.—The commonest site of abscesses in the pig is the lymphatic glands of the head, throat, and intestines. Sometimes the lungs and more rarely bones and other structures are also affected. The pus is whiter and usually the abscesses are smaller than those of cattle.

Fowl.—Most of the lesions are situated in the abdominal organs, viz., the mesentery (membrane from which intestines are suspended), ovary, liver, lining of the abdominal cavity, and intestines. The lesions are pearly greyish-white nodules varying from the size of a pin's head to that of a pea. The larger nodules contain cheesy pus similar to that seen in cattle and pigs.

If the intestines are affected ulcers may be seen on the inner surface.

Treatment.

There is definitely no treatment for tuberculosis in cattle, pigs, or fowls.

Eradication.

As long as there is a tubercular animal on the farm there is a danger of the disease spreading to others. The same applies to the disease in poultry. As has already been mentioned, a good indication of the presence of the disease is condemnation of pigs after slaughter.

If the presence of the disease is detected in a dairy herd the only way to eradicate it is by the application of the tuberculin test to all animals over the age of six months and immediate slaughter of reactors. The whole herd should again be tested in six months' time, and if any further reactors are found the herd again retested in another six months. Usually, the disease disappears after the first test.

The Department has recently inaugurated certification of dairy herds as tubercle free and abortion free herds, the conditions of certification being defined in agreements drawn up for signature by the owner contemplating certification.

In accordance with these conditions, the owner agrees to submit his entire herd to the tuberculin test, which is carried out or supervised by a veterinary officer of the Department, and all cattle reacting to the test shall be disposed of in a manner approved by the Department.

If the herd is found free on the first test, the herd is declared tubercle free. The whole herd is retested every twelve months, and the herd is not declared tubercle free until a test of the entire herd fails to yield a reactor.

All cattle to be introduced into the tubercle-free herds must be tested before introduction, and any cattle from a certified herd allowed to run in contact with untested cattle must be retested before being brought back into the herd.

For the benefit of owners of show stock it is not compulsory for cattle to be retested following exhibition, before re-introduction to the herd.

A charge of 1s. per head is made to cover the cost of ear tagging, the method adopted for identification of cattle.

When a herd has been declared tubercle free, a notice to that effect, together with date of expiry of certification, appears in the "Queensland Agricultural Journal."

At the present time, ten herds, comprising a total of 562 head, have been declared tubercle free. In addition, several herds have been submitted and, though they have not yet obtained a clean test, are continuing under test and will ultimately be eligible for certification.

The attention of pure breeders is drawn to the certification of herds as a means of creating greater demand for their stock, as men with intelligence, when purchasing stock, must give preference to a stud comprising certified tubercle-free stock.

Men producing whole milk for human consumption should seriously consider the certification of their herds as a business proposition. It has been found that a definitely greater demand exists for milk from such herds, as apart from freedom from tuberculosis, the milk is of superior quality to that from herds not under supervision.

It has been found that pure breeders, and producers of whole milk for human consumption, derive most benefit from certification, and are desirous of, and in a position to, strictly adhere to the regulations requiring periodical retesting and rigid control of movement and pasture of stock in a tubercle-free herd.

Many applications are received from dairymen who either are unable, or do not desire to conform with the conditions set out in the agreement, but really desire a statement regarding the incidence of tuberculosis in their herds. Farmers who have suffered pig condemnations are the most important in this category, and every effort will be made to eliminate tuberculosis from their dairy herds, but such testing as may be found necessary will be at the discretion of the veterinary officer handling the case, and not necessarily in accordance with the tubercle-free scheme.

Dairymen contemplating the certification of their herds should not be misled by exaggerated stories of the percentage infection and subsequent monetary loss likely to be encountered. Though popular opinion places the average infection of dairy herds at ridiculous figures, in the vicinity of 25 per cent., owners may be reassured by actual figures, which reveal an average percentage more in the neighbourhood of 7 per cent. infection for coastal herds, and less than 1 per cent. for inland herds.

All persons desiring certification of their herds are advised to apply in writing to the Supervisor of Dairying, and every effort will be made to give the matter the immediate attention of a veterinary officer.

It is hoped in the near future to commence a scheme of tubercle-free areas throughout the State to ensure a supply of milk free from tuberculosis for human consumption.

In the case of fowls it is advisable to dispose of the whole flock for slaughter under proper inspection.

The Public Health Aspect.

Reference to the table at the commencement of this article will show that human beings are subject to both human and bovine types of tuberculosis, and also that pigs and fowls may contract the human type.

Thus cattle, pigs, and poultry affected with tuberculosis are sources of infection for human beings. This applies particularly when children are fed tubercular cow's milk, quite a fair percentage of cases of bone joint and glandular tuberculosis in children having been traced to this source. Adults appear to be more resistant than children to bovine tuberculosis.

Pasteurisation of milk reduces the danger of infection, but cannot be guaranteed to kill all tubercle bacilli present.

Thus tuberculosis is dangerous for both man and animals, and no effort should be spared to endeavour to eliminate it from our dairy herds, particularly when milk itself is being used for human consumption.

THE excellent rains received late in June and during the first week of July brought unexpected relief, particularly to the parched western areas. Practically the whole State benefited, the falls ranging from 1 to 7 inches.

The Darling Downs and Southern coastal areas received the lighter falls, which is an unusual feature of the winter season.

Farmers on the Downs, Lockyer, and the north and south coasts will now have enhanced prospects for wheat, fodder crops, and winter grasses, while potato planting will proceed under much more favourable conditions. Although some weeks must elapse before natural feed is available in the pastoral areas, water supplies have been replenished and a good spring is assured.

The practice of stocking pastoral lands to the limit of their carrying capacity during normal seasons is gradually bringing about a depletion of the natural grasses and edible scrub, so that a marked decrease in the number of stock carried will be inevitable, unless a radical change of policy can be introduced. Considerable improvement will be effected if grasses are allowed to seed periodically and belts of edible scrub planted in suitable locations.

Sugar.

Relatively dry, cool conditions ruled throughout July in all cane areas. These conditions have served to check growth and hasten crop maturity. Sufficient rain fell in every district to ensure the maintenance of an essential measure of moisture in the soil for both plant cane and the cane now ripening for the harvest. A good germination has followed this season's plantings. Most of the mills are now crushing, and the cane appears to be uniformly rich in sugar content.

Wheat.

The outlook for the present season is now much brighter, as heavy sowings have been made on good moisture. The Maranoa has benefited by the over-average falls, and although the sowing period was of necessity later than usual, it is still possible to harvest a good crop, providing conditions remain favourable. Cheques covering the payment under the Federal Wheat Bounty have been posted to all growers whose claims have been found in order.

It is of interest to note that the "Flora" variety, a high-quality Queensland wheat, was successful in winning the championship at the recent Sydney Royal Show, attaining the remarkable bushel weight of 69¼ lb. Flora is now one of the most popular varieties grown in Queensland.

Cotton.

The harvesting of the cotton crop is drawing to a close, only a limited number of consignments being received daily at the two ginneries operating. Fourteen thousand bales of lint have been ginned to the end of July, which is a very satisfactory yield considering the most adverse climatic conditions that mostly rule from mid-January onwards. While only moderate yields have been obtained generally, the improvement in average prices being received this season will make the total value of the crop and by-products nearly the same as that of the record one of last season.

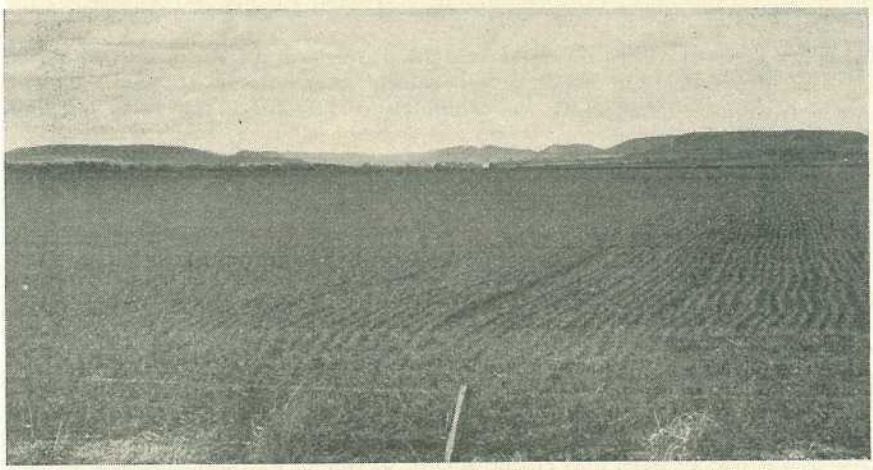

PLATE 34.—YOUNG WHEAT, DARLING DOWNS.

The results have greatly heartened the cotton-growers, and with the occurrence of the splendid soaking rains during the first part of July an increase in acreage can be anticipated in the coming season. Realising the value of early preparation of seed-beds, growers in all districts are hastening the ploughing of the old lands and also bringing in new cultivations to a considerable extent. The rate of arrival of seed applications also indicates the increased interest being taken in cotton-growing, and given suitable timely planting rains the coming crop should get off to a very satisfactory start.

The recent announcement of the anticipated requirements of the spinners for the next year makes the outlook very promising for obtaining attractive prices for the coming crop. It would appear that a considerable increase in production will be necessary to meet all requirements, and growers with suitable soils for the production of satisfactory yields of cotton should grow as large an acreage of this crop as they can cultivate properly.

Tobacco.

Interesting experiments have been carried out under the direction of the Council for Scientific and Industrial Research with the object of

controlling blue mould, at present the most serious disease with which growers have to contend. The essential feature of the treatment is the growth of tobacco seedlings in cold frames subjected to an atmosphere diffused with benzol. The initial results have been encouraging and warrant further trials.

Tobacco lands should now be ploughed and cultivated in preparation for the new season's plantings. In the south-west seed-beds are being prepared, but even in this district it is considered that the first week in August is sufficiently early for the sowing of tobacco seed.

Paspalum Renovation.

Paspalum dilatatum is the most important and widespread grass in the chief dairying districts, and it is a matter of concern that reports are now being received of the encroachment by mat grass (*Axonopus compressus*), particularly on the North Coast. It is well known that paspalum pastures deteriorate after a few years, and that a thorough ploughing, or renovating, plus the addition of fertilizer, is necessary to restore their original vigorous growth. Where ploughing is impracticable owing to standing timber, it is often possible to renovate portions of the area and apply the fertilizer as a top dressing. Experience in other lands points to the invasion by second-class grasses and weeds being primarily due to loss of fertility, brought about by the prolonged heavy stocking and consequent drain on the elements of soil nutrition. If this is proved to be the case no attempt at the eradication of undesirable species is likely to be successful, unless accompanied by the application of fertilizers and wherever possible by cultivation. On such cultivated land, the introduction of other desirable grasses and clovers then becomes a possibility.

TO NEW SUBSCRIBERS.

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

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

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

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

Seasonal Farm Crops.

By C. J. McKEON.

POTATOES.

IN most potato-growing districts in Queensland growers are fortunate in being able to grow two crops a year, the first, which is usually sown in August, commonly known as the spring crop; and the second, planted in February, known as the autumn crop. Provided the soil and climate are suitable and good cultural methods are used, potato growing can be made more payable than most other crops; in fact, those who persist with the crop, and are not discouraged by occasional reverses as a result of disease or low prices, will find it one of the most profitable crops in the long run.

Potato Soils.

The best soil for potato growing is a friable, well-drained, alluvial loam, and one which is sufficiently rich in organic matter to absorb and retain the necessary amount of moisture. As a general rule, good lucerne land is also good potato-land; but this does not always apply, for lucerne can be grown successfully on the heavier classes of black soil which, unless under the best of conditions, are unsuitable for potatoes. Then again, potatoes can also be grown on some of the lighter sandy loams which could not be regarded as good lucerne land. Clayey soils and those which are badly drained and liable to become water-logged should be avoided, for not only are the chances of raising a crop small, but tubers of good quality cannot be produced on soils of this nature. Even on the best soils, high yields cannot be maintained where the land has been producing potatoes continuously for a number of years, unless care is taken to maintain the physical condition of the soil by keeping up the supply of humus. This can only be done by practising a rotation of crops or by ploughing in a green crop, preferably a legume, such as field peas for winter growth or cowpeas for summer growth. Farmyard manure, where available, is also excellent for this purpose, and also possesses considerable value from a fertilizing point of view.

Early and thorough preparation of the soil is essential to get best results from any crop, but to none does this apply more than to potatoes. Farmers who spend the extra time and labour required to put the land in first-class condition for potatoes will be more than repaid, especially if a dry spell is experienced during the growth of the crop. Under the most favourable conditions good crops may be produced on land that has received a hurried and rough preparation, but in any district the odds are greatly against these conditions occurring other than at rare intervals and, consequently, the necessity for thorough preparation of the land cannot be stressed too strongly.

The first ploughing should be to a depth of at least 9 inches, which will ensure that the seed when planted will have 3 or 4 inches of worked soil beneath it. The land should be left to fallow for a couple of months at least before planting time, care being taken in the meantime to deal with any weed growth which may appear. The use of a spring tooth cultivator or other suitable instrument will not only prevent weed growth, but will maintain the surface soil in good condition. Land prepared in this way will almost invariably be in a sufficiently good condition at planting time to ensure a satisfactory germination.

Varieties.

The question as to the most suitable varieties to grow is one that the grower himself will have to determine, either as the result of his neighbours' experience or by conducting trials of his own. Of the white-skinned varieties, Carmens and Scottish Triumphs are by far the most widely grown. Both are good yielding varieties and always command a good price in the markets. Up to Dates also do well in some localities, and come next in order of popularity. Of the blue-skinned varieties, Manhattans are at present the most popular, and are also the most reliable variety In certain localities Guyra Blues also give good results, but they do not do well in all districts. Satisfactions and Rough Skinned Brownells are the most widely grown of the red-skinned varieties; neither, however, should be planted in any quantity without a trial, as they only do well in certain localities.

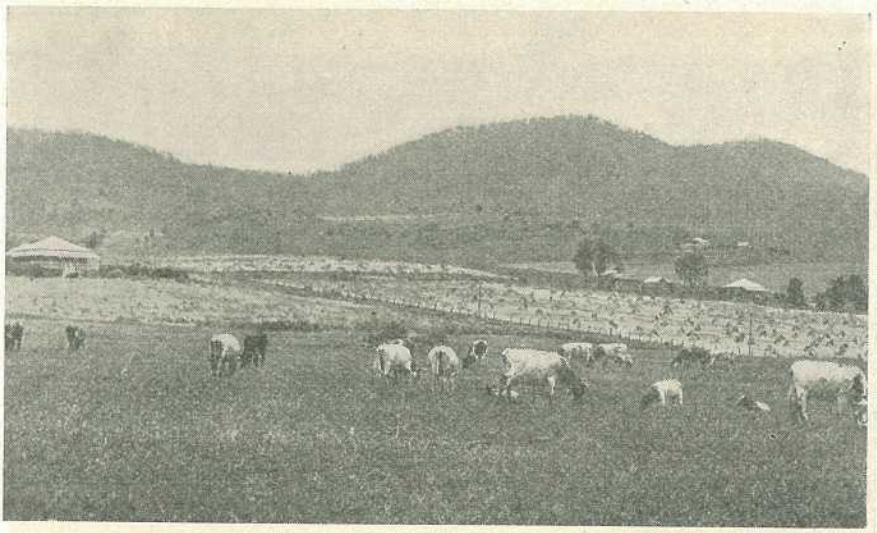

Plate 35.—In the Killarney District, South Queensland.

As growers are compelled, by reason of the fact that locally-grown seed is not available, to use seed which has been imported from the Southern States for the spring crop, supplies should be obtained from a reliable source. It is far better to get seed which will prove true to name of the variety which is known to suit the locality, even though it may cost a little more, than to obtain a cheaper line of seed which may turn out to be anything but the desired variety.

Providing the spring crop is planted early, seed from this can be used for planting the autumn crop in February.

All seed, especially that used for the spring crop, should be treated with formalin before planting, otherwise there is a serious risk of the introduction of disease. Anyone who may be interested in this treatment can obtain full particulars from the Department of Agriculture.

Tubers not perfectly sound or which, on being cut, show a suspicious looking discolouration should be rejected.

Seed for the spring crop may be cut, but this practice is not advisable in the case of the autumn crop, for hot, wet weather is frequently experienced during February, and, consequently, the cut seed is likely to rot in the ground. Where cut seed is used, the cutting should be done the day before to allow the cut surface to dry. Sprinkling with wood ashes is a practice which is adopted frequently, and it is a good one.

Much will depend on the size of the potatoes as to the best way to cut them, but as a general rule the smaller tubers should be cut in half lengthwise, and in the case of the larger tubers the stem end should be cut off at about a third of the length of the tuber, the remaining portion being cut through the centre lengthwise, thus making three sets.

PLATE 36.—FIELD OF CLOVER, WOOTHA, NEAR MALENY, SOUTH QUEENSLAND.

Planting.

Although there are machines for planting, the general practice is to plough the seed in, the seed being planted in every third or fourth furrow according to the width of the plough cut. This practice has much to recommend it, as the furrows are not allowed to remain uncovered for any length of time and the seed can be spaced at an even depth and distance apart. The usual distance between the sets is, approximately, 15 inches at a depth of about 4 inches. They should be planted on the side of the furrow to prevent the horses tramping on them, as would be the case where they were planted along the bottom of the furrow.

The quantity of seed required per acre will naturally depend on the size of the tubers and whether cut or whole seed is being used, but, as a general rule, about 7 cwt. per acre is sufficient.

Cultivation.

The first cultivation should be carried out as soon as the young plants appear above ground. A light tine harrow, preferably a lever harrow with the tines set back, is the most suitable implement. This cultivation will not only break up the surface soil which may have become slightly caked as a result of rain following planting, but will also destroy any weed growth which has sprung up between the plants. This will be the last opportunity of doing this, for all future cultivations can only be carried out between the rows. The number of inter-row cultivations required will depend on seasonal circumstances, but should be sufficient to keep weed growth in check and, at the same time, keep the surface soil in a friable condition.

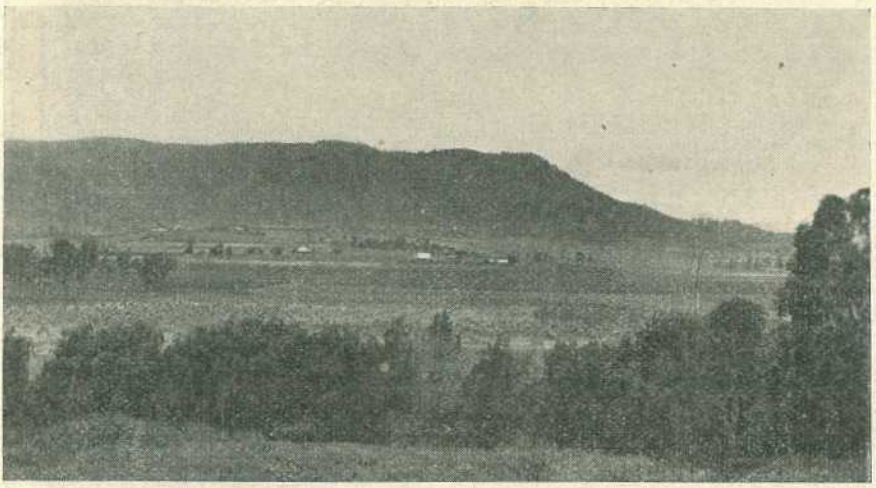

Plate 37.—Wheat Fields, Yangan Valley, Darling Downs.

When the plants reach the flowering stage they should be hilled; an effective and popular way of doing this is by fitting hilling attachments to an ordinary scuffler. The main advantages to be derived from hilling are that the tubers are protected from the potato moth, and it also prevents tubers which might otherwise have been exposed from becoming discoloured.

During growth every precaution should be taken to protect the crop against Irish Blight, and where there is a likelihood of this occurring, regular sprayings with Bordeaux mixture should be carried out. Frequently, sprayings are not commenced until the disease appears, and it is usually then too late. Spraying with Bordeaux mixture is purely a preventive and not a cure for the disease as many people imagine, and to be successful should be carried out before the disease appears. Full particulars of the preparation and use of Bordeaux mixture appear in a publication on potato diseases which may be obtained from the Department of Agriculture.

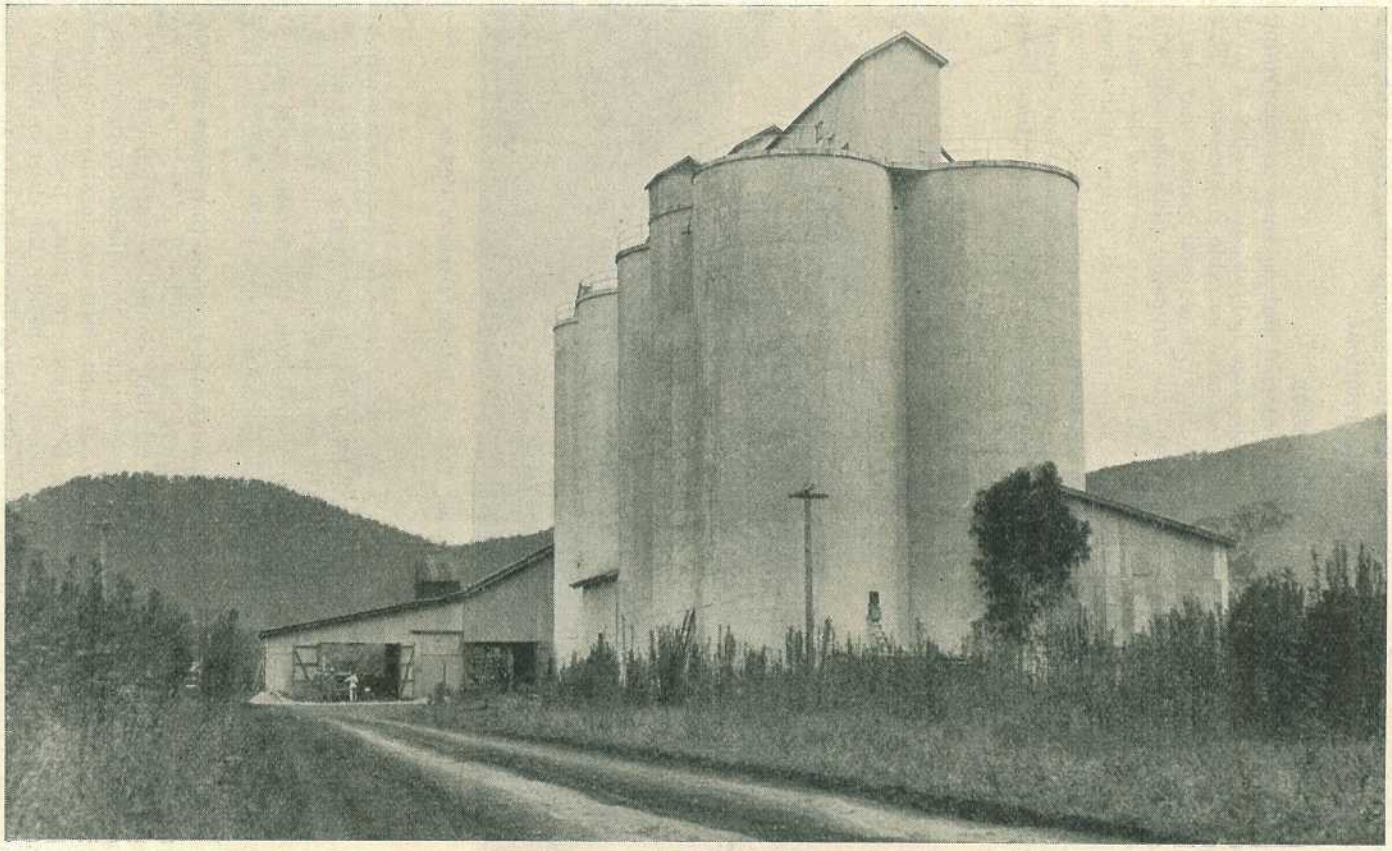

PLATE 38.—MAIZE SILOS AT ATHERTON, NORTH QUEENSLAND.

Harvesting.

In the case of the spring crop, harvesting is carried out usually as soon as it can be done safely, one of the chief reasons being a desire to get the potatoes on the market as soon as possible, for good prices are usually obtainable at the commencement of the season.

The hot weather, and the risk of damage by potato moth, also make it necessary to harvest the crop as soon as possible. In their anxiety to market their potatoes early growers frequently make the mistake of digging them before the skins are firm enough, with the result that they arrive on the market in a badly rubbed condition and consequently bring a reduced price.

Plate 39.—Mary River Crossing at Upper Kandanga, Mary Valley Line.

Harvesting is still done largely with a digging fork. A plough is also used at times to turn the tubers out, but although this is a quicker method than hand digging the crop cannot be harvested as thoroughly.

The tubers after being dug should not be left exposed for any length of time to the hot sun, and should be bagged and removed from the field as quickly as possible. When the potato moth is prevalent, on no account should the bagged tubers be covered with the tops or haulms while standing in the field, for this is one of the surest ways of introducing the moth to the bagged tubers.

When preparing them for market they should be graded carefully, for a nice, even-sized line of potatoes will command almost invariably a better price than an uneven sample. Care should also be taken to reject any tubers which are damaged or showing signs of moth infestation.

SORGHUMS.

Judging by numerous inquiries received from time to time by the Department of Agriculture for information on sorghums, there exists, apparently considerable confusion regarding the different groups. Those of importance as far as this State is concerned may be classified as follows:—Saccharine sorghums, grain sorghums, and grass sorghums. Broom millet, used for the manufacture of brooms, is also a member of the sorghum family. The saccharine or sweet sorghums are among the most valuable and widely grown fodders throughout the dairying districts of the State, and when cut at the right stage provide not only a nutritious fodder, but also a great bulk of fodder. The sweet juices contained in the mature stalks make them highly palatable to dairy and other stock. Although not quite so nutritious as maize, good crops of sorghum can be produced under conditions that would be fatal to maize. Sorghums also possess the advantage of remaining in a succulent stage for a considerable period after reaching maturity, whereas maize rapidly dries off on reaching maturity.

PLATE 40.—ON THE ROAD TO IMBIL, MARY RIVER VALLEY.

Although the heaviest crops are produced naturally on the more fertile soils, sorghums can be grown successfully on a very wide range of soils; in fact, it can be claimed for them that they will grow on a greater variety of soils and over a wider area of the State than any other cultivated summer crop. Owing to their hardiness and ability to withstand prolonged dry spells better than most other crops, they are of great value to stock owners during dry periods when there is a scarcity of grass or other succulent fodder.

Land Preparation.

To get the best results, it is just as necessary that the land should be prepared thoroughly prior to planting as for any other crop. Owing to their hardiness and their ability to thrive under adverse conditions, less attention is frequently paid to the preparation of the land for sorghums than crops such as maize, and while reasonably good crops are produced under these conditions, much heavier and more even crops will be obtained on well-prepared land.

Planting can be carried out at any time after all risk of frost is over and as soon as weather conditions generally are suitable.

Sowing.

The seed is frequently broadcast, but under average conditions this method is not nearly as satisfactory as sowing in drills. This applies particularly to districts where weed growth is prevalent, for it is not possible to keep weed growth in check while the young plants are becoming established. A broadcast crop is also much more difficult to harvest than one sown in drills, and the crop is also much more likely to lodge during wind storms; and where this occurs, particularly in a tall crop, it will remain down and tangled, thus increasing greatly the harvesting costs. The only advantage to be gained by broadcasting is that a finer stalk is produced. When sown in rows the usual spacing between the rows is about 3 feet, an ordinary maize planter fitted with a suitable seed plate being very satisfactory for the purpose. If no planter is available, furrows should be opened out with a single furrow mould-board plough to a depth of 4 to 5 inches and the seed dropped thinly by hand in the furrows. A light harrow should be then run along the drills to cover the seed.

Approximately 5 lb. of seed will be sufficient to sow an acre when sown in this way.

Cultivation.

Sufficient cultivation should be done between the rows during the early stages of growth to keep the soil in good tilth, and at the same time to check weed growth.

The crop is at its most nutritious stage when the grain is well formed, but still in the thick milk stage, and if the crop is to be used for converting into silage it should be cut at this stage. Where it is required for feeding in a green state, much of it will be naturally advanced much beyond this stage before it has all been cut, but it will still be of considerable food value even for some time after the leaves have been more or less killed by frost.

It is an excellent crop for silage, and when being harvested for this purpose the quickest and cheapest method of doing so is with a maize binder which cuts one row at a time and ties the stalks in bundles. Very few of these machines are in existence in this State, however, and the crop is usually cut by hand with a cane knife.

Varieties.

Numerous varieties of saccharine sorghums have been grown in this State at different times, but only a small number of the best of these have become popular.

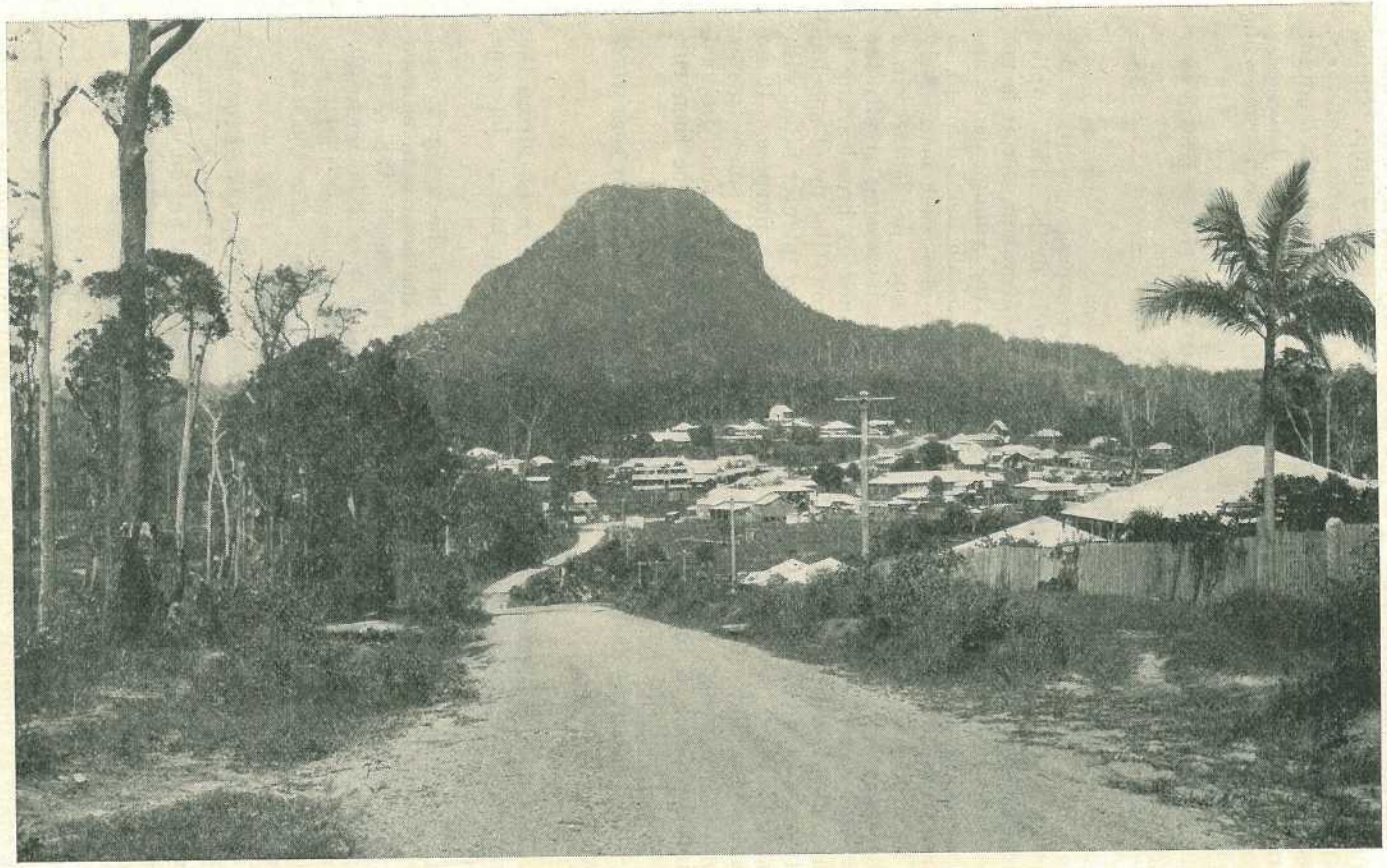

PLATE 41.—PICTURESQUE POMONA, SHADED BY COOROORA MOUNTAIN.
Pomona is the busy commercial centre of rich dairy, fruit, and timber lands on the near North Coast.

Of the quick-maturing varieties, Early Amber Cane is the most favoured, but it is a light-yielding variety when compared with some of the others, and for that reason is not grown extensively.

Saccaline is the most popular variety at the present time and has quite deserved its popularity. It is a tall growing, leafly variety which grows to 11 and 12 feet in height and takes approximately four to four and a-half months to mature. It also has the reputation of retaining its succulence for a longer period after being frosted than most other varieties. Unfortunately much of the seed now available shows signs of inoculation with other varieties, and growers who have pure seed should retain it for their own future requirements. Pure saccaline seed is of a brick-red colour.

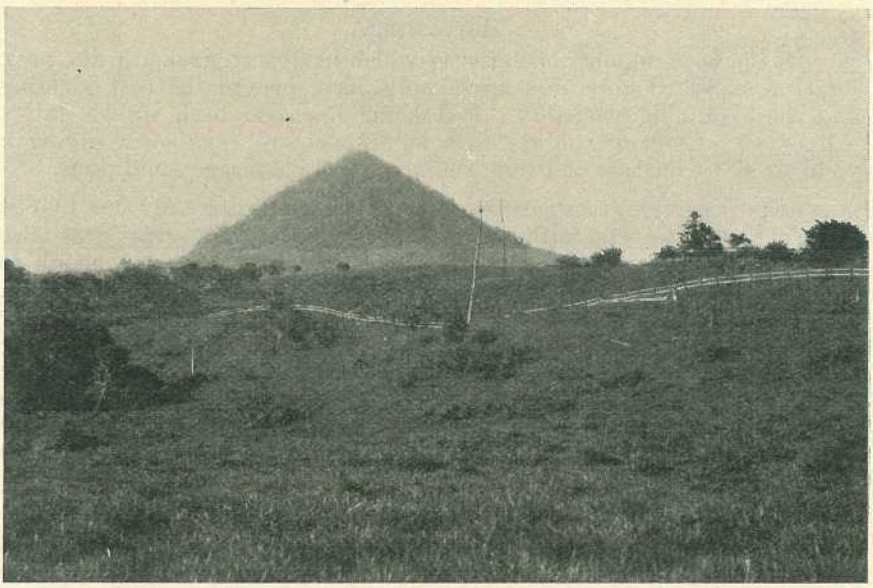

Plate 42.—Dairy Lands near Pinbarren Mountain, South Queensland.

Planters' Friend or Imphee.

This is a very old and favourite variety, and although not cultivated so widely as saccaline, still retains its popularity in some districts. It is a very heavy-yielding variety and grows, under good conditions, to much the same height as saccaline.

White African.

This is another tall-growing, heavy-yielding variety, but so far has not been grown to any extent in this State. In some of the coastal districts it has given excellent results during recent years and is increasing in popularity.

Honey Sorgho.

In the northern portion of the State a variety called honey sorgho has given very good results during recent years and is now much in favour. This variety, however, has never become very popular in Southern Queensland.

Grain Sorghums.

The grain sorghums are grown almost entirely for their grain and are not of anything like the same value for fodder purposes as the saccharine sorghums. The stalks do not contain sweet juices like the saccharine varieties, being of a more pithy nature. The yield of forage is also much lower. They are, however, capable of yielding large quantities of grain which in food value is almost equal to maize. They also have the advantage of being capable of producing a crop of grain on soils which are quite unsuitable for maize, and they are also capable of producing a crop under climatic conditions which would be fatal to maize.

The grain is of considerable value for poultry and stock feeding.

Harvesting.

Of the large number of varieties which have been grown in the past, feterita, standard milo, and cream milo have proved the best yielding and most suitable varieties. Red kaffir has also been grown fairly extensively. Any of the varieties mentioned are capable of giving a yield of sixty bushels of grain per acre under average conditions.

Regarding the grass sorghums, Sudan grass is the only one that is cultivated extensively, although in the past Johnson grass was also cultivated to some extent, but those who were unfortunate enough to introduce it to their cultivation paddocks have never ceased to regret having done so. Whilst it is an extremely hardy crop and also a very useful fodder at the right stage, it is extremely difficult to eradicate and becomes a serious pest. Sudan grass is a very valuable fodder crop and may be used for grazing off, converting into hay, or for silage purposes. It is particularly suitable for the more inland and drier districts, where it is now grown in preference to any other summer fodder crop.

Under reasonably good conditions at least three cuttings may be expected during the season. It is usually sown broadcast or with a seed drill. It is also sown in some districts in drills spaced wide enough to permit of inter-row cultivation being carried out. The quantity of seed required to plant an acre will vary from 5 to 15 lb. according to the method of sowing. Sowing should be carried out as soon as possible after the danger of frost is over, to permit of as many grazings or cuttings being made as is possible.

Harvesting has so far been done largely by hand. Where a suitable machine is available, the stalks may be cut and stooked in bundles until the grain is thoroughly dry. The heads are then cut off and threshed by a hackler or other suitable implement. Care should always be taken to see that the grain is sufficiently dry before being threshed and bagged; otherwise heating is likely to occur. The fact that so much hand labour is required for harvesting the crop has probably been the reason that grain sorghums are not grown more extensively in Queensland.

Grazing Risks.

Although Sudan grass is grown in very large areas each season and is frequently grazed in all stages of growth right throughout the growing period, there is always a risk in allowing stock on a crop before the flowering stage is reached. It will be admitted readily that thousands

of dairy stock are grazed on the crop each season, particularly in the Darling Downs and Maranoa districts, and suffer no ill effects. Cases of poisoning, however, do occur and serious losses result. For a very long time the general opinion was that pure Sudan grass was not poisonous at any stage of growth, and that poisoning of stock only resulted when grazed on crops which had been inoculated with other varieties of sorghum. This, however, does not appear to be the case, for in several cases that have been investigated there was no evidence that the crop was not pure. Past experience would appear to indicate definitely that the risk attached to grazing or on immature crop is very slight if the crop has been well grown. Where a crop has received a severe check from dry, hot weather and the growth is stunted, and this applies particularly to a ratoon growth, there certainly is a very serious risk attached to grazing the crop off before it flowers.

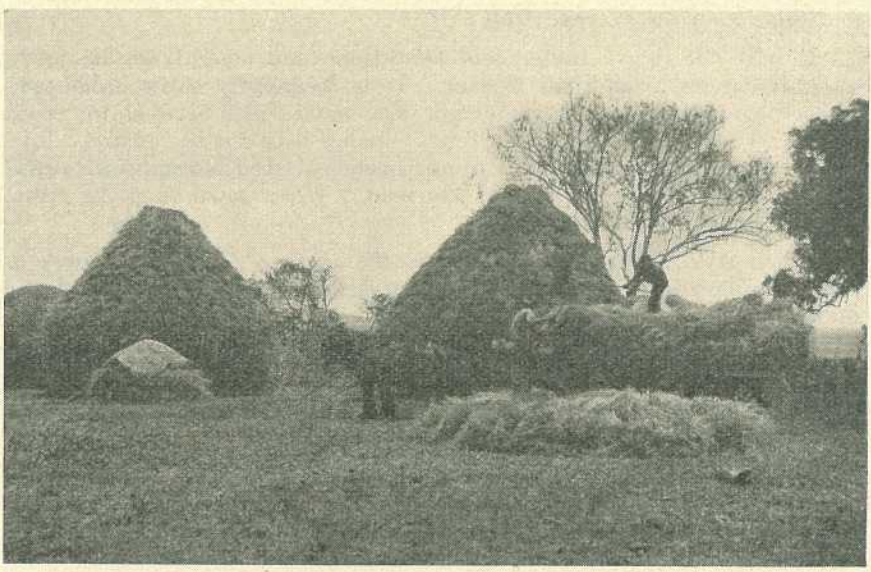

Plate 43.—Stack Building near Clifton, Darling Downs.

The saccharine and grain sorghums are very definitely dangerous before reaching the flowering stage, and while it is claimed that certain varieties are less poisonous than others, this has not yet been proved definitely, and consequently it is not advisable to take a risk with any of them.

SUMMER GRAZING CROPS.

Cowpeas.

As farmers are now busily engaged in preparing land for summer grazing crops, some of the most useful of these will be discussed briefly in these notes. One of the most valuable of these is cowpea, and although it has been grown for very many years and has proved conclusively that it will thrive over a wide area of the State and on a wide range of soils, it is not grown as extensively as it might be. Its value as a green manure crop is much more widely recognised than its value as a

fodder crop. It makes a highly nutritious hay, but it is not an easy crop to harvest and cure, and consequently is not widely grown for hay purposes.

For dairymen no more valuable crop could be grown for grazing purposes. Some difficulty is usually experienced at first in getting dairy stock to take to it, but once they acquire a taste for it they eat it readily, and its value as a milk producer will then be quickly demonstrated.

One of the best ways of getting the stock accustomed to cowpea is to make a light sowing of maize or other strong-growing crop amongst the peas. The trailing or twining varieties will twine round the maize stalks and the stock cannot avoid eating them while eating the plants of the other crop, and in this way will acquire a taste for them.

Cowpea can be grown on most classes of soil, provided the drainage is reasonably good, and it does not require any more favourable weather conditions than the average crop.

It will not thrive under cold conditions and should not be sown until all danger from frost is over. It is frequently sown broadcast, but sowing in drills is to be preferred. The usual width between the rows is 2 feet 6 inches to 3 feet with 8 or 9 inches between the plants. For broadcast sowing from one half to one bushel of seed is required to sow an acre, according to the size of the seed. When sown in drills from 5 to 15 lb. will be necessary.

When used for grazing purposes the cowpea not only proves a valuable milk-producing crop, but will greatly improve the soil after the residue has been ploughed under.

Where cowpea is grown solely as a green manure crop, difficulty will be experienced in satisfactorily ploughing under a heavy crop if the job is not carried out properly.

To do this successfully, the crop should be first of all flattened by rolling, and where a disc cultivator is available the process of ploughing the vines under will be more easily and effectively done if this machine is run over the rolled crop before commencing ploughing. The best stage at which to plough the crop in is when the pods have developed, but before they have started to ripen. A crop which has been allowed to mature too fully will become woody and consequently more difficult to plough under. As previously mentioned, properly cured cowpea hay is very nutritious and it is also very palatable to stock. In curing, a certain amount of care is necessary to prevent loss of leaf. To avoid this the cut crop should not be allowed to remain exposed to the hot sun for too long a period, and should be placed in loosely built cocks or heaps before the leaves become brittle. To effect an even cure the cocks should be turned occasionally.

The most favoured varieties are black and Poona. The black is a very old and popular variety which has proved to be a heavy cropper.

The Poona variety has come more into prominence during recent years and is now very popular in some districts. It is also a heavy cropper and can hold its own quite easily with the black variety in this respect.

Quite a number of different varieties are grown throughout the State, but the two varieties mentioned are the most widely grown.

Soy Beans.

Considerable interest has recently been shown regarding the growing of Soy beans. The Department of Agriculture has been conducting trials with these over a number of years, and while excellent results have at times been obtained the difficulty so far has been to secure varieties which will give consistently good results.

Other countries which are now growing them extensively experienced much the same difficulty at first, but once this problem has been overcome they have proved a valuable crop.

Although they are highly valued as a human food in countries of Eastern Asia, their chief value in this State, for some time at least, would be for fodder and soil improvement purposes.

The seed is valuable for its oil and also for the manufacture of soy bean flour, but it is doubtful if the seed could be produced here for the price at which it can usually be imported from countries where labour is cheap.

The plants contain a very high percentage of protein, and as they are palatable to stock either as a green fodder or in the form of hay, they would be of value for this purpose alone.

They also have a beneficial effect on the soil, and in countries where they do well are greatly valued for this purpose.

The results of the trials so far conducted would indicate that this crop will grow on most reasonably good soils provided the drainage is good. The young plants are fairly tender, and for that reason the surface soil should be well worked and should not be allowed to become caked prior to germination. Once the plants are established they are fairly hardy and will stand a dry spell as well as most other crops. They are susceptible to frost, and sowing should therefore be delayed until all danger of frost is over.

The seed should be sown in rows spaced at least 2 feet 6 inches apart with about 6 inches between the plants. They should not be sown deeply, a depth of 3 inches in a well-worked soil being sufficient. The seed of the different varieties varies greatly in size and consequently the quantity of seed required to sow an acre varies. Approximately 5 lb. of seed is sufficient for the small-seeded varieties and about 10 lb. per acre for the large-seeded varieties.

If the crop is being grown for hay purposes it should be cut when the seeds are about half formed.

To prevent loss of leaf the same care would be necessary in curing the crop as would be the case with cowpeas.

A crop that is grown for seed should be cut when about three-quarters of the pods are ripe. The pods do not all ripen at the same time, and if the cutting were delayed until all the pods had ripened many of those which ripened first would have shed their seed. The seed should be allowed to dry out thoroughly before being threshed and bagged, as it heats very readily where this is not done.

Regarding varieties, a large number have been tried so far, and those which have shown the most promise are Otootan, Biloxi, and Laredo, particularly the two former. Otootan is the most leafy and lightest stalked of these varieties, and shows distinct promise as a fodder variety.

The other two varieties are also tall-growing, leafy varieties, but are not as fine-stalked at Otootan.

From a grain point of view, Biloxi would probably prove the most suitable variety. These are fairly-late-maturing varieties and should be sown not later than November in the coastal districts and earlier than that in districts where early frosts may be experienced.

Of the quick-maturing varieties, none has shown more promise than one known as A.K. 2. This variety was introduced some time ago by the Ford Motor Company, and the seed was kindly forwarded to the Department of Agriculture for trial purposes.

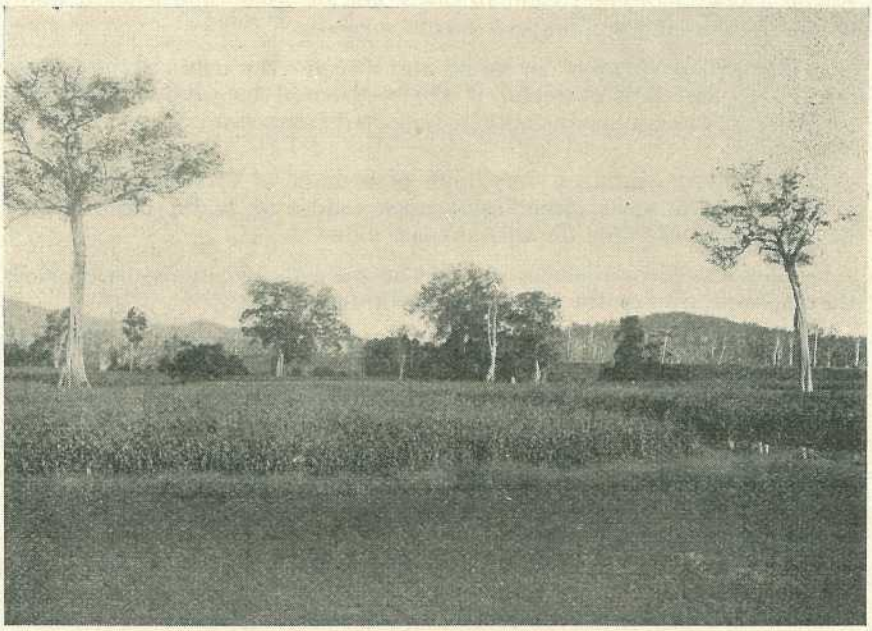

PLATE 44.—FIELD OF MAIZE, IMBIL, MARY VALLEY.

To save any disappointment to those who may wish to secure seed of Soy beans it is as well to point out that until something more definite is known regarding the suitability of the different varieties only sufficient seed is being retained for experimental purposes. No variety has yet given consistently good results to recommend their growth in preference to cowpeas.

Millets.

For a quick-growing summer grazing or hay crop, particularly for the coastal districts, the millets, or what are commonly known as panicums, have proved the most suitable. They can be grown on almost any soil that could be classed as worthy of cultivation.

They are usually sown broadcast at the rate of 12 to 15 lb. of seed per acre. They can be sown as soon as frosts are over and, given favourable weather conditions, will provide good grazing within five or six weeks from the time of sowing. They should not, however, be grazed

too early but should be allowed to reach a height of 8 or 9 inches when they will have usually a sufficiently strong root growth to stand grazing. If the crop is not allowed to become too mature before being grazed, a good second growth will appear, which can either be used for grazing purposes or for converting into hay.

When being used for hay the crop should not be allowed to mature the seed, but should be cut when the grain is forming.

Apart from the loss of food value in an over-matured crop, most varieties shed their seed freely, and this will germinate freely the following season. This would be of little consequence where the same land was again required for this crop, but where a crop such as maize or potatoes was to be grown, extra work would be entailed in cultivation to deal with the volunteer growth.

It will be found that most varieties dry out more slowly than most other hay crops, but when properly cured make a very nutritious hay.

They are also of value for silage purposes either for mixing with a heavier-stalked crop such as maize or sorghum or for using alone.

When used for this purpose the crop is much more easily handled both in the field and while being ensiled if cut with a reaper and binder.

Of all the varieties grown, white panicum and Japanese millet have given the best all-round results. They not only have proved to be heavier yielders, but are better stoolers and provide better grazing.

The best of the other varieties are Hungarian and Manchurian millet and what is commonly called giant panicum or liberty millet.

EXPIRED SUBSCRIPTIONS.

A very large number of subscribers to the Journal expired in June and July, and have not been renewed. A further large number expires with this issue.

Subscribers whose term expired in June and July have been continued on our mailing list, and a yellow wrapper on this month's Journal (August) is an indication that their subscriptions are now due.

Subscribers whose term expires with this issue are reminded similarly.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Poona Pea as a Green Manure.

THE use of Poona pea as a green manure is rapidly becoming popular in the cane areas of North Queensland. The accompanying photograph shows a splendid crop on the farm of Vessy and Sons, Edge Hill, Cairns. The soil is of a schist nature, and Poona pea is found to give better results than other green crops on this class of country.

PLATE 45.—AN EXCELLENT CROP OF POONA PEA AT EDGE HILL, CAIRNS.

The advantages of this particular green crop may be summarised as follows:—

1. Quick and certain germination;
2. More succulent than Mauritius beans, and consequently easier to plough under;
3. More resistant to bean fly than cowpea;
4. Gives crop under adverse conditions;
5. Higher value in supplying nitrogen than other crops;
6. Cheap to grow; seed costs 12s. 6d. to 17s. 6d. a bushel, which will take care of at least four acres.

Most farmers during the past season made the mistake of planting too thickly. From 12 to 15 lb. per acre are recommended, but as the seed is very small, care must be taken in broadcasting, otherwise this amount will be exceeded.

Up to the present the chief disadvantage shown by Poona pea is its tendency to come to maturity too quickly, especially when planted in rich soil. Further, if allowed to mature seed before ploughing under, subsequent germination may be troublesome to control after the young cane has been planted. It is, however, not nearly so difficult in this respect as Mauritius bean.

"G.B." in the "Cane Growers' Quarterly Bulletin" for July (Bureau of Sugar Experiment Stations).

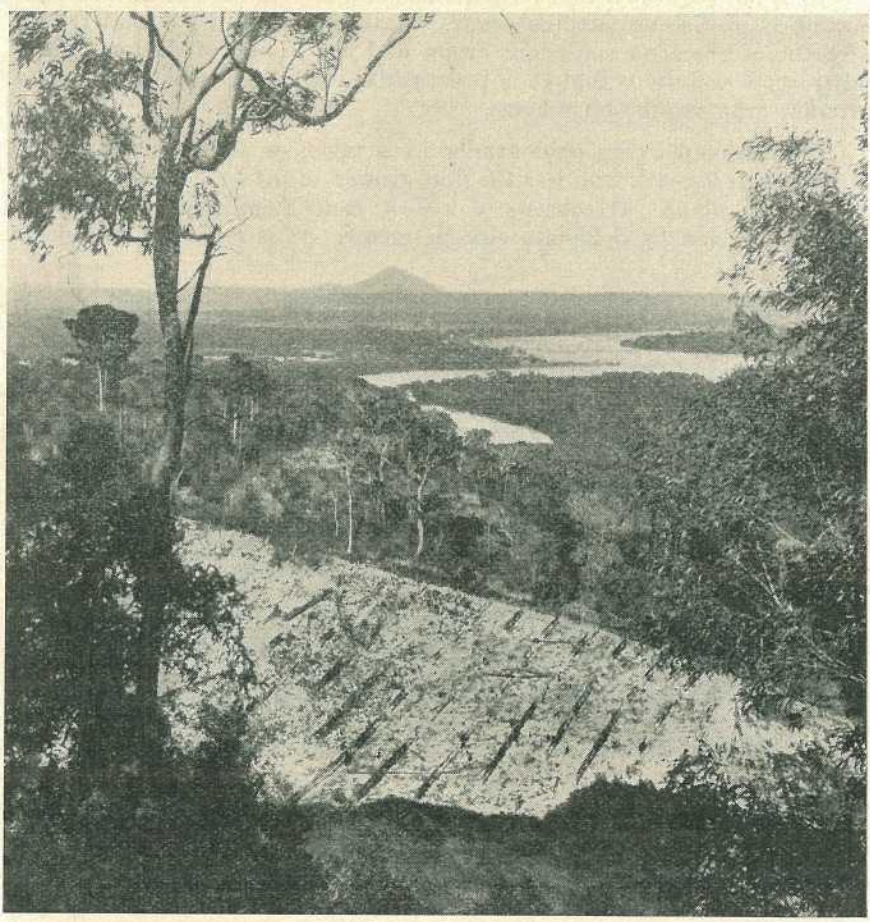

Plate 46.—View from Noosa Lookout, showing Noosa River, Weyba Creek, and Cooroy Mountain, South Queensland.

Irrigation in North Queensland.*

DURING the past summer several new irrigation plants were installed in North Queensland. Most of these were actually in operation in the Tully area, reputedly the wettest area in Queensland. In common with all other Northern cane areas an unusually long dry spell took the place of the normal wet season and the cane suffered severely. Those growers who were able to apply water to their crops during this period will reap a marked benefit in increased yields, and it is fairly safe to assume that the results which would accrue from adequate irrigation in a season such as this would be sufficient to cover the major portion of the costs of the installation.

It is not suggested that irrigation should be regarded as an economic means of producing surplus sugar. Rather is it to be considered as a means of ensuring consistent crops, and the results of the past three years show definitely that it is practically an indispensable aid to any rational crop regulation scheme.

The accompanying photographs were taken on the farm of Mr. E. Sues, of Gordonvale, who was the first grower in the far North to put in a pumping plant. It consists of a 7-in. centrifugal pump, with 9-in. delivery, driven by a 25-h.p. electric motor. It is reckoned to deliver

PLATE 47.—SHOWING CENTRIFUGAL PUMP.

60,000 gallons of water per hour. The water is drawn from the Mulgrave River, and is of excellent quality. The water is conducted through a pipe line of reinforced concrete.

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

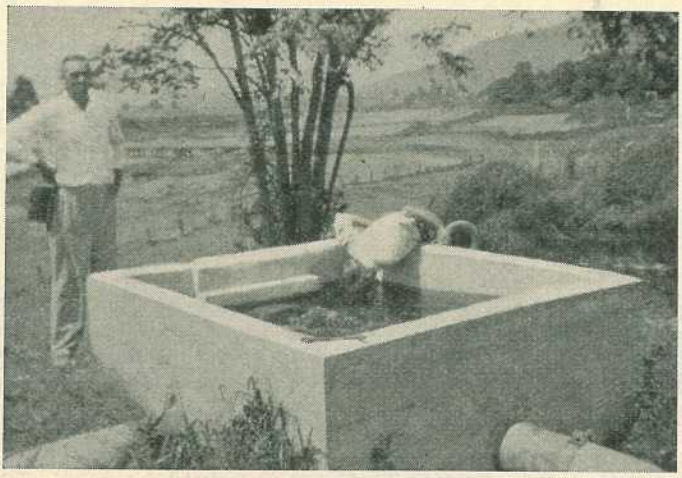

Plate 48.—Showing Discharge Tank and Distribution Mains.

That portion of the crop which was irrigated during the dry months demonstrates in no uncertain manner the benefits of the treatment, and will cut many tons to the acre in excess of similar cane which was dependent on natural rainfall.

Plate 49.—The Road to Skyring's Creek Skirts the Base of Cooroora Mountain, South Queensland.

COTTON ROTATIONS.

By W. G. WELLS, Director of Cotton Culture.

THE necessity of discontinuing the practice of growing successive crops of cotton over a period of several seasons on the same site is becoming more apparent each year on all soil types. One of the most obvious reasons is that cultivation costs are considerably increased through the greater number of operations required to combat the excessive weed growth on the old cultivations, particularly where the pigweed is a pest. Investigations carried out in recent seasons have shown that certain chemical and physical changes are occurring in the soils with the continuous cultivation of cotton on the same land that also make it imperative that this practice be stopped, and it is the purpose of this article to draw attention to these factors.

Changes in the Chemical Composition of the Soils.

The intensive cultivation of a soil over a series of years stimulates the bacteria in it, which assist in the decomposition of organic matter such as all parts of grasses and plants that become mixed with the soil. One of the products resulting from these "breaking down" operations is the plant-food nitrate—nitrogen—which is very essential for the proper growth of plants. The fodders and grasses all require large amounts of nitrates for successful growth, but the cotton plant produces better with limited amounts, or where there is a wide ratio between the carbon and nitrogen content of the soils. Carbon is the basic material of all organic matter, and the ratio between the carbon and nitrogen content of soils appears to play a most important part in the fruiting ability of plants. A survey made of some of the main soil types of the cotton areas has shown that, broadly speaking, the soils which can be relied upon to produce good yields of cotton under favourable climatic conditions have wider ratios of carbon to nitrogen than do those on which poor yields are generally obtained.

When virgin country or grass land is brought into cultivation the nitrate content of the soil is usually very low; the initial determinations of most cotton soils generally give under 12 parts per million with an occasional sample of very fertile soil as high as 15. Adjacent soils of six or seven-year-old cotton cultivations may range as high as 30 to 40 parts of nitrates per million, depending on the time of year they are taken. When these soils are held under optimum temperature and moisture conditions for 28 days the new cultivations seldom increase to as much as 30 parts of nitrate, whereas the older more fertile cultivations have recorded as high as 60 parts of nitrate per million parts of soil.

This tendency for the nitrate content of the older cultivations to increase under optimum conditions, which are warm temperatures and well moistened soil, explains the results that are often obtained on the older cultivations of the alluvial loams and clay loams. During the 1934-35 season the nitrate content of such soils on the Cotton Research Station averaged around 8 to 10 parts per million in the dry spring months. With the advent of frequent rains and hot weather the nitrate content rose very quickly, and in 28 days had reached 26 parts per million. During this period the plants which were entering the squaring period grew so rapidly and rankly that only limited squaring developed. Had a normal "wet season" been experienced after that undoubtedly a very rank growth of plant, accompanied by excessive and continuous shedding of squares, would have resulted. Fortunately a sudden hot dry spell occurred instead, which checked plant growth and nitrate manufacture, and within three weeks a heavy crop of squares was being produced on all plantings. Dry conditions, broken only by hard beating storms which mostly ran off, wetting only the surface soil layers, ruled for the rest of the season, so that the moisture and nitrate content of the soils was steadily lowered. There was a slight increase in the nitrate content of the surface soils following each rain, however. It can be appreciated, therefore, how quickly the nitrate content of the fertile soils of the older cultivations may increase, and what effect the same may have on crop production.

Changes in the Physical Condition of the Soils.

The decrease in the amount of organic matter which accompanies the increase in the nitrate content has a marked influence on the physical condition of the soils. With the lowering of the organic matter content, the soil particles tend to adhere together to a greater degree, which in the clay soils eventually results in their setting into such a hard mass during beating storms that little penetration is obtained afterwards, except with steady soaking rains. Soil in such state breaks up into large clods when ploughed unless it is in exactly the right moistened condition. Sieving tests of two and nine-year-old cultivations of a clay loam soil, which were carried out at the Research Station, demonstrated that a greater percentage of soil, by weight, broke up into clods during the ploughing of the oldest cultivation, that would not pass through a 1½-inch mesh. The older cultivation also broke up into fewer of the finer particles that would pass through an ⅛-inch mesh.

This tendency for the older cultivations to set into hard masses which are penetrated to any depth by only steady soaking rains is one of the most serious problems facing the farmers of this State. A good

percentage of the total rainfall received in most of the agricultural areas outside of the cane-growing districts of the North occurs in the form of storms rather than general soaking rains. In some instances as much as 4·25 inches have fallen in less than three hours, and often around an inch in under an hour has been recorded at the Cotton Research Station. There is a big run-off of such rains under the best of soil conditions, but where crops are grown on the older hard cultivations undoubtedly small benefit is obtained from such storms. This is evidenced by the results obtained in soil-moisture studies at the Research Station. In the 1932-33 season a total of 2·94 inches, occurring in two storms, one late in the evening followed by the other early next morning, failed to increase the moisture-content of the 4-6-inch soil level on well-mulched old cultivation to any appreciable extent—plants on any little high spots wilting in the afternoon within six days. In the following season it was demonstrated that with a continuous rain over twenty-five hours, yielding 2·46 inches, only 35 per cent. of the rain penetrated into the first 18 inches of soil in an eight-year-old cultivation, as compared to 74 per cent. in a two-year-old. During the 1934-35 season fortnightly determinations were made on adjacent blocks of three, six, and nine-year-old cultivations. The results obtained are shown in Plate 50.

The relative effect of ploughing during a dry spell is clearly indicated in the marked lowering of moisture content in all of the cultivations in the plough depth of the upper 6 inches. The good soaking rains occurring after the planting period apparently tended to set the oldest cultivation, for even the good storm group of December failed to bring the content of the 10-12-inch depth up to those of the other cultivations, as was also true in the 4-6-inch level.

Rotations of Crops Necessary.

It is apparent, therefore, that the growing of successive crops of cotton on the same land over a series of years brings about undesirable chemical and physical changes in the soils. It thus becomes necessary for cotton-growers to examine all possible cropping systems which will provide a suitable rotation with cotton-growing to prevent these soil deteriorations occurring. The advantages of growing cotton on new cultivations out of the virgin state have been discussed previously.* Naturally the size of the farms limit the extent to which this procedure can be adopted, but fortunately it appears that very satisfactory results can also be obtained by growing cotton in rotation with Rhodes grass. Some gains may also be realised by growing cotton in rotation with maize and fodder crops, particularly the latter on the less fertile clays and clay loams. The results that have been obtained with these different rotations will next be presented.

New Cultivations.

The value of new cultivations for cotton-growing is becoming more appreciated by growers, and there has been a decided tendency during the last season to bring more virgin country into cultivation, both in forest soils and in scrub country where the stumps of the original burn have rotted sufficiently to allow of economical clearing for ploughing.

* Cotton Growing on New Cultivations, by W. G. Wells, Director of Cotton Culture, "Queensland Agricultural Journal," April, 1934.

The results realised on the newer cultivations have generally been satisfactory, even under the low rainfall and higher temperatures which ruled throughout most of the latter half of the past season. Such conditions have favoured the older cultivations to some extent, for there was little tendency to develop rank growth of plant, and their

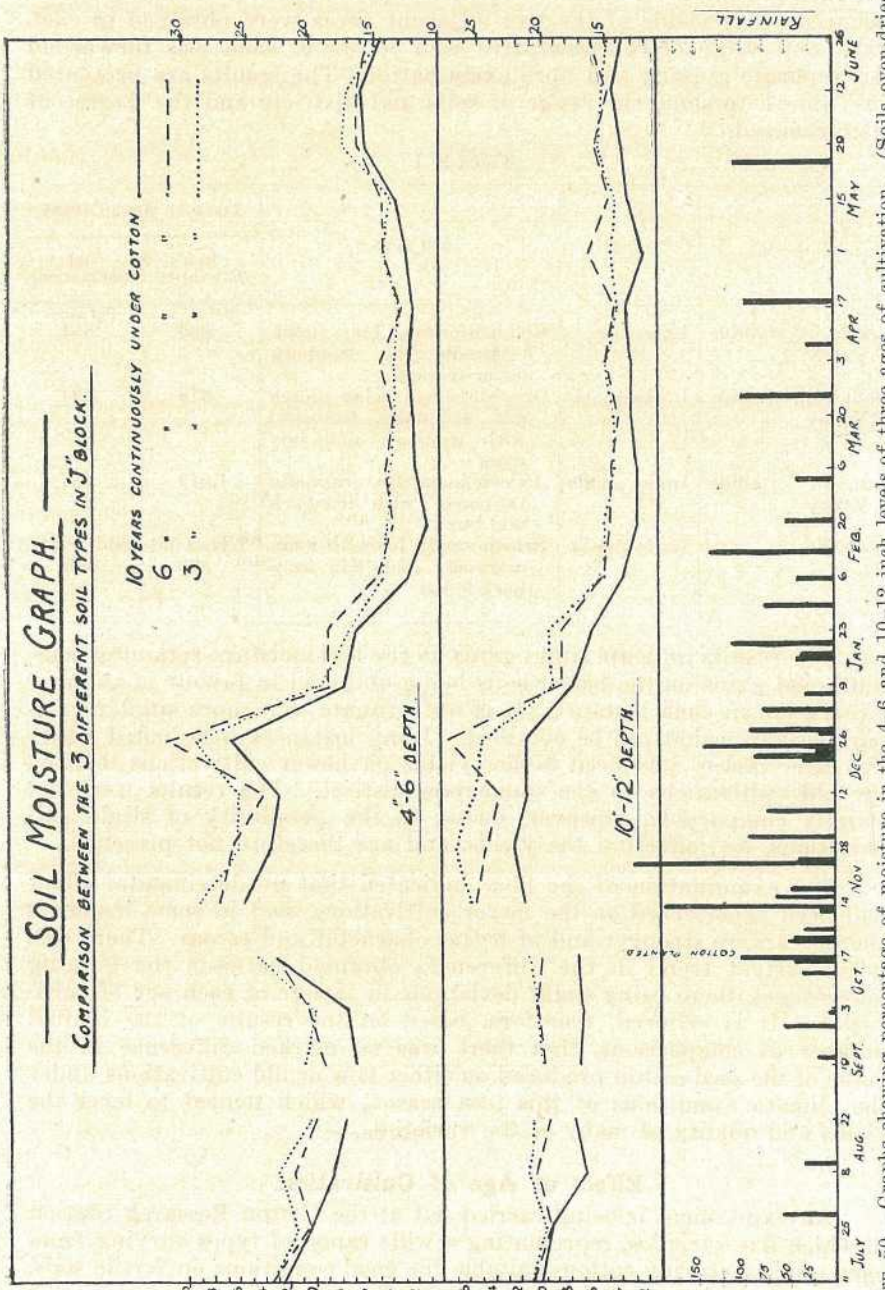

PLATE 50.—Graphs showing percentage of moisture in the 4–6 and 10–12 inch levels of three ages of cultivation. (Soils oven-dried at 100 deg. C.). Soils ploughed August 13-22. Differences of over 2 per cent. of moisture are significant statistically.

higher nitrate content helped to counteract the lesser moisture existing during the critical stress periods of the formation of the crop that was harvested.

Efforts were made to obtain as many illustrations of the relative yielding ability of the soils as possible, but unfortunately only a limited number of cases were found where strictly comparable results could be secured. The yields of the two adjacent acres were obtained in each case, and 80 lb. of representative seed cotton of each was forwarded for separate ginning and fibre examination. The results are presented in Table I. to show the range of soils and districts and the degree of gain realised.

TABLE I.

District.	Variety.	Soil Type.	Yield lb. Seed Cotton.	
			New Cultivation.	Old Cultivation.
			Per acre.	Per acre.
Scoria, Callide Valley	Lone Star	Reddish-brown clay loam originally on ironbark covered slope	606	554
Goovigen, Callide Valley	Indio Acala	Greyish-brown clay loam flat originally timbered with ironbark and box trees	578	524
Jambin, Callide Valley	Indio Acala	Brown loam flat originally timbered with ironbark and box	1,012	927
Wowan	Indio Acala	Brown sandy loam to loam originally gum and ironbark forest	2-year old 800	Old cult. 500

The results indicate slight gains on the less moisture-retaining soils, and good gains on the better soils being obtained in favour of the new cultivation in each instance. It is unfortunate that more similar comparable data could not be obtained. Many instances were noted where the same variety produced higher yields on newer cultivations than on the old cultivations in the immediate district. The results were not strictly comparable, however, owing to the possibility of slight soil variations, &c., affecting the yields, and are therefore not presented.

The examination of the fibre indicated that no detrimental effect had been experienced on the newer cultivations, and in some instances the fibres were stronger and of better character and colour. There was no consistent trend in the differences obtained between the ginning percentages, there being slight deviations in favour of each age of cultivation. It is believed, therefore, based on the results of the limited number of comparisons, that there was no marked difference in the value of the seed cotton produced on either new or old cultivations under the climatic conditions of this past season, which tended to level the yields and quality of many of the varieties.

Effect of Age of Cultivation.

An experiment is being carried out at the Cotton Research Station in which five varieties, representing a wide range of types varying from open quick-maturing cottons suitable for good conditions on fertile soils, to drought resistant ones more suitable for the drier districts or the

harder soils of the districts of good rainfall, are being grown on soils of different ages of cultivation. The results obtained from the first three seasons of the experiment are given in Table II.

TABLE II.

Season.	Yields per acre in lb. Seed Cotton.		
1932-33—Uniformity trial of one variety	1-year cult. 917	4-year cult. 501	8-year cult. 251
1933-34—Latin square of five varieties	2-year cult. 1372	5-year cult. 1313	9-year cult. 1236
1934-35—Latin square of five varieties	3-year cult. 936	6-year cult. 978	10-year cult. 911

The differences in the mean yields for each age of cultivation show how varying seasonal conditions affect the results obtained on the same soil sites. The 1932-33 season was one of light rainfall following a season of drought conditions. The crop had a "hand-to-mouth" existence, as it were, and the crops on the more open-textured newer cultivations undoubtedly obtained greater benefit from the rains that occurred. Very serious corn-ear worm attacks were experienced in mid-season, particularly on the oldest cultivation, where heavy loss of crop resulted that was followed by very rank growth of plant. The 1933-34 season was characterised by the greatest winter rainfall in sixty years, with ample rains for the rest of the season, except a rather marked dry period at mid-season. Plant growth was remarkably small in all cultivations, the nitrate content being low all season, and practically no insect attacks were experienced. Under the circumstances all five varieties produced the heaviest crops on the oldest soils, where the higher nitrate content assisted crop development.

The climatic conditions of the 1934-35 season have just been described in the discussion of the development of the nitrate content of the soils for this season. Although the mean yields of all varieties are in the order shown in Table II., three out of the five varieties had heavier yields on the 3-year cultivation than on the 10-year, with three of the five having the heaviest yields on the 6-year cultivation. The two varieties having higher yields on the 10-year than on the 3-year cultivation were a big boll type suitable for wet districts and a rather later-flowering variety which normally has a large vegetative structure that produces a heavy top crop. The higher nitrate content of the older cultivations would assist both of these varieties, particularly the latter one, which produced its highest yield on the 6-year-old cultivation.

The results obtained so far from the experiment have shown marked differences in yields occurring between the different ages of cultivation, according to the season. It is pointed out, however, that there has been practically no corn-ear worm attacks during the last two seasons, with the usual resultant rank growth of plant. Also, late seasonal conditions have not been conducive to promoting rank growth. The conditions have been rather unusual, therefore, and not favourable for the newer cultivations. Undoubtedly the rank growth that frequently follows the loss of crop during a corn-ear worm attack on the older cultivations of high nitrate content is a very serious factor in successful cotton-growing in many of the districts. Although severe losses may be experienced on the newer cultivations, the lower nitrate content does

not promote luxurious growth after the loss of crop has occurred, and when the attack ceases a profitable crop is quickly developed if weather conditions are at all favourable.

Rhodes Grass.

The yields that have been obtained where old Rhodes grass sowings amongst the stumps of the original scrub burns have been brought into cultivation have led to investigations into the merits of the Rhodes grass—cotton rotation being carried out on forest soils at the Cotton Research Station. During the past two seasons results have been obtained that indicate this is a rotation that all growers should try. In the first season of cotton after only two years of growth of Rhodes grass on six-year-old cotton cultivation, a gain of 30 lb. of seed cotton per acre was obtained, following Rhodes grass, in early planted cotton, and 40 lb. in a late planted experiment. Very clear evidences of a lack of nitrates was noticeable during the first half of the season in the cotton following the Rhodes grass which may have checked the development of crop, as the plants were smaller and of a more restricted type than those in the cotton-cotton plots. The unusually heavy rainfall in the first half of the season undoubtedly caused excessive washing down of the nitrates in such open soils. In the 1934-35 season the experiment was harvested so as to show the effect on different soil types. The crops following Rhodes grass outyielded the cotton following cotton plots by 124 lb. seed cotton per acre on flat very fertile alluvial clay loams, and by 80 lb. per acre on a slight sandy clay slope with low moisture-holding capacity, which also tends to set very hard following severe storms after the last cultivation.

Investigations were also carried out into the hay producing ability of Rhodes grass in its second year of growth on alluvial forest loams which had previously grown cotton for eight years. Upwards of 2 tons of a good class of hay were produced per acre even under the adverse mid-seasonal conditions. Analyses also showed that Rhodes grass reduces the nitrate content of the soils outstandingly—all samplings of the last two seasons in growing crops of Rhodes grass showing practically no nitrates present in either of the first or second six inches of soil.

It would appear, therefore, that the practice of growing Rhodes grass on the old cotton cultivations for three or four years and then following with cotton for the same period is one that every cotton-grower should try out, particularly on soils of high nitrate content. It is possible that on the harder clay soils of naturally low fertility it may be more advantageous to rotate cotton with annually sown fodder crops such as Sudan grass and panicum. Both are quick growing, and can be sown at the start of the wet season and make a good yield of hay under average seasonal conditions. By ploughing early in the autumn after these crops full advantage of the winter rains is obtained, and in addition the stubble decomposes fast enough so as to prevent any deficiency of nitrate manufacture during the growth of the following cotton crop.

Cotton-Fodder Crop Rotations.

A series of rotations in which Sudan grass, giant panicum, saccaline, sorghum, and maize are grown alternately with cotton, and also longer ones, such as wheat-maize-cotton, oats-maize-cotton, &c., is being carried out at the Cotton Research Station. Some of the rotations have not been conducted long enough to allow of thoroughly indicative results

being obtained. No consistent gains have resulted from any one rotation, however, and the mean gain of all treatments shows only a slight superiority over the cotton-cotton controls. Generally speaking, the most gains have been obtained in the drier years, when cotton followed fodder crops grown in wet seasons—there apparently having been a reserve of subsoil moisture left for the deep roots of the cotton plants. In wet seasons the yields of all plots have been surprisingly alike, or in several instances

Plate 51.—Showing Set, Old Cultivation.

Soil of a 10-year-old cultivation. Note the compact set appearance. The water from hard storms mostly runs off such soils, which "set" so quickly that easy penetration is very soon prevented.

the cotton following early ploughed panicum stubble has been outyielded by the cotton-cotton plots. Investigations carried out this past season indicate that the panicum stubble is quickly decomposed where it is ploughed before the late summer rains cease. Fortnightly nitrate determinations showed an increase in nitrate content within a month on both summer and early winter ploughing of the stubble, but a greater rate of production in the earlier ploughed plots, which was maintained well into the following mid-season. The soils were of a fertile nature of good nitrate content, so it is possible that all fodder stubbles are digested too quickly to obtain sufficient reduction of nitrate production to affect materially the growth of following cotton plants. On soils of lower nitrate content a slow enough rate of decomposition may take place to allow the stubble to improve the texture of the soils somewhat, but still have sufficient production of nitrates to promote good growth of cotton.

Value of Rotations to Reduce Soil Erosion.

It is a matter of experimentation for each grower to ascertain the most profitable cropping system for his various soils. It is absolutely necessary, however, that some form of crop rotation be adopted which will improve the physical condition of the soils so that greater penetration of severe storms can be obtained. This will not only increase the yields of cotton, but will assist in retarding run-off of the rain water actually falling on the field. Where cotton is grown in rotation with fodder crops the plantings of fodders or grasses can be arranged in alternate

strips with the cotton, which reduces the flow of the run-off and accompanying soil losses to a remarkable extent. Experiments in the United States of America have shown a most pronounced reduction in soil and moisture losses where cotton is grown in rotation with fodder crops as compared to continuous cotton. The losses of soil and accompanying plant foods are appalling where cotton follows cotton for several years on certain classes of soils of that country.

PLATE 52.—SHOWING STUBBLE IN NEW RHODES GRASS CULTIVATION.

Soil at the end of the first cotton season following two years of Rhodes grass. Note the grass stubble that is still on the surface, and also the more crumbly nature of the surface. A field in this condition absorbs a greater amount of storm rains, as the run off is retarded, thus allowing of better penetration.

Similar losses are occurring in most cotton districts of this State. In one investigation of a loamy scrub soil it was ascertained that, on the lower portion of the slope, soil of over 6 inches in depth had been deposited from the upper levels. This section of the field was really too fertile for successful production of the variety of cotton that was required for the upper slopes, which had been denuded of much of their fertility during only four years of cultivation. On some places in the older sections of the south-eastern part of the State, forty to sixty years of farming without paying attention to proper rotations, ploughing and planting row crops up and down the slopes instead of on only slight grades across them, and failure to divert the flow of water from adjacent fields, have caused the loss of all the originally very fertile scrub surface soils. Crops are now being grown on the poorer subsoils, which require frequent rains to produce even moderate yields. From any hill top the various coloured subsoils now show up in every field, and it is but a matter of time, if soil-improvement methods are not soon adopted, before these soils will become so infertile as to make farming of any kind unprofitable. Cotton-growers in the newer districts are therefore urged to adopt methods of crop rotations and planting across the slopes of their cultivations, which will make cotton-growing more profitable, maintain the physical condition of their soils, and save the fertile surface soils which are the product of the forces of Nature operating over hundreds of years, and are irreplaceable.

THE LITCHI.

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

THE Litchi is a member of the Nephelium genus, of the order Sapindacea, and is known botanically as *Litchi chinensis* (Sonn.) or *Nephelium litchi* (Cambess.).

In suitable regions and under good conditions the tree may grow to a height of about 40 feet, and is very ornamental. It has a compact, round, broad top, thickly furnished with glossy bright-green old foliage, and light-green, yellowish or pink young growth. The leaves are compound, being composed of two to four pairs of leaflets, oblong-elliptic to lanceolate, glabrous, and about 3 inches long.

The flowers are small and borne in terminal panicles, similar to the mango. The fruit which follows is in loose clusters of three or four up to twenty or twenty-five, and is oval to ovate up to 1½ inches long. The rind or skin is thin and warted, green when the fruit is young and gradually, in most varieties, changing as it matures to yellow, and finally when quite ripe to a magenta red. One variety, however, retains its green colouring when ripe, and one or two others retain a bright yellow colour. As the fruit progresses to the over-ripe stage the rind becomes brown.

Under the rind of the fruit is a white membranous skin covering the flesh beneath, the latter botanically known as the arillus. This is whitish, translucent and jelly-like but firm, and has a flavour slightly sub-acid.

The seed enveloped in the aril is glossy dark brown, frequently small and shrivelled in the better varieties.

The name of the tree is variously spelt Litchi, Lychee, Leechee, Lichee, &c., but Litchi is generally accepted, following its botanical name. The pronounciation varies, but in the region of China where it is grown ly-chee is the pronounciation and this is generally accepted.

The native habitat is generally agreed to be Southern China, but as it has been cultivated for 2,000 years or more its origin is more or less obscure. In China the country round Canton is considered most suitable for litchi growing and the industry is chiefly concentrated round that region.

According to Alphonse de Candolle India has been growing litchis for approximately 200 years. Commercial orchards are now flourishing in several districts, but production is not as extensive as in China. Cochin-China, Burma, Hawaii, and other places grow the tree on a limited scale.

In Queensland the introduction of the litchi dates back to 1854, when plants were obtained from the Sydney Botanical Gardens. In the later fifties the tree was planted in the Brisbane Botanical Gardens (ref. J. F. Bailey, "Introduction of Economic Plants into Queensland"). Towards the end of last century and in the early years of the present century a number of trees were imported and planted in North Queensland and many of these are still flourishing.

However, litchi growing has never assumed the proportions of even a small industry in Queensland. Probably the difficulty in obtaining plants, coupled with the long period required for seedling trees to reach maturity, and the uncertainty of their being good varieties when they did mature, has deterred many from embarking in their cultivation.

Soil and Climate.

In soil requirements the litchi prefers rich alluvial loams, but it is fairly adaptable, and W. Popenoe reports it as being grown successfully on light sandy loams in Florida.

Whatever the type of soil, however, copious soil moisture is strictly essential, and if it is naturally lacking it must be supplied artificially. Drying out of the soil is a fatal handicap to successful litchi growing, for although the trees may not be killed outright (except in extreme instances) they are so slow growing, ragged, deficient in foliage and generally sickly that profitable results are impossible.

A humid atmosphere appears also to be advisable, although not strictly necessary as is proved by the commercial growing of the trees on the plains of Northern India under fairly dry atmospheric conditions.

Yet one more point should be borne in mind in selecting a site for a litchi orchard—that is freedom from frost. Cool conditions are not considered harmful as may be proved by the successful growth of several trees around Brisbane for many years. Heavy frosts are, however, definitely deleterious, and young trees are delicate in even light frosts.

There are therefore four main conditions to be noted in considering the establishment of a litchi orchard, if the best results are to be obtained. They are (*a*) plentiful soil moisture, (*b*) rich alluvial loamy soil, (*c*) humid atmosphere, and (*d*) freedom from frost.

In Queensland these conditions are combined in the area of land lying within the tropical coastal wet belt, and as would naturally be expected it is within this belt that the best trees are to be found.

In the early days of North Queensland settlement numbers of litchis were planted, and although many have since been destroyed there still remain odd trees scattered here and there, chiefly on old selections. The

old-time settler recognised and appreciated the value of a home garden and usually made an effort to surround his home with such a selection of fruits that he had fruit of some kind at any period throughout the year. To these old settlers we are indebted for the propagation of many varieties of fruits, probably the best of them being the litchi.

Cultivation and Fertilization.

Regarding the cultivation of the litchi, little is necessary beyond maintaining the soil in good condition and keeping up the supply of moisture. Heavy mulching under the trees is regarded favourably, and since the tree is generally reported as a shallow-rooted one with its feeding roots close to the surface, this practice would be very beneficial under tropical conditions.

No experimental work has yet been carried out with artificial fertilizers on this tree, so any recommendations on the matter could only be based on guess work. In the East night-soil and the carcasses of dead beasts are favoured for manurial purposes. In the absence of definite information regarding artificial fertilizers, applications of fowl or goat manure may be regarded as the best treatment in this country.

Pruning and Propagation.

In North Queensland the general rule has been for trees to bear a heavy crop only once in two or three years with no or very few fruit the following years. The tree is one which fruits on the previous season's growth and it is therefore necessary, to ensure a crop every year, to make sure of new growth each year. The production of a very heavy crop apparently absorbs all the energy of the tree, with the consequent result that no new growth is made, resulting in no crop the following year. To ensure the continuous cropping of the tree the Oriental considers it necessary in picking the fruit to break off the whole spray with a few inches of the branch attached, rather than pull the individual fruit from the bunch. This apparently is analagous to our pruning of a tree, and is quite feasibly the necessary method of pruning the litchi. The general training of the tree should be restricted to the removal of weak inner twigs and the thinning out of crowded branches.

Propagation of the litchi is practically restricted at present, to raising from seed, and gootee. Of these methods the former is unsatisfactory for several reasons, the chief being the inability of the seed to produce true to the parent, the poor viability of the seed from good varieties of fruits, and the extreme slowness of seedling trees in reaching maturity—from eight to twenty-five years. The gootee method of propagation whilst producing trees true to the parent, and cropping usually at about three years of age, does not tend to produce a tree with a particularly strong root system. It is, however, the more satisfactory of the two methods at present employed.

With a serious expansion of litchi cultivation more up-to-date methods of propagation must be resorted to and working on stocks of the sturdier and quicker growing members of the genus would probably be attempted on a commercial scale. Experimental work on the Longan stock (*Euphoria longana*) is reported as having met with some success, but further study of results is necessary before generally recommending this stock.

Varieties and Yield.

Many varieties are recognised and propagated in both China and India. Amongst the best of the Chinese are "Loh Mai Chee" and "Kwai

me,'' whilst the better known of the Indian fruits are probably the ''Bedana'' and ''Mazufferpur.''

The yield varies considerably according to age and condition of the trees. H. Newport has recorded a tree in the Cairns district as bearing 4 cwt. of fruit in a season at the age of about twenty-five years. Two hundred to three hundred pounds is regarded as a fair average for trees about this age.

In North Queensland the crop ripens during late December and January. Should the wet season be an early one some loss is experienced as the ripening fruit are subject to damage by rain.

Pests and Diseases.

The chief pest attacking the fruit is the flying fox, whose depredations may cause heavy loss. Fruit fly has also been reported as attacking the fruit at times, particularly if the crop is late.

Ringbarking of the limbs of the tree has been noted on occasions, the damage apparently being done by the larvæ of some beetle. An occasional inspection of the interior of the trees should be made for these borers. Their presence may be readily detected by the sawdust from their borings, which are usually located near a fork.

PLANTING DECIDUOUS FRUIT TREES.

By H. ST. J. PRATT, Instructor in Fruit Culture.

THE planting of deciduous fruit trees should be done in July if possible, and must be completed in August at the latest. The roots of fruit trees are working throughout the winter, although the tops are dormant, and early planting is desirable so that the trees can get established and become fit and strong enough to bear the strain of leaf and shoot production in the spring. If a tree is planted in July or early in August, by the time it should be putting forth its leaves and young shoots there will be an immense number of young rootlets growing from the sides and ends of the original roots, drawing nourishment from the soil to support the growth of leaves and shoots. Should the tree be planted late it will come into leaf before the young roots have developed sufficiently to support growth; the leaves will draw the sap that is in the tree, and when that is exhausted the tree suffers severely. The tree will be living, as it were, from hand to mouth—it has no sap reserves. If the weather conditions are ideal the grower will get away with it and may even say that early planting is unnecessary, but if the weather conditions are not good then a very great strain is put on the tree—it may be stunted, put on a weakly growth, or even die, and then the grower may blame the nurseryman for sending out weak trees and suggest that they were diseased, whereas he alone is to blame for not planting them at the proper time.

Young trees when lifted from the nursery of necessity have their root systems reduced considerably, and so when planted out the tops must be severely shortened to balance not only the reduced rooting system but also the break in its development. The shortening of the tops also has the advantage of retarding leaf growth and so giving the roots additional time to store up sap so as to ensure a regular flow when growth commences.

APPLE PRUNING IN THE STANTHORPE DISTRICT.

By H. St. J. PRATT, Instructor in Fruit Culture.

THE object of pruning is to make the tree bear regular crops each year of good-sized commercial fruit over as long a period of years as is possible. If too much bearing wood is left, the tree will be weakened by setting too heavy a crop for it to stand, and if too much bearing wood is cut out, then rank wood growth with a light crop of over-sized and unsaleable fruit will be the result. To achieve the objective the tree must be kept growing and annual common sense pruning is required, together with good cultivation and maintenance of the fertility of the soil.

If a tree is allowed to go unpruned, it would fruit right up the leaders, turn inside out with the weight of the fruit, fail to put on growth, and bear a fairly large crop biennially, and its commercial life in the Stanthorpe district would be of very short duration. The tree would not die, but it would not pay. It should be borne in mind that fruit is really a sign of weakness; Nature says—"Reproduce, and then die."

A healthy tree must have plenty of foliage, and be kept moving as to leader and lateral growth. The rooting system and the top are so much bound up with one another that, if the top is at a standstill, the roots cease functioning properly, and conversely anything that militates against the roots will adversely affect the top.

More fruit will always be produced on laterals than on spurs on the leaders. Laterals can be kept growing, but not so spurs which multiply and get weaker every year; this makes spur pruning necessary, a very tedious process.

It will be found that, in pruning an apple tree, practically every lateral will require some attention to keep the tree in a really healthy condition. Those of last year's growth will require shortening, and of those carrying spurs, some will require shortening back to a single spur in order to produce fresh growth after the fruit has set, to be shortened the succeeding year to keep the tree growing. If a lateral remains unshortened it bears an apple at the terminal bud, and then spurs back as far as the quantity of sap or vigour of the tree will permit. With a twelve inch lateral, it would probably spur back four spurs, and the remaining eight inches would become barren, and that lateral would be at a standstill; but if, on the other hand, the lateral was reduced to six or four inches, according to its strength, the apple at the terminal would be lost that year, but the next year the top bud would have put on a strong growth, the second bud a weak growth, the third a dart, and the next two or three buds would have developed into spurs, and the fruit would then be close to the leader or sub-leader with growth beyond the fruit.

Sap in a fruit tree always flows to the top or extremities—the top bud gets the most sap, the second bud less than the first, and the third less than the second, and so on; but it will have to be remembered that there is not sufficient sap to develop all the buds, and a good pruner, before cutting a leader or a lateral, unconsciously makes a quick mental calculation as to how many buds can be left so that practically every bud will develop. The length that can be left will

depend on the vigour of the tree. Whenever a lateral or leader is cut it acts like a suction pump, drawing the sap, and so assists very materially in keeping the sap in circulation.

The aim of the pruner should be to get growth and foliage beyond the fruit. The leaders of the tree must be well defined, and nothing should interfere with their growth or enter into competition with them. It is better to make the tree proceed upward and slightly outward slowly with sturdy limbs well furnished with laterals, than to run the tree up quickly by long pruning with barren spaces devoid of fruiting wood. Everything connected with a fruit tree, whether lateral or leader, will grow more vigorously vertically than horizontally. In the shaping of a tree be careful not to develop too great a spread during the first few years prior to the tree's coming into bearing. The weight of the fruit will bring out the leaders considerably, and many a grower who has been proud of his goblet-shaped trees when four or five years old has been horrified to find them requiring props to prevent them turning inside out as soon as they bore a crop of fruit.

PRODUCTION OF EARLY-BEARING GRAPE VINES.

Following is a translation of an extract from "Der Landfreund" (Berne, Switzerland), 10th May, 1935:—

NORMALLY several years are required before a grape vine produces its first fruit. We give below a procedure by which vines can be raised that will have produced beautiful clusters by the first year after planting.

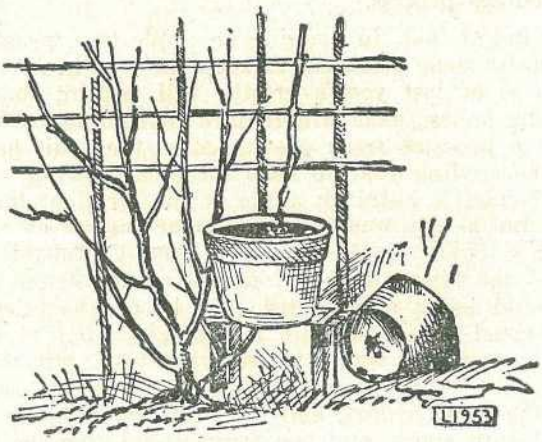

PLATE 53.—A sound, healthy shoot of the vine is introduced into the pot, as shown in the illustration.

Early in the year, before the sap begins to mount, select a suitable slender vine without side shoots. Stick it through a hole bored in the bottom of an old pot or such like, and fix the vessel on a stand so that the vine is subject to no shocks and can be trained over the trellis in the usual way. Fill up the pot with compost or good calcareous garden

soil, and keep the vine quite moist by regular watering. The vine then strikes root abundantly inside the pot in the course of the summer and autumn. In the winter make sure of a frost proof covering.

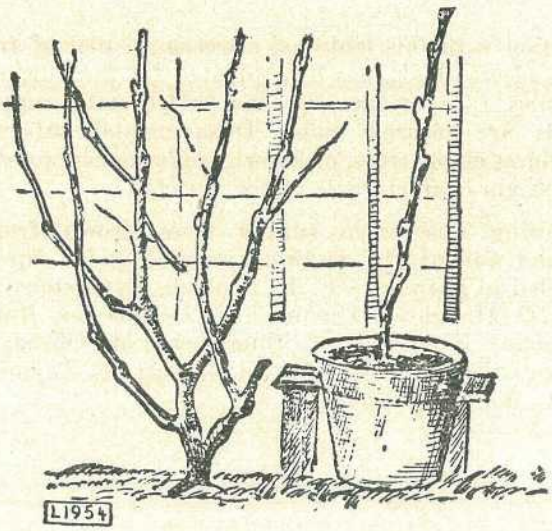

Plate 54.—After striking root, a fairly rapid process, the vine is cut off, and thereby another plant is obtained.

At next spring the vine can be cut off at the pot, and the now rooted and vigorous plant can be transferred to the place already selected (and well-prepared) for it. The vine will bloom at the accustomed time and produce fruit.

CITRUS BUDWOOD SELECTION.

THE large proportion of trees of undesirable strains in many of our citrus orchards is largely due to the lack of care in the selection of budwood.

With regard to citrus trees, there is no general accepted theory to account for bud variation; it is of a more or less frequent occurrence in trees of all varieties. It may manifest itself in the habit of growth of the tree, or in the size, colour, texture, abundance or scarcity of the fruit. Sometimes a tree grown from a single bud will develop several distinct strains of fruit. Minor variations in fruit characteristics are of very frequent occurrence.

It must be patent to growers that too much care cannot be taken in the selection of budwood. Nursery propagation of bud variation may be largely avoided through the use of buds selected from trees whose records have shown them to be heavy, consistent producers of fruit of a desirable strain.

In this regard Queensland has enacted legislation prohibiting the sale of citrus trees excepting those which come up to certain desirable standards. Nurserymen now sell only the acknowledged best varieties of trees which have been grown from seed selected under the supervision of an officer of the Fruit Branch of the Department of Agriculture and

Stock, and which have been worked with scions selected under the supervision of such officer from vigorous trees free from disease and bearing large, consistent crops of fruit characteristic in all respects of the variety.

In connection with this budwood selection, a plot of trees, worked from specially selected buds, has been planted for the purpose of future budwood supplies. To bridge over the period until supplies become available, buds are secured under Departmental supervision from Queensland's finest citrus trees, of known performance, producing fruits of a desirable strain characteristic of the variety.

The following nurserymen supply trees grown from specially selected seed and worked with budwood selected under supervision, and are recommended to growers:—F. E. Benham, Byrnestown; T. Houghton, Lawnton; O. Houghton, Lawnton; C. Langbecker, Bundaberg; E. Obrist, Rochedale; E. A. Obrist, Bundaberg; J. Obrist, Rochedale; E. Sandall, Sunnybank; J. Trim, Mount Gravatt; E. Taylor, Eight-mile Plains; and H. Williams, Runcorn.

MARKETING NOTES.

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

Deciduous Fruits.

DECIDUOUS growers should now give attention to cleaning up the boxes used for picking and the machinery used for sizing and handling, in an endeavour to eliminate Brown Rot and kindred diseases which might easily be carried over to next season's crop if precautions are not taken. Spraying the machinery, &c., with a solution of 1 part of formalin to 20 parts of water, and dipping the boxes for two minutes in lime sulphur solution, will be effective and go far in helping to check these troubles next season.

Apples.

A very difficult season has now drawn to a close. The apple crop, owing to severe hail damage in most parts of the Granite Belt, was hard to handle satisfactorily. Growers should not attempt to cold store for late marketing apples that have been affected by hail, as apart from the risk of the fruit becoming "specky" in store, it will be hard to obtain prices that will cover the extra expense of cold storage, as this fruit will be sold in competition with Southern fruit unaffected by hail.

The results of this season's marketing must give us food for a great deal of thought. At present one of our most largely grown apples is under a cloud—I refer to the Dunns. This apple is the finest early cooker, and possibly the finest cooker we grow, yet immediately green Granny Smith apples are placed upon the market, the prices of Dunns fall to an unprofitable level. If as much propaganda were used in boosting the Dunns as is with the Granny Smith, and housewives were made acquainted with its excellence, then our Cinderella of apples would possibly return prices which would be of great advantage to the apple districts. The writer would mention in passing that to date Dunns

when in season are being used in preference to Granny Smiths by many of those housewives whose families produce both Dunns and Granny Smith apples.

Now let us look at the results of our Granny Smith marketing. In the Granny Smith as grown in Queensland we produce, I consider, the finest apple of its type in Australia. In our marketing of this apple are we doing the correct thing in order to maintain the excellent reputation that past years have given it? This season Granny Smiths were placed on the market early in January, the prices for the first consignments touching 12s., whilst Jonathans, which are considered inferior to the former, were realising much lower prices. A fortnight later, due to their immaturity, Granny Smiths were down to 6s., with Jonathans up to 2s. per case higher. A month later, when the Granny Smiths were more forward, the prices had risen 1s. to 2s. per case, and this in face of the extra opposition offered by the large quantities of badly hail-marked fruit and export culls which were placed on the market. The prices of Jonathans remained about the same. On examining the whole marketing situation I consider it only reasonable to expect that better financial results would accrue to the industry if the opposition offered to the Dunns by green Granny Smiths early in the season was removed, and a good boost was given to the Dunns through intensive advertising. It is only late in the season that the Granny Smith matures to be the great apple we can all appreciate.

Exporters have become acquainted with the new grade designations "Extra Fancy" and "Fancy." I would point out, however, that the old designations "Special," "Standard," and "Plain" still apply to the local marketing of apples.

Publications in connection with apples issued by the Department and now obtainable free upon application are packing charts for packing both the standard and dump cases, and a leaflet on cold-storing Granny Smiths. A comprehensive booklet on marketing apples will be issued in the course of a few weeks, embracing harvesting, packing, and storing information.

Citrus Fruits.

The citrus season is with us, and growers must for their own protection become acquainted with the requirements of the citrus maturity standards. These are as follows:—

In the case of oranges, grape fruit, and mandarins, the weight of the hand-pressed juice in mature fruit must be not less than 30 per cent. of the total weight of the fruit.

As regards navel oranges and mandarins, ten cubic centimetres of juice must be neutralised by not more than twenty-six cubic centimetres of deci-normal (N/10) alkali, while in the case of oranges other than Navels ten cubic centimetres of juice must be neutralised by not more than thirty cubic centimetres of deci-normal (N/10) alkali.

An outfit for testing, complete with solutions, instructions, &c., can be obtained from the Committee of Direction of Fruit Marketing.

These maturity standards are being enforced, and some early-marketed lines of fruit were removed from the market. Growers using artificial colouring methods should use only ethylene or acetylene gas

methods. Motorcar exhaust gases or kerosene lamps will only create difficulties in marketing. It must be remembered that only matured fruit will colour satisfactorily. The practice of colouring should not be condemned, but rather the abuse of it by growers who have not the interests of the industry at heart.

The usual warnings are given with regard to blue mould. The use of picking bags is not recommended, as they roll the fruit, causing small skin damage to occur with consequently a much greater chance of mould infection.

In packing, the count system is recommended in preference to sizes. First grade fruit should always be wrapped. Eliminate as far as possible small sizes of fruit, as there is no demand for them. Send regular consignments, as haphazard marketing does not give your agent a chance to work up a connection.

Publications available for free distribution include packing charts for oranges in both the standard and dump cases, and booklets on marketing both oranges and lemons. A packing chart for lemons is in course of preparation and will be available at an early date.

Tomatoes.

Growers marketing coloured lines continue to obtain better prices than those marketing green or partly-coloured lines. Local growers of small lines of tomatoes using second-hand cases must take care to scrape off or obliterate all marks placed on the cases by previous users.

Publications available include a packing chart and a booklet on marketing tomatoes in the dump half-bushel and long half-bushel cases.

Custard Apples.

Many growers still do not attempt to make good packs of this fruit. The main fault encountered is the large amount of green fruit placed on the market. Such practice very quickly turns away consumers from this luscious fruit, as green custards go black in the skin and are lacking in flavour.

Papaws.

Many green papaws also are on the market. Winter papaws are hard to ripen off the tree, so fruit should be allowed to advance to a more coloured stage before picking in winter than in summer.

Pineapples.

Care should be taken to eliminate as far as possible pineapples with brown heart. Since the cold weather this trouble is more apparent, especially in Roughs, making customers doubtful when buying.

Publications are available from the Department on the packing of passion fruit, pineapples, custard apples, papaws, and strawberries.

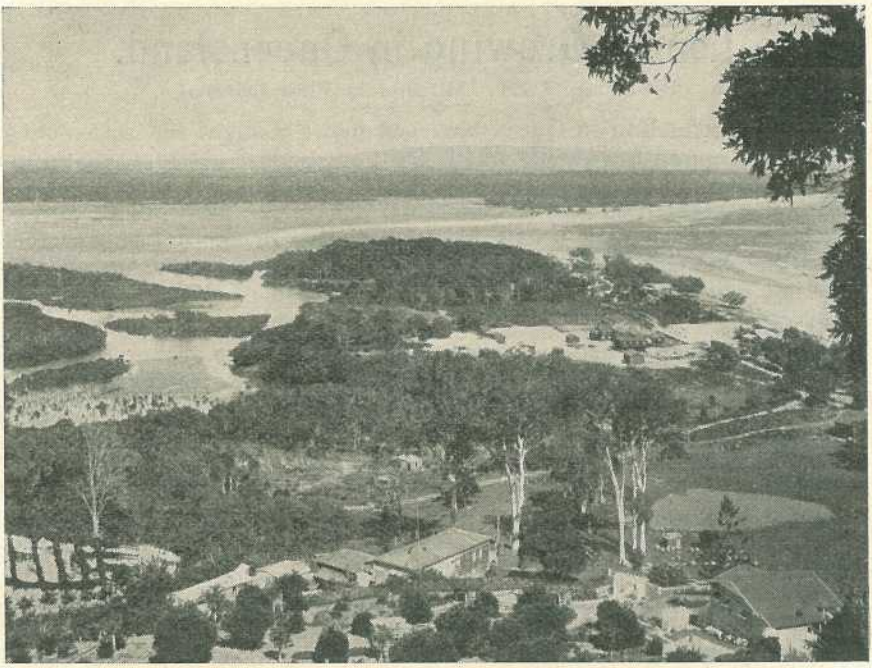

Plate 55.—Noosa Heads, South Queensland.

Plate 56.—A Favourite Corner on a North Coastal Dairy Farm.

Lemon Growing in Queensland.

By R. L. PREST, Instructor in Fruit Culture.*

LEMON production in Queensland has shown a slight but satisfactory increase, and the quality of the fruit is equal, if not superior, to the Italian and Californian fruits. The newer orchards have been, and are now being, planted on sound commercial lines. The trees are all worked on selected stocks with scions from known-performance trees, so that where the maximum attention is given and the trees grown under suitable soil and climatic conditions, the production of desirable fruits is as far as possible ensured.

With one or two exceptions the choicest lemons are produced in some of our semi-arid regions where suitable soils and water for irrigation purposes are available. Lemons will succeed well on a good many kinds of soils providing they are deep and well drained.

In relation to fruit quality, soil relations are difficult to discuss, as they are closely bound up with other contributing factors. Evidence in Queensland points to sandy loams (where the environment is suitable and reasonable measures can be taken to offset adverse seasonal conditions) as being the most satisfactory for the production of high grade lemons. Suitability appears to be due more to the physical properties of the soil and the maintenance of such physical condition than to the chemical properties. It is therefore important that from the outset attention be given to keeping up the humus content in the soil. In the absence of farmyard manure, which would be required at the rate of at least 20 tons to the acre, green manuring must be resorted to, care being taken to see that such crops do not compete with the trees for moisture. General observations from field trials would indicate that nitrogen is one of the main constituents required to maintain healthy and vigorous lemon trees. At the same time phosphoric acid and potash have their place. At least 6 cwt. of sulphate of ammonia to the acre, with 4 cwt. of phosphoric acid and 2 to 3 cwt. of potash would be a basis for a fertilizing programme for mature bearing trees. The nitrogen is best supplied so as to be available during the spring. Such practice tends to increase the crop and improve the quality. Whether or not an autumn application will be necessary will depend upon the vigour of the tree. The promotion of too much vigorous growth at this period is detrimental to the production of high grade fruit. However, it will be found that a light dressing of nitrogen with rather increased quantities of phosphoric acid and potash will assist in maturing autumn growth and future fruiting wood, and will also benefit the crop.

Irrigation.

In Queensland this practice is as yet in its infancy. It is felt, however, that far better results will be achieved by the checking of soil moisture by means of a soil augur, and so learning the moisture requirements to a far greater depth, than by the usual examination of only the top 3 or 4 inches. Many of the lemon-growing soils are of a deep sandy nature and more likely to be over-drained than under-drained. More frequent and regular waterings would greatly tend to reduce the wilting that frequently occurs.

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*From a radio broadcast from National Station 4QG, Brisbane, and 4RK, Rockhampton.

Pruning.

The general practice has been to prune lemon trees quite severely while they are young in an effort to control the growth for a strong framework. Apart from the treatment at planting, which consists in the shortening back and removal of badly broken and bruised roots, together with a corresponding shortening back of the head of the tree in such a manner as to ensure a strong straight stem with three or four well-placed main arms radiating from it. During the first two or three years little pruning should be done, comprised merely of a thinning system, with practically no heading back except perhaps to shorten into laterals. In starting the tree in this system some six main upright shoots, well-spaced, are selected as main leaders. As they become weighted down at the ends, strong side-shoots will arise, and these may be thinned and shortened to make fruiting spurs, suitable ones being left to take the places of former leaders. Practically no lower branches are cut, even though they may appear crowded. It is seldom that a crowded condition on a young lemon tree warrants the removal of foliage.

As the tree grows older it is built up in a series of irregular tiers of branches radiating from central permanent parts. The object sought after in building up the tree by means of a series of branches bending from an upright position is to establish a fruit-bearing habit. The quiet habit assumed by the side shoots arising from such branches is conductive to fruit production. The vigour of the vertical shoot does not allow it to throw into fruit until subdivisions become numerous and weak.

When shortening any side shoots the cut should be made back into ripe wood, tending to throw the sap into dormant buds. Any light wood issuing from inside the more erect permanent arms may be retained and from time to time renewed, but no rank growth is tolerated unless it is required to continue the work of some displaced leader. As the lower limbs drag down it will be found necessary to lift the tree from time to time by removing some of these lower limbs.

Picking and Curing.

Lemons carefully handled and gathered at the right stage of maturity may be successfully cured and stored on the orchard for several months without deteriorating, but rather with improvement to their appearance and carrying qualities. All fruits should be clipped, not pulled from the trees, just as they are turning colour. The fruit should be of normal size and the dark green colour just turning to a paler shade which is generally termed silvering. In order to avoid injuring and bruising, and thereby leaving the fruit open to the attack of moulds, it is important to remember that it must at all times be handled with the very greatest of care. After picking, the fruit should be placed in shallow trays and allowed to remain for several days to sweat off excess moisture. When storing for any length of time, dipping in a bluestone solution 1 in 500 for a period of one to two minutes is recommended. After thoroughly drying, the fruit is packed in bushel cases and stacked in a storing chamber in such a manner as to permit a ready circulation of air. Such chamber should be so constructed as to lend itself to control of the relative humidity. A low relative humidity results in the shrinkage of the lemons, with a consequent loss of weight and an inferior colour in the fruit, accompanied by a shrivelling as well as the browning and dropping of the buttons of lemons held in storage for any period. These conditions are mostly apparent during late spring, a period of

relatively high day-time temperatures and a low relative humidity. Satisfactory conditions may be obtained by controlling the humidity at from 85 to 90 per cent. For controlling the humidity a humidifier may be cheaply constructed by hanging a series of absorbent cloths from a frame, above which a small perforated iron water pipe permitting water to drip when required is fixed, and the air in the chamber circulated by means of a small fan. Under such conditions lemons may be stored for several months.

Other methods used in storing lemons are, after sweating, to loosely pack the fruit, either wrapped or unwrapped, in cases lined with paper, which are stacked in a cool dry shed in blocks of from fifty to sixty cases and covered with a canvas sheet or tent. Low open water containers may be introduced when necessary, always as far as possible avoiding extreme variations in temperature and humidity. Fruits should be examined at intervals of ten days, and those showing signs of decay removed. Or they may be stored by wrapping the fruit in sulphite tissue wraps and loosely packing in cases lined with paper, using chaff or straw as a filler. The bottom of the case is covered with a layer of straw or chaff, a layer of lemons is then placed thereon, and the spaces filled and the lemons covered with a further layer of chaff or straw, and so on until the case is full. The cases are then stacked, handled and examined as for the cases packed without chaff.

PLATE 57.—LAKE COOTHARABA, SOUTH QUEENSLAND. BOREEN POINT IN THE MID-DISTANCE.

A Handy Lidding-Press for Cased Bananas.

THIS press is easy to make and simple to use. The following timber is needed:—

2 pieces 4 inches by 2 inches by 30 inches long for side pieces;

1 piece 3 inches by 3 inches by 13½ inches long for base block;

1 piece 8 inches by 1½ inches by 13½ inches long for pressure unit;

1 piece broom handle 12 inches long for handle of pressure unit;

4 pivots (pieces of broom handle) for pressure unit and base block;

4 pegs or pins to place on the outside of side pieces.

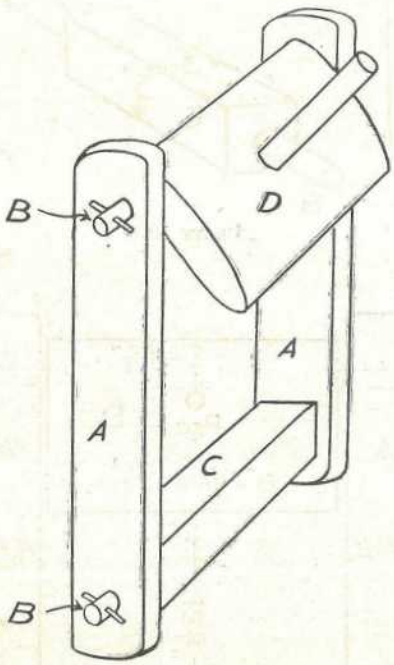


Plate 58.

The side pieces (A) are drilled to take the broom handle pivots (B), which are placed in the ends of the base block (C) and pressure unit (D). The holes should be drilled so as to permit the bottom of the pressure unit and the top of the base block to be 12½ inches apart (see Plate 58).

The pressure unit is made by taking the 8 inch by 1½ inch by 13½ inch piece of timber and rounding one edge. This is the bottom edge which comes in contact with the box lid while pressing. The board is

drilled at the opposite edge to take the pivots, one being inserted at either end about 1½ inches from the top edge. The lever is inserted in the middle of the board 3½ inches from the top edge.

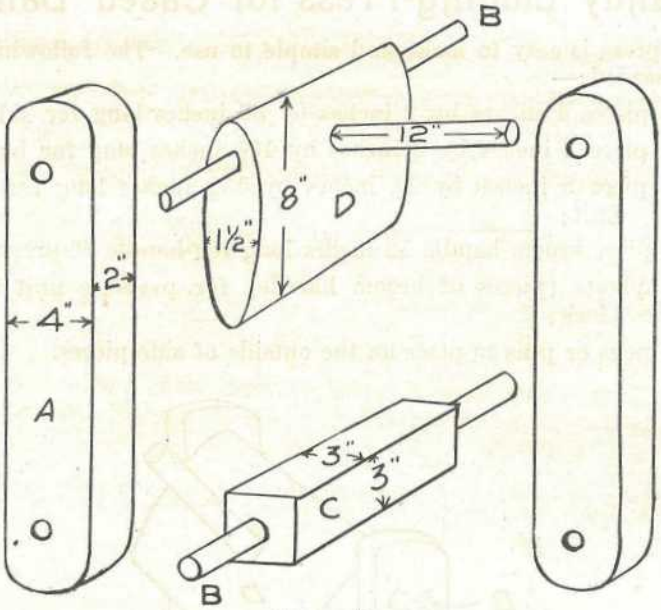


PLATE 59.

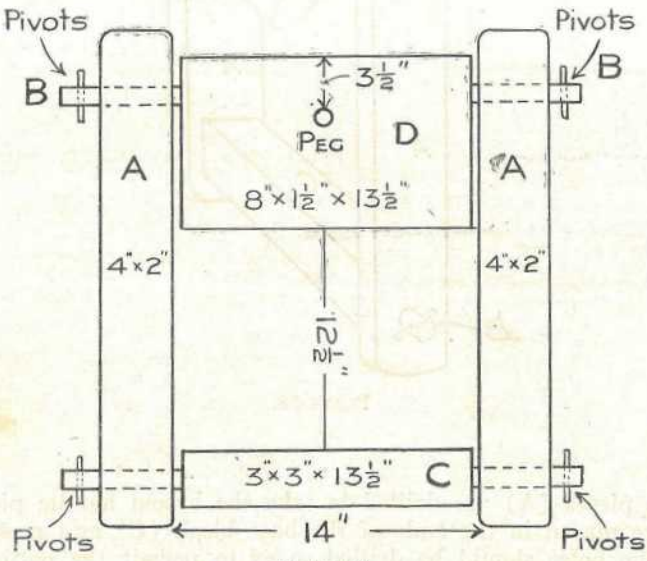


PLATE 60.

The base block of 3 inches by 3 inches timber is made by inserting two pivots into the ends. The pivots should be approximately 6 inches long, and be inserted at least 2 inches into the pressure unit and base block.

A glance at Plates 59 and 60 will illustrate the method of use.

Thanks are due to Mr. E. H. Taylor, of Upper Mudgeeraba, for his assistance in making available the means for photographing the appliance.

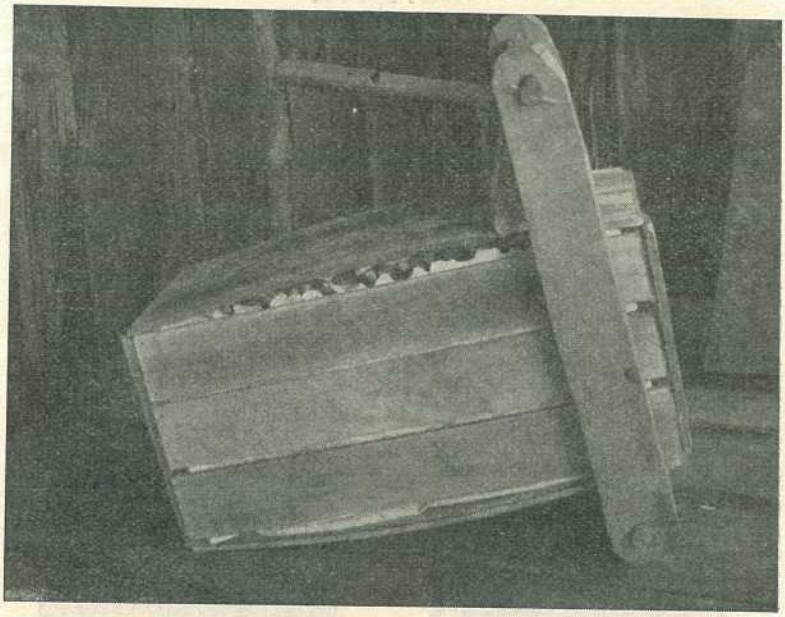


Plate 61.—Before Applying Pressure to Lid.

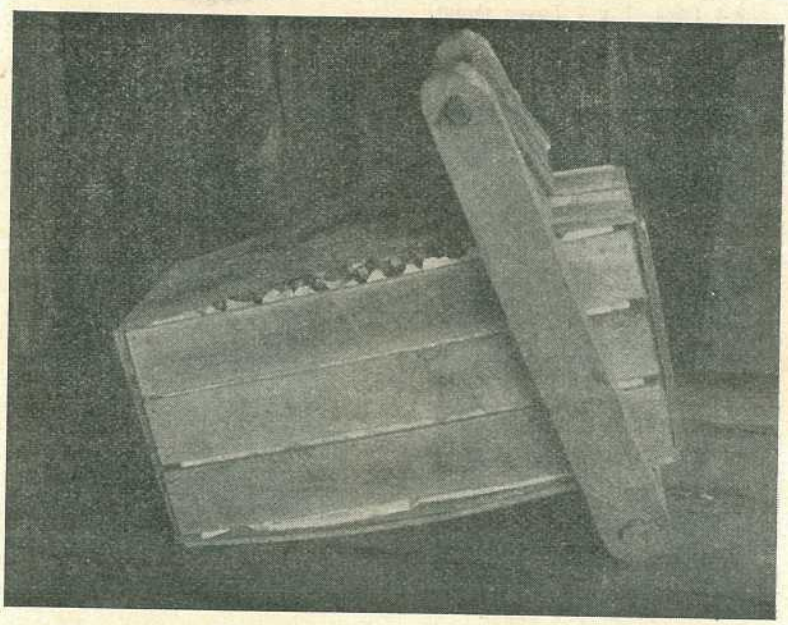


Plate 62.— Pressure Applied.

Apple Packing for Export and Home Markets.

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

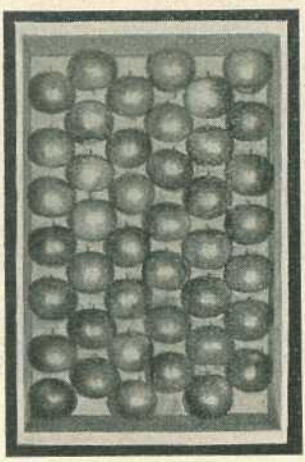
PART II.

(*Continued from p. 70, vol. xliii., Part I.—January, 1935.*)

HOW TO PACK THE STANDARD CASE.

3-3 Pack.

First Layers.



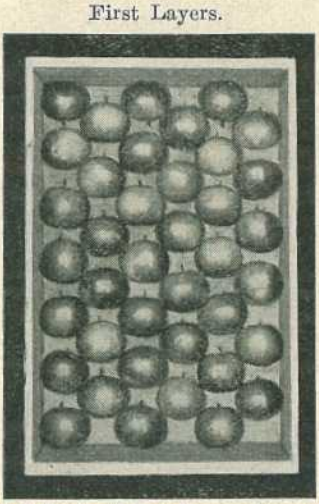
3-3 Pack, 7 x 7 Layer Count.
6 Layers. 252 Count.

Finished Case.

Top Side

3-3 Pack. 252 Count.

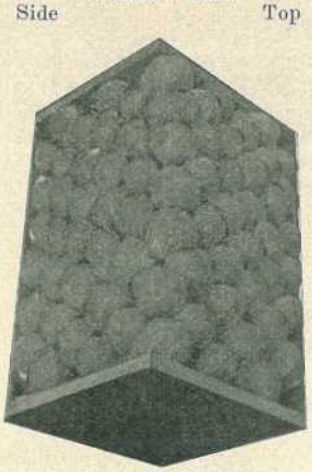
First Layers.



3-3 Pack, 7 x 6 Layer Count.
6 Layers. 234 Count.

Finished Case.

Side Top



3-3 Pack. 234 Count.

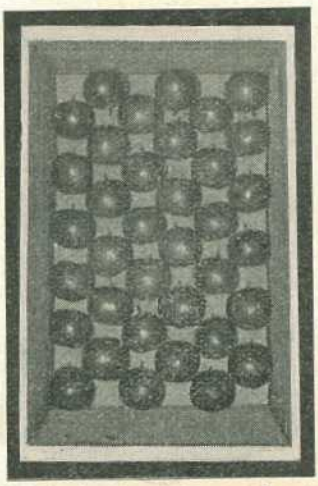
Observe the alignment of the fruit across, up and down, and diagonally in the case.

PLATE 63.

How to Pack the Standard Case.

3-3 Pack.

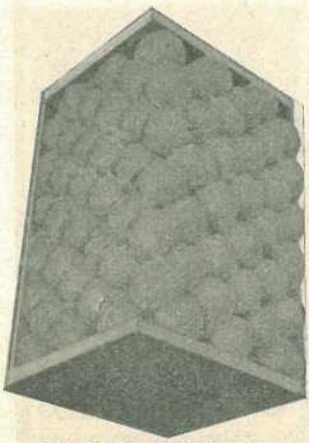
First Layers.



3-3 Pack, 6 x 6 Layer Count.
6 Layers. 216 Count.

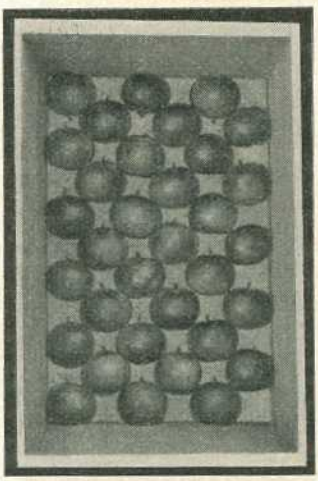
Finished Case.

Side Top



3-3 Pack. 216 Count.

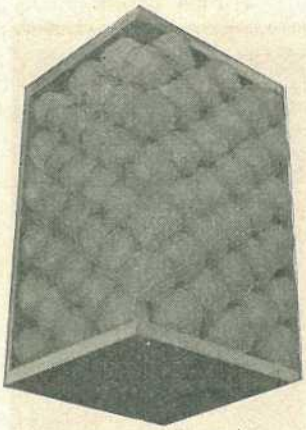
First Layers.



3-3 Pack, 6 x 5 Layer Count.
6 Layers. 198 Count.

Finished Case.

Side Top



3-3 Pack. 198 Count.

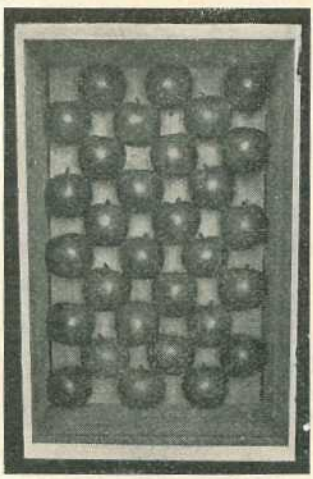
Observe the alignment of the fruit across, up and down, and diagonally in the case.

Plate 64.

HOW TO PACK THE STANDARD CASE.

3-3 Pack.

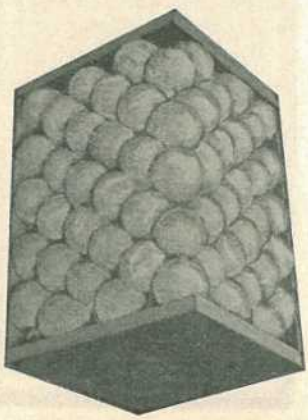
First Layer.



3-3 Pack, 5 x 5 Layer Count.
6 Layers. 180 Count.

Finished Case.

Top Side



3-3 Pack. 180 Count.

Observe the alignment of the fruit across, up and down, and diagonally in the case.

HOW TO PACK THE STANDARD CASE.

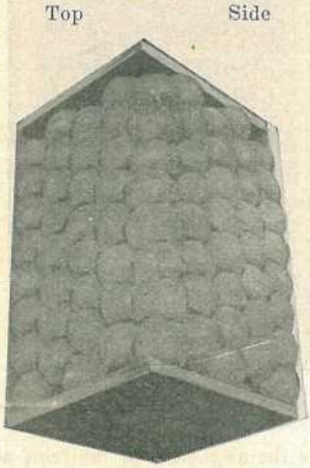
3-2 Pack.

First Layers.

3-2 Pack, 8 x 8 Layer Count.
5 Layers. 200 Count.

Finished Case.

Top Side

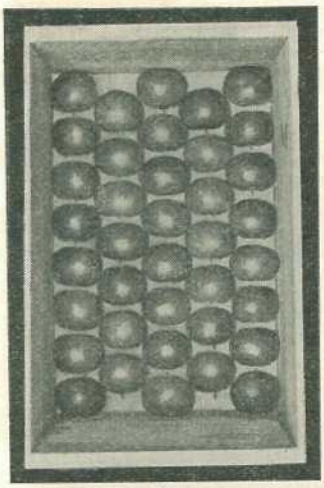


3-2 Pack. 200 Count.

PLATE 65.

How to Pack the Standard Case.

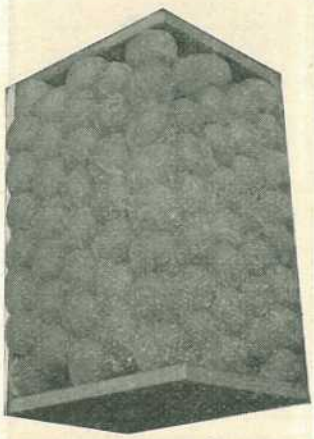
3-2 Pack.



3-2 Pack, 8 x 7 Layer Count.
5 Layers. 188 Count.

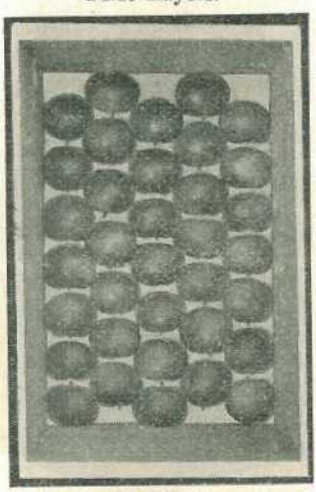
Finished Case.

Top Side



3-2 Pack. 188 Count.

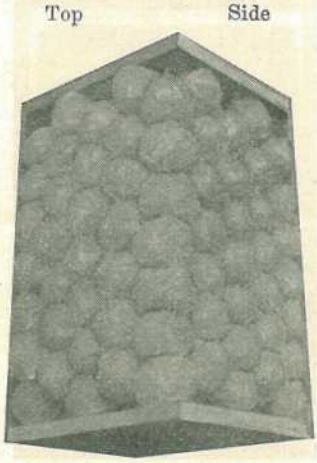
First Layers.



3-2 Pack, 7 x 7 Layer Count.
5 Layers. 175 Count.

Finished Case.

Top Side



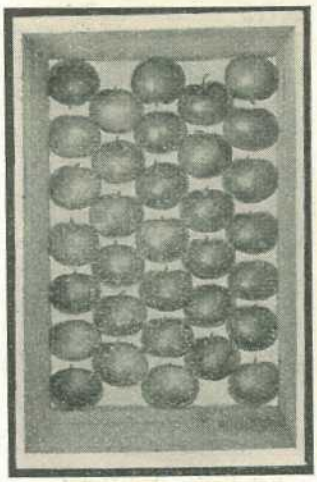
3-2 Pack. 175 Count.

Plate 66.

HOW TO PACK THE STANDARD CASE.

3-2 Pack.

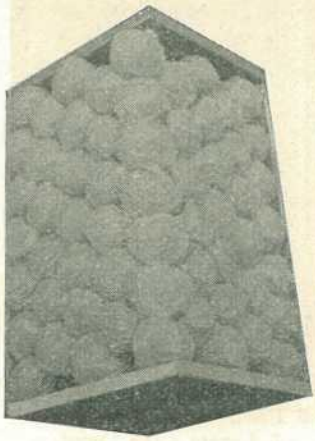
First Layers.



3-2 Pack, 7 x 6 Layer Count.
5 Layers. 163 Count.

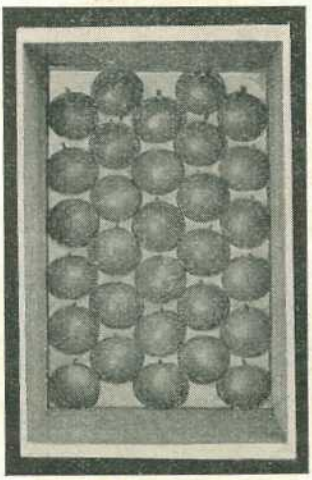
Finished Case.

Top Side



3-2 Pack. 163 Count.

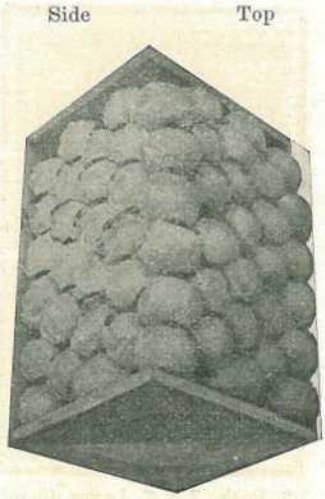
First Layer, 3-2 Pack.



3-2 Pack, 6 x 6 Layer Count.
5 Layers. 150 Count.

Finished Case.

Side Top



3-2 Pack. 150 Count.

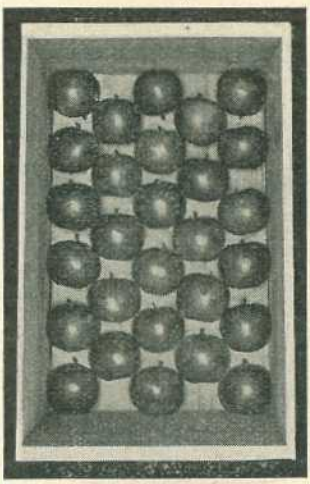
Observe the alignment of the fruit across, up and down, and diagonally in the case.

PLATE 67.

How to Pack the Standard Case.

3-2 Pack.

First Layers.



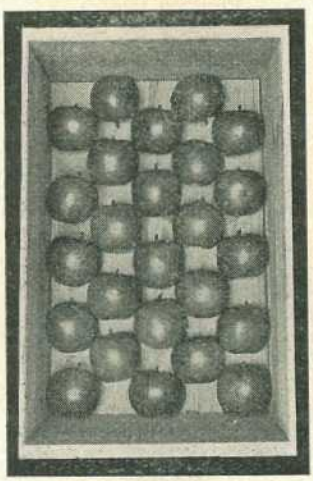
3-2 Pack, 6 x 5 Layer Count.
5 Layers. 138 Count.

Finished Case.

Top Side

3-2 Pack. 138 Count.

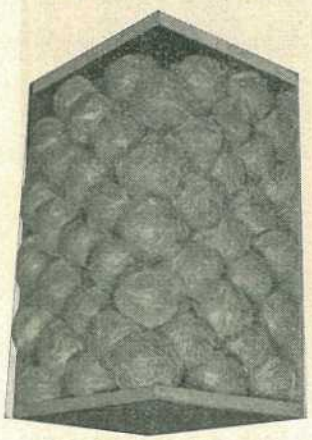
First Layers.



3-2 Pack, 5 x 5 Layer Count.
5 Layers. 125 Count.

Finished Case.

Top Side



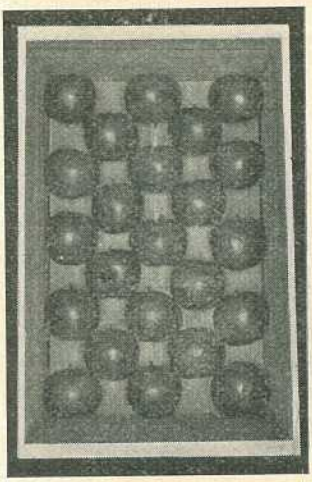
3-2 Pack. 125 Count.

Plate 68.

HOW TO PACK THE STANDARD CASE.

3-2 Pack.

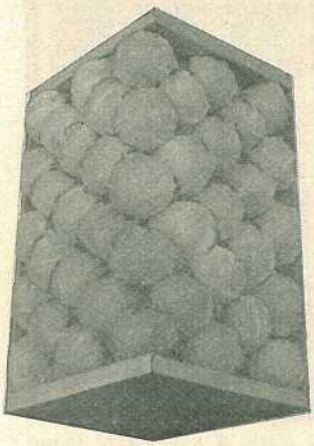
First Layers.



3-2 Pack, 5 x 4 Layer Count.
5 Layers. 113 Count.

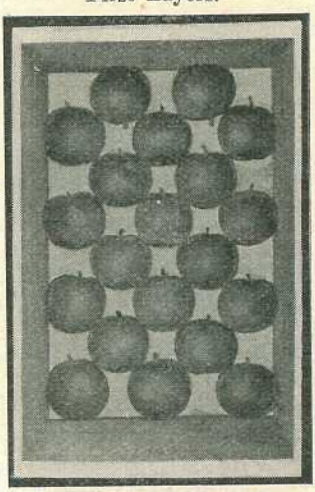
Finished Case.

Top Side



3-2 Pack. 113 Count.

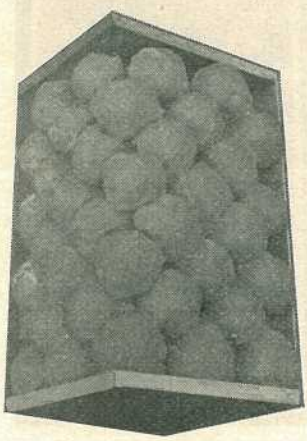
First Layers.



3-2 Pack, 4 x 4 Layer Count.
5 Layers. 100 Count.

Finished Case.

Side Top



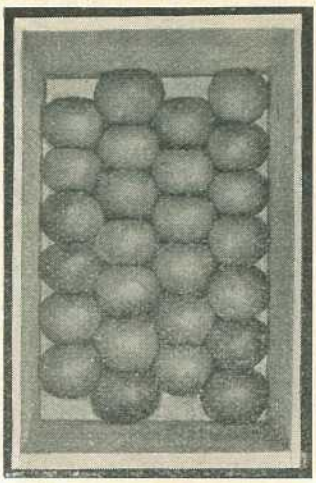
3-2 Pack. 100 Count.

PLATE 69.

How to Pack the Standard Case.

2-2 Pack.

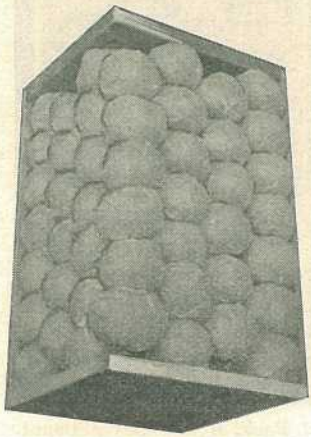
First Layers.



2-2 Pack, 7 x 6 Layer Count,
4 Layers. 104 Count.

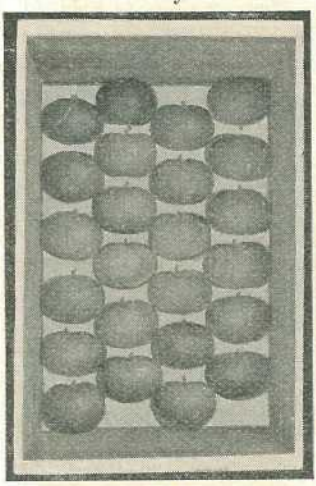
Finished Case.

Side Top



2-2 Pack. 104 Count.

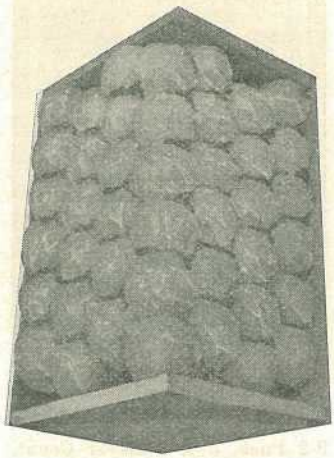
First Layers.



2-2 Pack, 6 x 6 Layer Count.
4 Layers. 96 Count.

Finished Case.

Top Side



2-2 Pack. 96 Count.

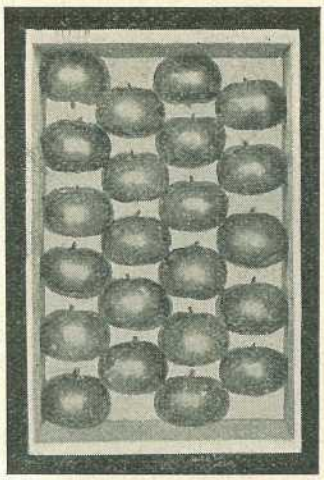
Observe the alignment of the fruit across, up and down, and diagonally in the case.

Plate 70.

HOW TO PACK THE STANDARD CASE.

2-2 Pack.

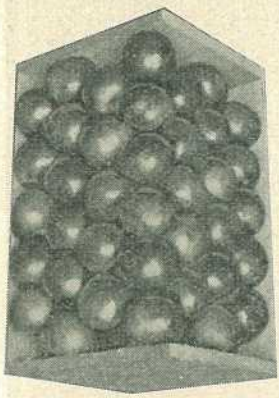
First Layers.



2-2 Pack, 6 x 5 Layer Count.
4 Layers. 88 Count.

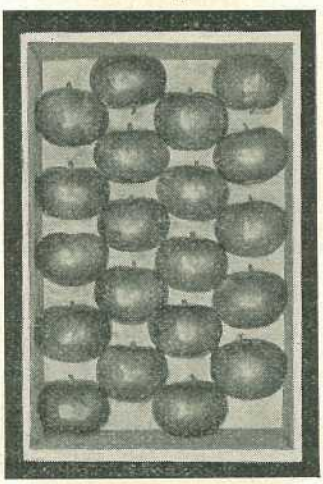
Finished Case.

Top Side



2-2 Pack. 88 Count.
Showing fruit with wrappers removed.

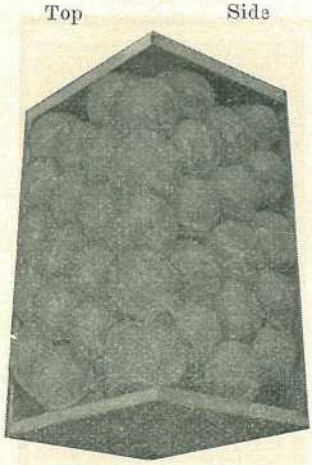
First Layers.



2-2 Pack, 5 x 5 Layer Count.
4 Layers. 80 Count.

Finished Case.

Top Side



2-2 Pack. 80 Count.

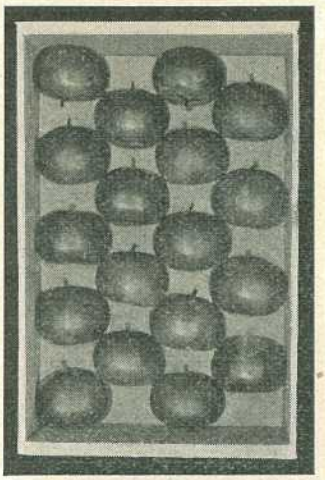
Note alignment of packed cases, across, up and down, and diagonally.

PLATE 71.

How to Pack the Standard Case.

2-2 Pack.

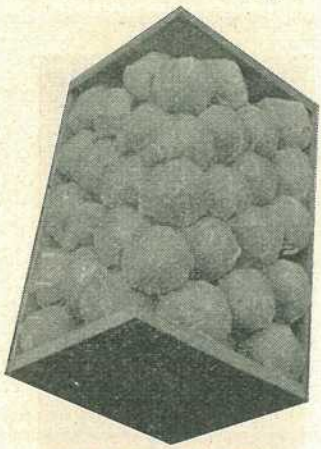
First Layers.



2-2 Pack, 5 x 4 Layer Count.
4 Layers. 72 Count.

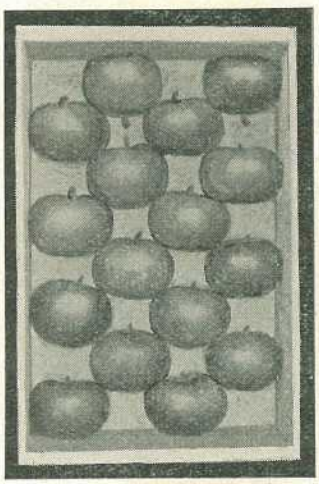
Finished Case.

Side Top



2-2 Pack. 72 Count.
Note alignment of packed cases.

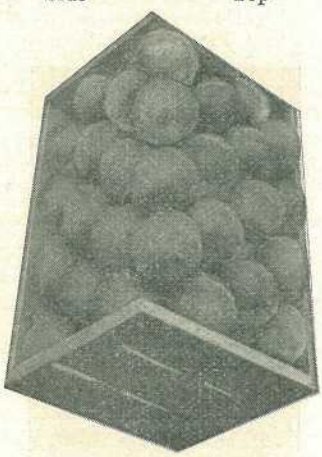
First Layers.



2-2 Pack, 4 x 4 Layer Count.
4 Layers. 64 Count.

Finished Case.

Side Top



2-2 Pack. 64 Count.
Showing fruit with wrappers removed.
Note placing of fruit.

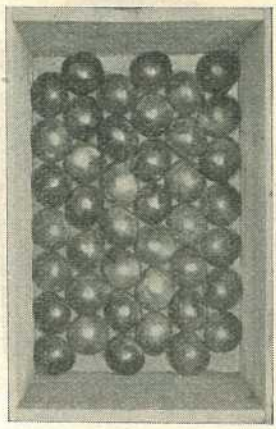
Plate 72.

EXAMPLES OF ANGLE PACKING IN THE STANDARD CASE.

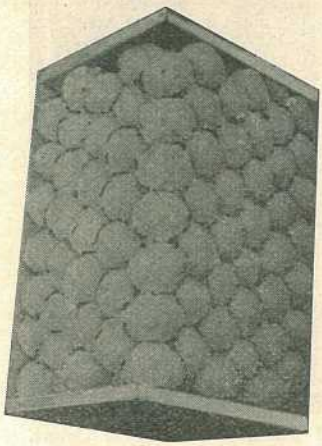
Angle Pack Counts are shown in the table of alternate packs.

3-3 Pack.

First Layer.



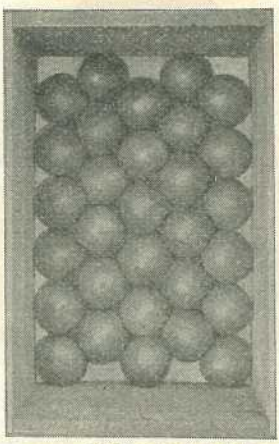
Finished Case.



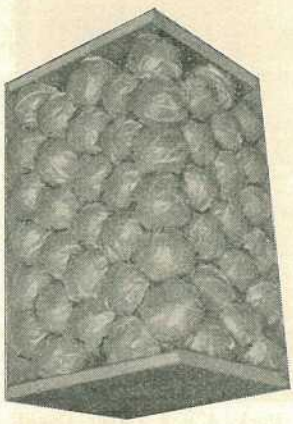
3-3 Pack, 7 x 7 Layer Count. 5 Layers. 210 Count.
3-3 Straight Packs have 6 Layers, compare with this 5 Layer Angle Pack.

3-2 Pack.

First Layer.



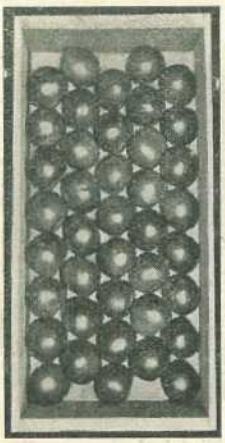
Finished Case.



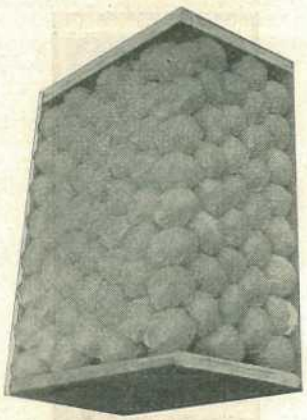
3-2 Pack, 6 x 6 Layer Count. 4 Layers. 120 Count.
3-2 Straight Pack have 5 Layers, compare with this 4 Layer Angle Pack.

PLATE 73.

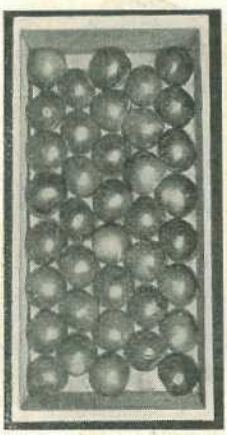
3-2 Pack. All 3-2 Packs have 7 Layers.



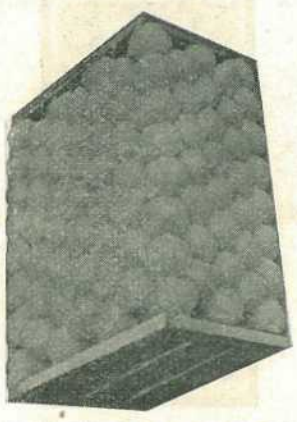
3-2 Pack, 8 x 8 Layer Count.
280 Flat Apples only.



Finished Case.
280 Count. 3-2 Pack, 8 x 8 Layer Count. 7 Layers. Flat Apples only.



3-2 Pack, 8 x 7 Layer Count.
263 Apples.

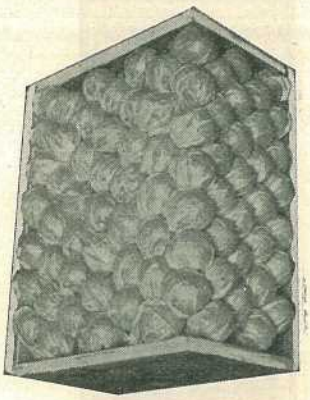


Finished Case.
263 Count. 3-2 Pack, 8 x 7 Layer Count. 7 Layers.

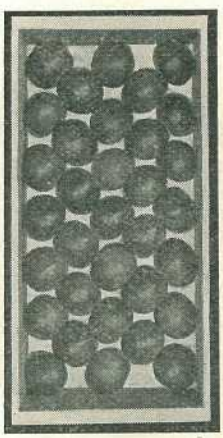
Plate 74.

3-2 PACK. ALL 3-2 PACKS HAVE 7 LAYERS.

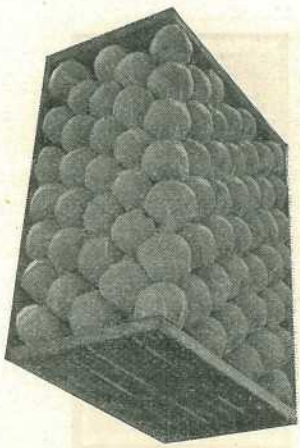
3-2 Pack, 7 x 7 Layer Count.
245 Apples.



Finished Case.
245 Count. 3-2 Pack, 7 x 7 Layer Count. 7 Layers.



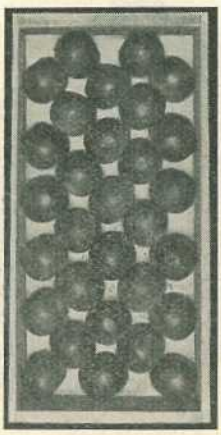
3-2 Pack, 7 x 6 Layer Count.
228 Apples.



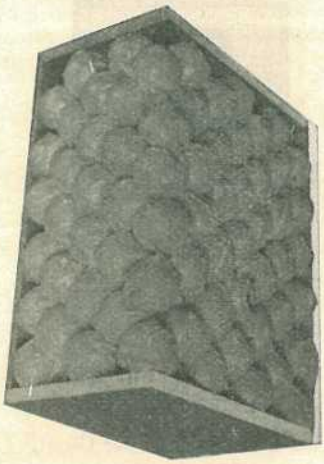
Finished Case.
228 Count. 3-2 Pack, 7 x 6 Layer Count. 7 Layers.

PLATE 75.

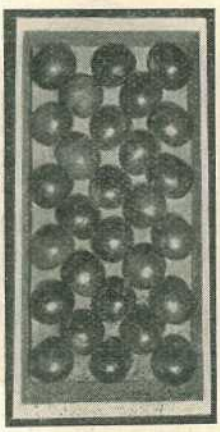
3-2 Pack. All 3-2 Packs have 7 Layers.



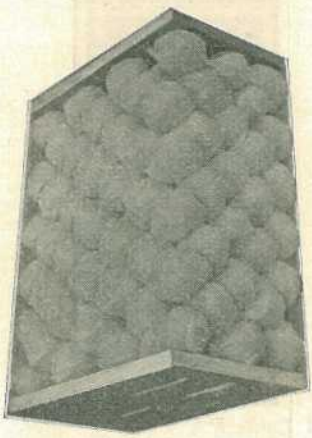
3-2 Pack, 6 x 6 Layer Count.
210 Apples.



Finished Case.
210 Count. 3-2 Pack, 6 x 6 Layer Count. 7 Layers.



3-2 Pack, 6 x 5 Layer Count.
193 Apples.

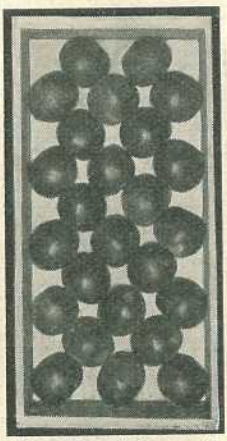


Finished Case.
193 Count. 3-2 Pack, 6 x 5 Layer Count. 7 Layers.

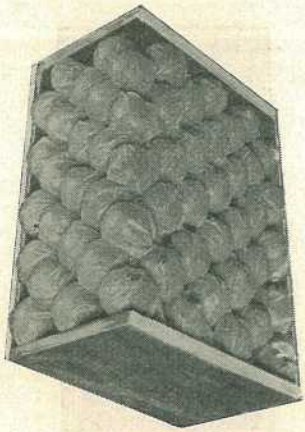
Note alignment of fruit across, diagonally, and end to end in the case.

Plate 76.

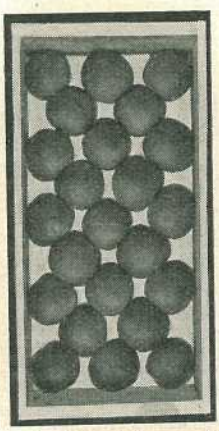
3-2 PACK. ALL 3-2 PACKS HAVE 7 LAYERS.



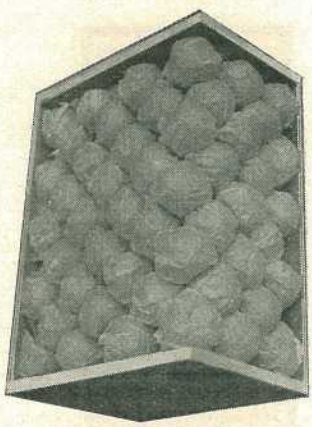
3-2 Pack, 5 x 5 Layer Count.
175 Apples.



Finished Case.
175 Count. 3-2 Pack, 5 x 5 Layer Count. 7 Layers.



3-2 Pack, 5 x 4 Layer Count.
158 Conical Apples only.

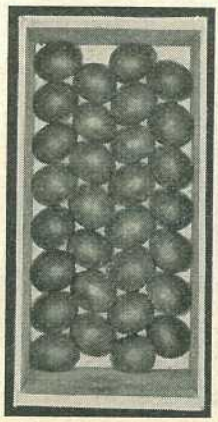


Finished Case.
158 Count. 3-2 Pack, 5 x 4 Layer Count. 7 Layers.
Use for Conical Apples only.

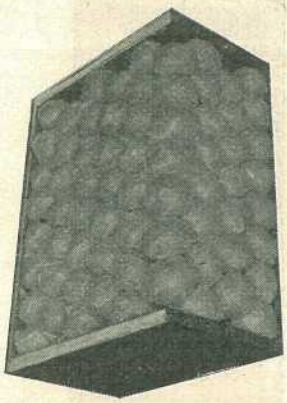
PLATE 77.

2-2 Pack.

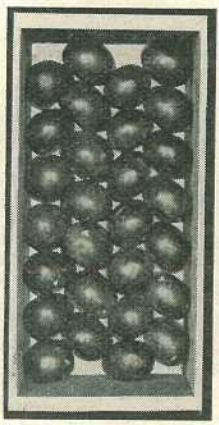
All 2-2 Packs have 6 Layers.



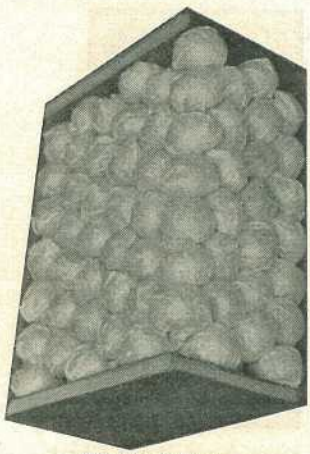
2-2 Pack, 8 x 7 Layer Count.
180 Flat Apples only.



Finished Case.
180 Count, 2-2 Pack, 8 x 7 Layer Count. For Flat Apples only.



2-2 Pack, 7 x 7 Layer Count.
168 Apples.

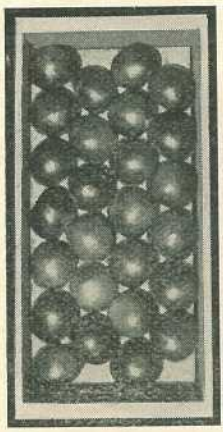


Finished Case.
168 Count. 2-2 Pack, 7 x 7 Layer Count. 6 Layers.

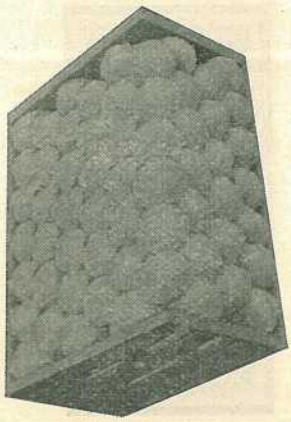
Note the alignment of the fruit across, diagonally, and end to end in the case.

Plate 78.

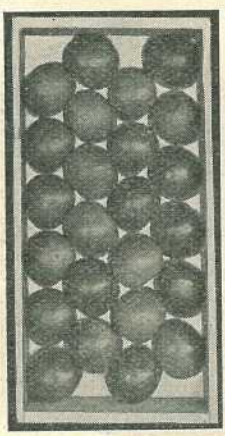
2-2 PACK. ALL 2-2 PACKS HAVE 6 LAYERS.



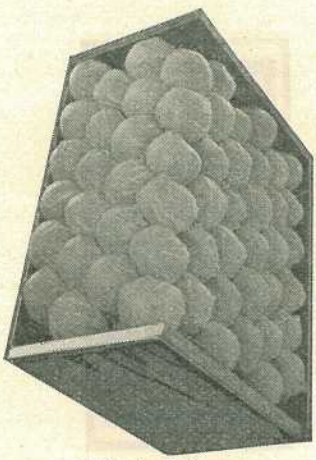
2-2 Pack, 7 x 6 Layer Count.
156 Apples.



Finished Case.
156 Count. 2-2 Pack. 7 x 6 Layer Count. 6 Layers.



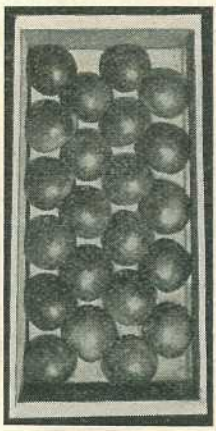
2-2 Pack, 6 x 6 Layer Count.
144 Apples.



Finished Case.
144 Count. 2-2 Pack, 6 x 6 Layer Count. 6 Layers.

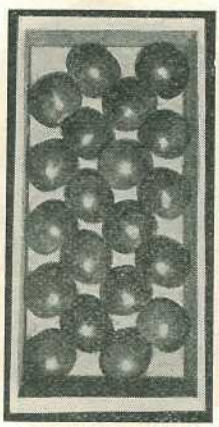
PLATE 79.

2-2 Pack. All 2-2 Packs have 6 Layers.

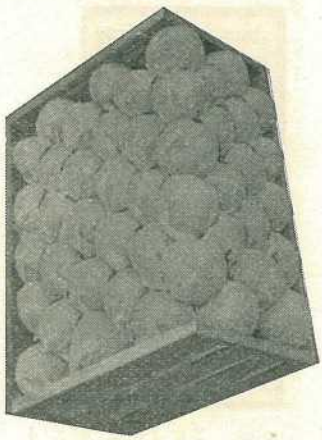


2-2 Pack, 6 x 5 Layer Count.
132 Apples.

Finished Case.
132 Count. 2-2 Pack, 6 x 5 Layer Count. 6 Layers.



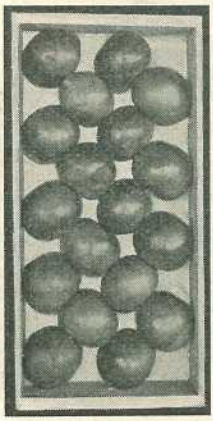
2-2 Pack, 5 x 5 Layer Count.
120 Apples.



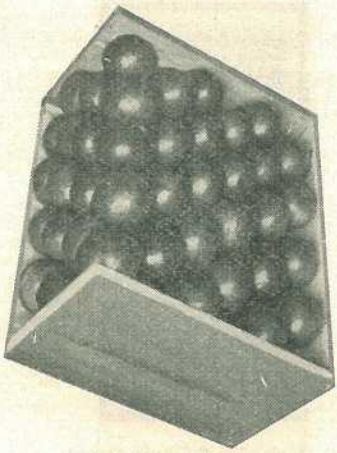
Finished Case.
120 Count. 2-2 Pack, 5 x 5 Layer Count. 6 Layers.

Plate 80.

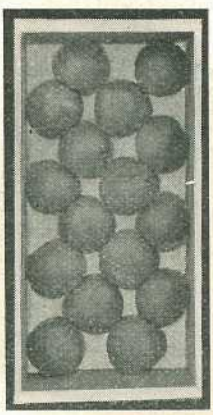
2-2 PACK. ALL 2-2 PACKS HAVE 6 LAYERS.



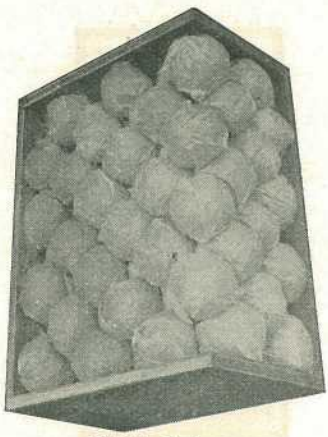
2-2 Pack, 5 x 4 Layer Count. 108 Apples.



Finished Case.
108 Count. 2-2 Pack, 5 x 4 Layer Count. 6 Layers.



96 Apples. 2-2 Pack, 4 x 4 Layer Count. For Conical Apples only.

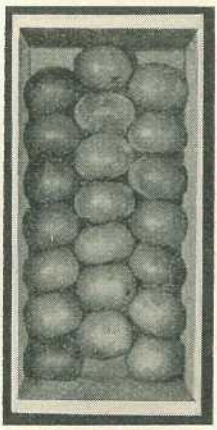


Finished Case.
96 Count. 2-2 Pack, 4 x 4 Layer Count. 6 Layers. For Conical Apples only.

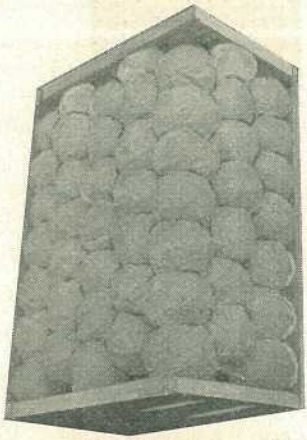
PLATE 81.

2-1 Pack.

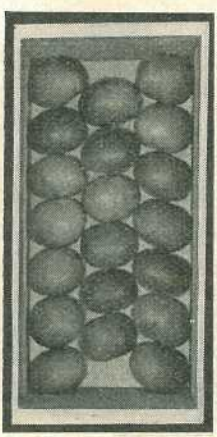
All 2-1 Packs have 5 Layers.



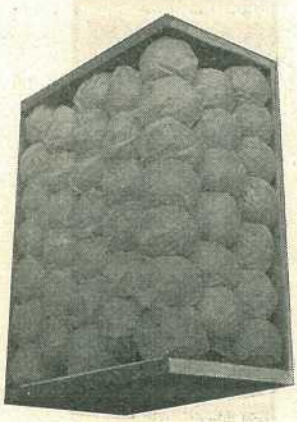
2-1 Pack, 7 x 7 Layer Count.
105 Flat Apples only.



Finished Case.
105 Count. 2-1 Pack, 7 x 7 Layer Count. 5 Layers.



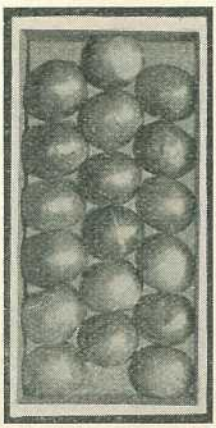
2-1 Pack, 7 x 6 Layer Count.
98 Apples.



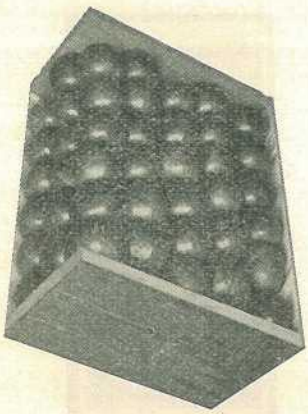
Finished Case.
98 Count. 2-1 Pack, 7 x 6 Layer Count. 5 Layers.

Plate 82.

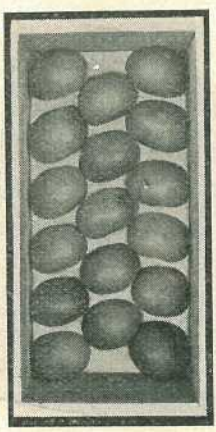
2-1 PACK. ALL 2-1 PACKS HAVE 5 LAYERS.



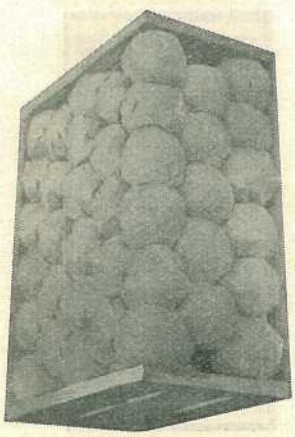
2-1 Pack, 6 x 6 Layer Count.
90 Apples.



Finished Case.
90 Count. 2-1 Pack, 6 x 6 Layer Count. 5 Layers.



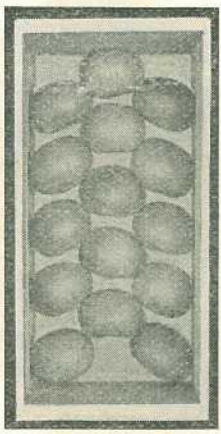
2-1 Pack, 6 x 5 Layer Count.
83 Apples.



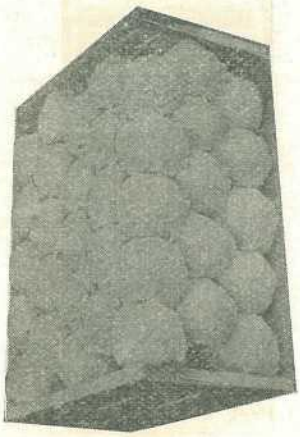
Finished Case.
83 Count. 2-1 Pack, 6 x 5 Layer Count. 5 Layers.

PLATE 83.

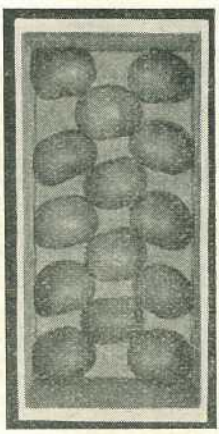
2-1 Pack. All 2-1 Packs have 5 Layers.



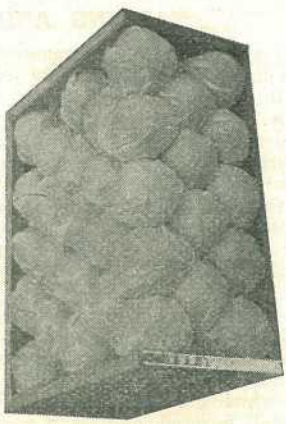
2-1 Pack, 5 x 5 Layer Count.
75 Apples.



Finished Case.
75 Count. 2-1 Pack, 5 x 5 Layer Count. 5 Layers.



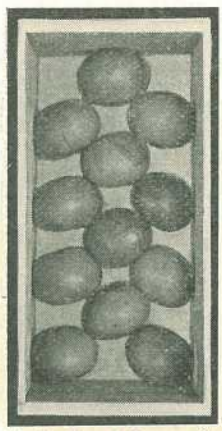
2-1 Pack, 5 x 4 Layer Count.
68 Apples.



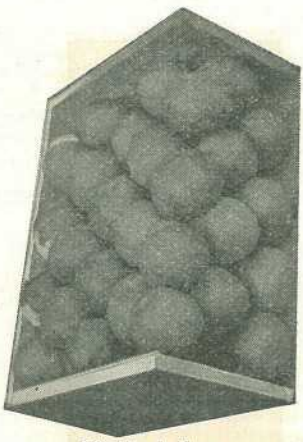
Finished Case.
68 Count. 2-1 Pack, 5 x 4 Layer Count. 5 Layers.

Plate 84.

2-1 PACK. ALL 2-1 PACKS HAVE 5 LAYERS.



2-1 Pack, 4 x 4 Layer Count.
60 Apples.



Finished Case.
60 Count. 2-1 Pack, 4 x 4 Layer Count. 5 Layers.

PLATE 85.

TANNING AND DYEING SHEEPSKINS.

After the pelt has been removed from the sheep spread it on an even surface, flesh side up, sprinkle salt freely on it, and rub it in hard. Let it remain on the floor until the salt dissolves, then make a strong warm suds, and wash the wool thoroughly. Let it get partially dry, then if the skin is a large one take 1 lb. of pulverised alum and mix it with 1 lb. of salt; mix in bran and water enough to make a stiff batter; spread it over the flesh side of the skin, then fold it in this manner (being careful to keep the wool on the outside). Turn the sides in until they meet in the centre. Let it lie so for two or three days, then shake the bran all off. As soon as it begins to dry work it by pulling and stretching over the top board of a fence (or a similar device). Continue in this manner until the skin is soft and pliable. After this is accomplished the wool is to be carded or combed. This is the most tedious process of all. Another tanning recipe is as follows:—First make a strong lather with hot water and soap; let it get cold, and then wash the skin in it, carefully squeezing out all dirt from the wool, after which wash it in cold water until all the soap is rinsed out, changing the water until the last is clear. Then put the skin in a tub, and pour over it two gallons of hot water in which has been dissolved 1 lb. each of salt and alum. See that the skin is completely covered, and let it soak for 12 hours. Then drain it well, and stretch it carefully on a board to dry, stretching it several times while drying. Before it is quite dry sprinkle on the flesh side 1 oz. each of finely pulverised alum and saltpetre, rubbing well in. Let it remain a day or two, and if the wool does not seem to be firm rub again with alum; fold the flesh side together, and hang in the shade for two or three days, turning over each day until quite dry. Then scrape the flesh side thoroughly with a blunt knife, and rub with pumice-stone until it is clean, and the skin will be ready for use. A good way to dye wool on sheepskins is by means of the prepared aniline dyes, which can be obtained from any chemist. Prepare the wool by washing the skin in a scouring mixture composed of 10 gallons water, 1 lb. soft soap, and 1 lb. common soda. Afterwards rinse in clean water, and treat according to the instructions which accompany the dye. Use a shallow vessel when dyeing if you wish to keep the dye off the tanned side of the skin.—"The Australasian."

Does Pig-Raising Pay?

By L. A. DOWNEY, Instructor in Pig-Raising.*

IN discussing the subject of whether pig-raising is a profitable undertaking, it is first necessary to look at the business of pig-raising in the correct perspective; thus one might ask the question: Why do we keep pigs?

Mankind is omnivorous, eating both vegetable and animal foodstuffs, and among his animal foodstuffs pork, either fresh or preserved, finds a place. The demand for pork and pork products as a food for man is so great that it could not be supplied from the world's herds of wild pigs, therefore, man has taken up pig husbandry so as to increase production and supply his wants and those of his neighbour. It has been found that in domestication pigs are very adaptable in most respects, and by altering their environment man has been able to alter the characteristics of pigs such as their rates of growth and reproduction, their carcass quality, and their food requirement per unit of pork produced. In fact, pigs respond to good environment and are much more productive under good domestic conditions than they were under natural conditions.

So obliging are pigs in regard to their diet that in many cases they have been asked to live and produce on foods which are not conducive to the best results; some people have gone so far as to consider the pig as a scavenger which will eat any kind of food in any condition. Thus we find pigs being used to dispose of waste products from dairies, slaughter-yards, kitchens, and such places. Peculiarly, pigs have put such foods to very good account and returned their owners good profits. When such waste products form the entire diet of pigs, the food cost is negligible and the return is mainly for labour, interest, and depreciation

Under conditions where foods are grown or purchased especially for the pigs, it is found that approximately 80 per cent. of the total production costs are accounted for by the foods. It will, therefore, be realised that pig-raising depends very largely on the food supply, its availability, and its cost.

A certain fairly definite amount of food is required to produce 1 lb. of pork. This figure is about 5 lb. of dry food for each pound of dressed pork, and it varies slightly according to the inherent quality of the pig, its diet, its environment, and health. Pigs require a plentiful supply of foods, which together should make a balanced and complete diet, in order to make a maximum growth per unit of food consumed, but it frequently happens that a ration not very complete or balanced can be provided at a much cheaper rate. This is often the case at piggeries where the buttermilk from butter factories is the main source of pig food; buttermilk alone does not make an ideal ration, but it is usually so plentiful and so cheap in certain seasons that it is more economical to use it entirely in the ration rather than use it in combination with grain to make a balanced ration.

The dairy farmer who keeps pigs merely to consume his separated milk is treating the pigs more as a convenience than as a business. On many farms pigs are fed in the summer entirely on separated milk, and

* In a radio broadcast from National Stations 4QG Brisbane; and 4RK, Rockhampton.

that milk usually has no market value other than what the pigs return for it. Under such conditions pig-raising pays almost at any price. In the winter time, however, those dairy farmers have a greatly reduced milk supply, and they must either keep less pigs or provide food in addition to the separated milk, in which case the pig-raising becomes more of a business in which the cost of production must be carefully watched.

It is possible for dairy farmers to keep more pigs and use milk in combination with grain and other foods in the summer, and then by the use of more grain and probably milk substitutes such as meat meal in the winter, the increased number of pigs could be carried throughout the year, but under such conditions pigs are not just a convenience and production costs and market values must be studied.

A number of pig-raisers in Queensland are now rearing pigs on grain and other home-grown or purchased foods, together with meat meal and entirely without milk; such ventures are really a means of converting crops into cash by way of the pig. It is generally assumed that one bushed of maize will produce 10 to 12 lb. of pork in average pigs, thus, when 10 to 12 lb. of pork is worth more than a bushel of maize, it probably pays to convert the maize into pork, provided other costs such as labour, interest and depreciation are taken into account. Under this system of pig-raising a long policy over a number of years must be followed, because seasonal variations in the market values of grain and pork might upset the balance temporarily, but the pigs must go on and cannot be starved for a time while maize is being sold at a good price, and then be fed to maturity at a later date.

A portion of the grain requirement of the pig's diet may be replaced by root crops, such as sweet potatoes or arrowroot or by pumpkins. All these crops usually give a greater return of pig food per acre than a crop of maize or wheat. For example, an acre of land that would produce 1 ton of maize should produce 9 tons of sweet potatoes, and the 9 tons of sweet potatoes, together with the vines and leaves, are approximately equal to 3 tons of maize as pig food. Thus sweet potatoes as a crop are about three times as valuable as maize for pig feeding, and would reduce production costs considerably if they were used to replace a portion of the maize in the pig's diet. It must be realised, however, that pigs do not grow so well on a diet composed mostly of bulky foods like sweet potatoes as when they receive a mixture of grain, sweet potatoes, and meat meal.

By grazing pigs on pasture or on forage crops such as lucerne, rape, cowpeas, and field peas, up to half of the grain and other concentrated food may be saved, but here again there is a limit to the pig's capacity to thrive on such cheap but bulky foods. It will be evident, however, that the farmer who grows most of his pig food can, by a judicious selection of crops, increase the pork production per acre to a maximum, thus lowering his production costs. Another way of reducing costs is to so arrange the piggery that at least a portion of the crops can be harvested by the pigs themselves, thus effecting a saving in labour and retaining fertility in the cultivation paddocks.

After having provided for a cheap food supply, the pig-raiser should aim at having his pigs in such condition that they will make the best use of the available food. The efficiency with which pigs convert their food into pork depends on the inherent quality of the stock. Some pigs

require more food than others to make 1 lb. of pork, even when kept under similar conditions; hence, the selection of breeding stock to produce good quality pigs has a marked effect on the profit or loss of pig-raising.

As prolificacy is inherited in pigs, care should be taken to select productive breeding stock, as the number of pigs reared per sow also affects the production cost considerably.

The environment in which pigs are kept affects their food consumption and rate of growth. Comfortable and hygienic accommodation, which safeguards the health of pigs, provides for greatest efficiency.

Having dealt with factors affecting the production cost of pork, I will now refer to market values of pork. In this respect one cannot say what values will be in the future, but we can refer to prices in the past.

From records of prices paid by Queensland bacon factories for prime bacon pigs on a dressed weight basis at country loading depots, we see that during the last eight years prices ranged from 3¼d. to 8½d. per lb., that is equal to a range of from £1 12s. 6d. to £4 5s. for a top weight pig of 120 lb. Such a big variation would be most upsetting in any calculations to estimate probable returns from pig-raising. However, there is marked difference in the prices of the last four years and the previous four years. During the period 1927 to 1930 inclusive, pork prices ranged from 4¾d. to 8½d., while in the period 1931 to 1934 inclusive, prices ranged from 3¼d. to 6½d., the average price for the earlier period being approximately 6d. and for the latter period approximately 4d.

One significant fact in the price chart over a number of years is that prices invariably fall rapidly in autumn and reach their highest peak in the spring; this is the result of our reliance on separated milk as the main source of pig food. The dairy farmers' pigs flood the autumn market and meet low prices, then they have very few pigs ready for market in the spring because they have depended mainly on milk for their pigs, or in other words, they have used the pigs merely as a convenience to dispose of their surplus milk in the summer.

This flooding of the market in the autumn makes it bad for the pig-raisers who do not feed largely on milk, but they get their share of the good prices in the spring provided they have made provision for a fairly regular food supply throughout the year; this class of pig-raiser can, therefore, reckon on a somewhat higher average pig price than the dairy farmer receives.

Having a satisfactory degree of efficiency in breeding and general management of pigs and the most economical food supply, pig raisers should keep a constant watch on the balance between food costs and pig prices, knowing that to produce a given amount of pork a certain minimum of food will be required.

So the answer to whether pig-raising pays is "yes," under some conditions, but it is necessary to understand the conditions under which a business is operating.

SHEEP RAISING ON SMALL HOLDINGS.

By JAMES CAREW.

SHEEP are conspicuous by their absence on small farms in Queensland, except on the Darling Downs. The general idea is that a large area of country is necessary, and, even then, that sheep should be run chiefly for wool production. That is in keeping with western conditions in the lower rainfall belts, but near the coast the method should be to sell as fats all surplus sheep that can be spared. If they cannot be sold as fat lambs then as soon after as possible; and in this respect crossbreds are more suitable than merinos. Besides selecting the more suitable breeds, the method of management has an important influence on the success of the undertaking. There are disadvantages, of course, such as sheep being a nuisance by getting through fences, and losses through parasites and dogs. If sheep formed part of the stock on all farms, provision would be made to secure them properly, domesticated dogs would become more accustomed to and consequently more friendly towards them. Usually when mutton and wool are low in price sheep are considered not worth keeping, and when values are high the customary prices for stores are considered too great.

Most farmers are anxious to buy when wool and mutton are high, and if a cheap lot of sheep are available for purchase they are bought—the trouble some one is anxious to get rid of being probably included in the bargain.

Any farmer planning to commence sheep-raising should first select a block of country, a portion of which is high and well drained, and secure it with netting. The area should be sufficient to meet ordinary requirements for the business. A substantial portion of the land should also be suitable for growing the crops necessary for fattening purposes. As merino ewes are always available at market rates, they are, under our present conditions, the most suitable to start off with. Purchase

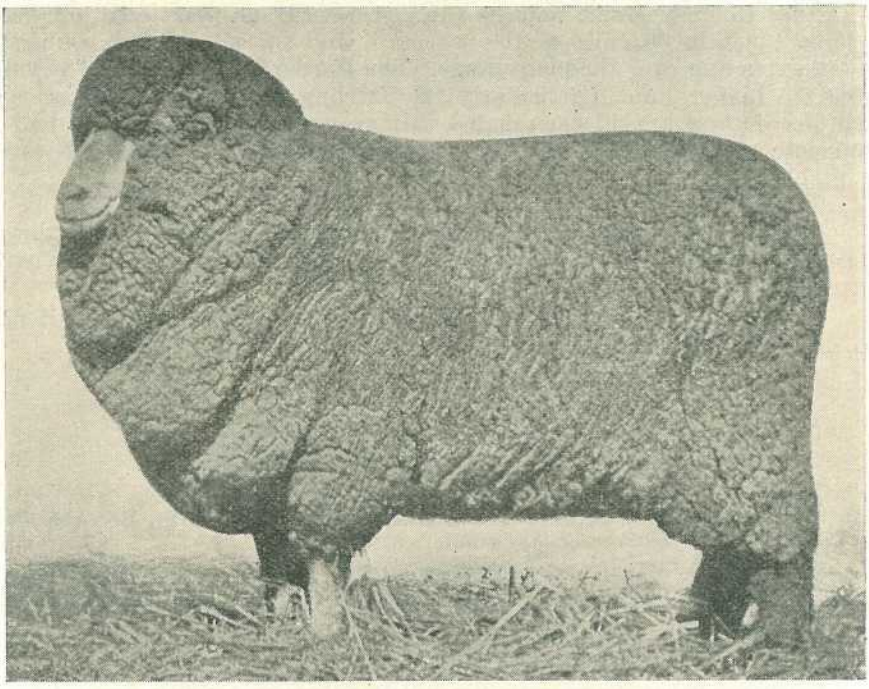


Plate 86.—Typical Merino Ewe.

western ewes of the large plain-bodied type which may be cast for strength or age. The breed of ram should be selected to suit the locality, but for purely farmers' sheep the Romney Marsh and Border Leicester will fill the bill.

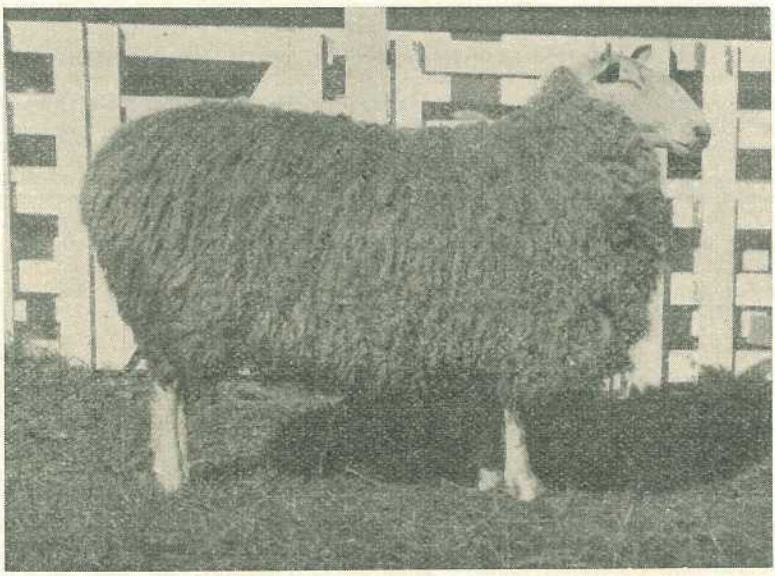


Plate 87.—Border Leicester Ram.

The Romney Marsh may be run successfully on practically all the country within 30 miles of the seaboard, and for all the low country even extending over the main range. The Border Leicester is the breed for the higher land, particularly the Darling Downs and tablelands. Either of these breeds when mated with the merino produce good dual-purpose progeny which develop into good mothers. If conditions are suitable they fatten at four and a-half to five months, and dress up to 35 lb.

If the ewe lambs are retained for breeding purposes (and they should be), they develop into good wool producers as well as having a good carcase for the butcher.

The advantage of keeping sheep for home supplies is also an item of interest worth considering.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

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

On Tuesday and Thursday of each week, as from the 8th August, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

The following is the list of lectures for August and September, 1935:—

SCHEDULE OF LECTURES.

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

Thursday, 8th August, 1935—"Care and Management of Growing Chickens," Part II., by J. J. McLachlan, Poultry Inspector.

Tuesday, 13th August, 1935—"Selling Our Scenery," by J. F. F. Reid, Editor of Publications.

Thursday, 15th August, 1935—"When the Cows Come Home," by J. F. F. Reid, Editor of Publications.

Tuesday, 20th August, 1935—"Avocado Growing," by H. Barnes, Director of Fruit Growing.

Thursday, 22nd August, 1935—"Harvesting and Marketing Tomatoes," by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, 27th August, 1935—"The Necessity for Culling and its Advantages," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 29th August, 1935—"Bush Hay," by N. A. R. Pollock, Senior Instructor in Agriculture.

Tuesday, 3rd September, 1935—"Fungicides and Disease Control," Part I., by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 5th September, 1935—"Fungicides and Disease Control," Part II., by J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 10th September, 1935—"Fungicides and Disease Control," Part III., by J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 12th September, 1935—"Salt Bushes," by C. T. White, Government Botanist.

Tuesday, 17th September, 1935—"Chloris Grasses," by S. L. Everist, Assistant to Botanist.

Thursday, 19th September, 1935—"Manures and Fertilizers," by E. H. Gurney, Agricultural Chemist.

Tuesday, 24th September, 1935—"Brains in Farming," by J. F. F. Reid, Editor of Publications.

Thursday, 26th September, 1935—"Kilkivan to Kingaroy—An Epic of Pioneer Settlement," by J. F. F. Reid, Editor of Publications.

Crutch Strike by Blowflies in Sheep.

A Preventive Operation.

By J. H. W. MULES.

IN 1928 the writer bred a very dense, strong-wooled stud ewe lamb. In November of that year flies attacked the lamb, and the conformation of the crutch wrinkles was such that as the animal grew the wrinkles closed up the channel below the vulva almost completely, with the result that the lamb could not urinate without befouling itself. Despite continued attention the lamb was struck repeatedly, and one was faced with the fact that as the lamb then appeared she was likely to become a constant source of worry. She promised to be an exceptionally heavy cutter and a possible show sheep, and it was feared that the continual treatment necessary to keep her free from maggots would tend to stunt her growth and impair her constitution generally; so, summing up the position, I decided to remove the offending wrinkles with a pair of Burdizzo pincers. In performing this operation, the skin was removed by applying the pincers to the wrinkle at its base and cutting the fold or wrinkle off inside the jaws of the pincers. It was found that the pressure applied was so great that the two edges of the skin at the base of the wrinkle were cut so cleanly that there was no bleeding whatever. The use of this instrument in performing this operation on high-class stud sheep is, therefore, recommended, but I consider it too heavy and slow for general pastoral work. The result of the operation on the ewe weaner was such that she had no further attraction for blowflies and remained free from strike for several years. When this interesting result manifested itself I set out to learn why it was that the weaner was apparently immune, and decided to remove the verticle wrinkles from every female in the flock, enabling them to urinate without wetting the wool. The result of this operation was precisely similar to that of the first lamb treated, and the entire flock remained free from any strike for a period of nearly three years, after which no records were kept and the sheep passed into other hands.

It was necessary to know why the sheep did not attract flies, and sections of skin were placed as near as possible representing what appeared to be different degrees of susceptibility; and, although no complete test was made, it was found that there were apparently degrees of susceptibility, as shown by the number of flies attracted to the various sections set out, side by side, but not touching each other. It was also discovered that what might appear to be a perfectly normal piece of skin to the naked eye might be highly susceptible and might be a definite case of dermatitis. Dr. Bull, in taking skin for specimens, took one sample of what appeared to be normal skin for comparison, but on microscopical examination this specimen proved to be highly infected, with sufficient minute ulcerations to cause the lamb, which was about four weeks old, to be susceptible. This discovery caused Dr. Bull to ask me to try to find out how long it would take the continual wetting of the skin by urine to cause ulceration and susceptibility. This determination was reached by tying the wool together across the crutch just below the vulva, and in such a way that the urine reached the skin by capillary attraction. After a daily examination for twenty-one days, it was found that the lamb was struck, so that it is assumed that in lambs, say, two

months old, that period of time was required to cause susceptibility in this way. I think, however, that in older sheep with tissues less delicate the term may be longer—possibly four or five weeks. It was also shown that by removing one wrinkle the lamb would be struck on the remaining area, and so it became possible to cause the lamb to be struck on either side at will. It was, therefore, assumed that fly strike could be controlled to a large extent, and so all the possibilities were examined which the foregoing experiments opened up for further investigation. The question which naturally presented itself was: How can ewes be prevented from befouling themselves? The answer was obviously: By cutting away all obstructions to a clear drop to the ground of all urine. In the cases of normally formed ewes with perfect vulvæ, this is quite easily and quickly done by surgical removal of all surplus and obstructive skin in the crutch. There are, however, several factors which contribute to befouling, and which now enter into this discussion.

Side Delivery or Distorted Vulvæ.

In the case of side delivery, the vulva is so distorted from its normal position as to cause the urine to reach the wool on the wrinkle on one side more than the other. This distortion may be pre-natal—*i.e.*, it may be that the lamb is a thick-skinned lamb with a broad flange on the tail opposite the vulva, and that the lamb's position prior to birth may be such that the tail presses on one side of the vulva more than on the other, and so the parts of lamb merely become moulded to that form resulting from the growing tissues taking the line of least resistance. The vulva yielding to the pressure of the tail may consequently develop sideways. My observations have, in my opinion, established definitely that distortion of this nature is determined before birth. This malformation is due to the breeder of the sheep seeking just a little more density of wool than the breed can accept and remain perfect in all its conformities. I say this because the broad tail is the cause of the distortion, and a thin-tailed lamb seldom or never suffers this form of distortion.

Distortion of Vulvæ after Birth.

Malformation of vulvæ after birth may be from one of two primary causes, viz.:—(1) Pressure of tail which has not been cut short enough; (2) contraction of skin due to scabby ulcer, with which I shall deal later in this article.

We will take the distortion by pressure of tail first. When a tail is cut so long that it presses on and over the vulva, it almost invariably makes a position for itself on one side or the other, and in time the vulva becomes set in the position assigned to it and is permanently directed sideways. In the case of very fat lambs from birth, the fullness of the flesh and fat on either side of the vulva makes the position of the vulva difficult for the tail to displace, and it is not uncommon in these cases to find that the vulva is lying in an absolutely central position, but instead of pointing downward is pointing upward, with the result that Nature's provision for natural, clean drainage is rendered useless for that purpose, with the further result that the last few drops of urine run down the skin, and the upward distortion of the vulva causes splashing to the sides, and so leads to early susceptibility to fly strike.

Distortion of Vulvæ by Contraction of Skin by Erosion of "Scabby Ulcer."

Distortion of vulva by erosion of "scabby ulcer" is a common cause, and is due to there being insufficient air to dry the vulva and the tissues in its immediate vicinity after urination. Distortion of this nature only occurs when the ulcerated area appears on the side of the vulva, and no distortion usually takes place until the sheep is crutched or is subjected to a "dewrinkling" process. It is when the ulcerated area is healing that the contraction of the skin pulls the vulva to one side, and thus the sheep remains imperfect and subject to "side delivery."

Treatment for Distorted Vulvæ.

(*a.*) When distortion is pre-natal, and the tail is cut to reach no lower than one-sixteenth of an inch above the lips of the vulva when healed, the distortion can be permanently set right by making an oval cut and removing a portion of skin on the convex side of the organ. The piece cut out may have to be of various sizes corresponding with the degree of distortion, but the contraction in the course of healing will do the job nicely. This operation can be done with a sharp pair of scissors or with "Rolcut" secateurs, or with sharp dagging shears. Care must be taken not to cut too deeply, but a very small portion of tissue besides skin may be removed without bungling the operation.

(*b*) When distortion is caused by tail pressure, the tail in grown ewes must be recut to reach no lower than clear above the lips of the vulva. In recutting, the skin of the tail should be pressed up towards the butt and the bone cut shorter by nearly half an inch than the skin; this enables the skin to completely cover the bone when released. The main artery of the tail should be touched with a hot iron to stop bleeding in grown sheep.

(*c*) The distortion of vulvæ by "scabby ulcer" is not apparent till the scabby area is healing or has healed, and the treatment varies slightly. An area as near as possible equal in size to the area of the ulcer should be pinched out on the side of the vulva opposite the ulcer, and the ulcerated area should be treated with a rough rubbing with rock bluestone. In this case the incision is made a preventive measure, for otherwise the contraction of the skin of the scabby side would do what the operation would do—you equalise matters and the vulva remains in a central position.

"Scabby Ulcer."

Scabby ulcer is a term I have used to define the brown scab caused by the action of urine on the skin of sheep. At the present time not much is known about the actual agent which causes it, but this will probably be determined by the bacteriological staff at Yeerongpilly. It is sufficient to say for the present that "scabby ulcer" shows on the whole of the area on which urine flows for any length of time. The ulceration forms round the point of the vulva in many cases, and it is almost certain that, if not removed, it will completely dissolve and erode the point of the vulva till it entirely disappears. This condition I have described as "stubby vulva"—a vulva that will not drip, but drains the last few drops of urine which flows over and percolates down the channel immediately below it. A vulva so conditioned is almost certain to cause the ewe to become susceptible to fly strike, and, in my opinion, if shearers always realised the very serious results of cutting off the tip of vulvas

accidentally, or possibly carelessly, in the course of shearing, they would take every care to obviate it. Many vulvas are cut in shearing, but many are also lost through the ravages of "scabby ulcer." Shearers are often blamed wrongly, however, for what is merely the result of disease. "Scabby ulcer" is far-reaching in its effects, and there seems to be no doubt about its influence on fly strike susceptibility among ewes. A thorough investigation of "scabby ulcer" as, probably, a definite cause of ewes becoming chronic urine-dribblers, and consequently highly susceptible to fly strike is, in my opinion, well warranted. It is the ewe with the "stubby vulva" that gets struck low down on the crutch, and sometimes on the udder.

So far as is known, urine percolating to the skin is mainly the cause of dermatitis, or fever of the skin in the crutch. The yolk glands and follicles of the wool become affected, and the temperature of the skin rises. Exudations are retained on the surface of the skin by wool fibres, and the surface of these exudations oxidises. Meanwhile, the exudation continues under the oxidised or solidified surface, and there eventually becomes a crumbly, cheesy (in appearance) mass of pabulum or food suitable for the larvæ of blowflies. The affected parts, at varying stages, become what is commonly known as a susceptible area. This exudation is what attracts the fly.

It is no part of my intention to write of the habits of blowflies, but I might here state that, unless a ewe is susceptible, she will not suffer seriously from blowfly attack.

The obligation is therefore on stockowners who breed sheep of such a type that they cannot remain insusceptible to protect them by rendering them immune from attraction to flies. This can be done in two ways. Firstly, by Dr. Seddon's "breeding-out of wrinkles" process; and secondly, my method now known as Mules' Operation.

The Operation Described.

I now propose to show how a sheep may be kept free from normal fly strike for the term of its life by rendering her free from susceptibility.

The operation necessary to do this is simple, and is based on the need for dryness instead of moisture in the crutch and below the vulva. It consists of the removal of any wrinkles or "surplus" skin in the crutch and around the excretory organs of the sheep that are likely in any way to obstruct the flow of urine; but apart from that as a main object the aim is also to "aerate" that part of the sheep in a general way, by the removal of loose skin, to the end that it will become and remain dry at all times. Many stockowners simply cut the wrinkles off with shears; others use the Burdizzo pincers, but Rolcut secateurs are probably the most suitable instrument on the market for the job. The lamb is held as for tailing, and the operator then cuts the two wrinkles nearest the vulva and running in a line from the hock to the base of the tail. The wrinkles should be cut from the tail to as low as 4 to 6 inches below the vulva, and should be completely removed, leaving the lamb's skin quite plain in the vicinity of the operation. Where it is obvious that wrinkles further away towards the side of leg will tend to close the wool in behind the sheep, and thus make a second operation necessary, it will be as well to remove those wrinkles also as a precautionary measure. Care must be taken to cut no area of the bare skin close to and below the vulva. The cutting blade should

cut on the wool line, and in this way stretch if anything the bare area in the process of contraction by healing. It must be remembered that flies will blow meat, and, although I have never yet heard of a cut wrinkle being blown, I think that it is advisable at all times to put a little dressing on in the form of any reputable fly dressing. The Mules' Operation consists of four essentials:—

(1) Removal of wrinkles (this can be done at the rate of five lambs per minute easily);
(2) Treatment of "scabby ulcer" by bluestone dressing or cauterising;
(3) Straightening up distorted vulvas by means of a minor operation;
(4) Shortening of tail to a point just above the lips of the vulva, the cutting of the tail to be done in such a way that an overlap of skin is available to cover the end of the tail loosely, thus obviating the "dimpling" at the end of tail, where fly strike sometimes occurs.

Conclusion.

In concluding, I would like to state the following facts:—Ewes may be treated irrespective of age. If well treated, they will never befoul themselves. If they remain dry, they will not be struck in normal times, but if not kept dry in the crutch, they will certainly be struck.

The skin of lambs varies. The variation may be in the same breed or strain, and it certainly is highly pronounced in the different merino strains. Taken generally, the Peppin strain has a thick, firm skin of fine texture with small "ribby" wrinkles all over the body. The South Australian type, into which no Peppin infusion has been made, has quite a different type of skin. It may be termed an elastic skin loose on the sheep, and not so firm to handle. It is not uncommon for a shearer who has been shearing Peppin sheep to have to alter the points of his combs before he can shear comfortably sheep of another strain. When the operator grasps the skin of a lamb to remove it, if he is a student of stud-breeding he can tell immediately whether the lamb will grow skin or grow out of it. No hard-and-fast rule for guidance as to this knowledge on the part of breeders can be given, because it is an accomplishment that can only be acquired through years of stud-breeding experience; but, as a general rule, a robust, thick-skinned lamb will grow skin, and a thin-skinned ("wastey to the feel") lamb will not develop more wrinkles as it grows. This rule is upset when lambs are under-nourished at the time of treatment, and plentiful feed after treatment may cause a growth of skin; so it is always advisable when there is a doubt to make sure and take plenty of skin off.

The cuts should be made from not less than half an inch above the vulva to as low as may be required. They should be long and narrow, for wide or round cuts cause puckering and infolds. Very wrinkly lambs or ewes require a cut right from tail downwards. No sheep is so plain that it cannot be made plainer by this process, and it is my belief that the least susceptible type, as represented in Dr. Seddon's A class, can be rendered still less susceptible by the treatment under "Mules' Operation."

The Giant American Toad (*Bufo marinus*).

By R. W. MUNGOMERY.*

THE giant American toad, which, until recent years, was restricted to the tropical and temperate parts of South America and certain of the West Indian Islands, first came forcibly under our notice when Mr. Arthur F. Bell visited Puerto Rico as the official Queensland Government representative at the Fourth Conference of the International Society of Sugar Cane Technologists held in San Juan in 1932. There he was able to see large numbers of these toads successfully operating against the Puerto Rican cane beetle in their newly adopted country, and, of course, the value of such an important predator immediately became apparent. At this conference Mrs. Dexter presented to the members of this society a paper detailing the feeding habits of this giant of the toad family. Its diet was found to be both varied and extensive, whilst it possessed an enormous capacity for food. This carefully prepared census of the toads' victims was obtained as a result of the examination of the stomach contents of several hundred specimens which had been captured in various parts of the island and killed with the above object in view. The examination revealed that of those insects that had been eaten, and whose undigested remains were able to be identified, approximately 51 per cent. were harmful species of insects, 42 per cent. were neutral, *i.e.*, neither harmful nor beneficial, while the remaining small percentage of 7 per cent. proved to be beneficial species.

So impressed were some of the visiting delegates with the possibilities of this animal becoming an important factor in the control of some of the more serious cane pests in their respective countries that they immediately made arrangements to take with them, on their departure, consignments of these toads in order that this useful predator might similarly become established in other parts of the world and continue there its good work.

The toad is a native of tropical America, extending from Mexico to the Argentine. From French Guiana it was introduced into Barbados prior to 1850, primarily with the object of preying on young rodents which at that time were inflicting great damage on the cane crops of that island. It is not reported to what extent they were successful in rat control (possibly of little value); however, their effect on insect control was very marked, and from there they have been spread to most of the West Indian Islands, including Puerto Rico in 1920. From Puerto Rico they were taken by Mr. C. E. Pemberton, Entomologist of the Hawaiian Sugar Planters' Experiment Station, to Honolulu, where they rapidly multiplied, and they are now well established in different islands of the Hawaiian group. They have since been sent to the Philippines for colonisation in the canefields.

We, in our turn, have watched with interest the successful establishment of this toad in several new countries, and the gradual suppression of some of the major pests in areas where it has been operating for longer periods, and where its population has reached saturation point. We have also been impressed with the possibilities of such an animal operating against our indigenous cane beetles, and some of our other

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

major sugar-cane pests. The writer's recent visit to Hawaii was made, therefore, primarily with the object of studying the toad in an invironment which has proved particularly favourable for its natural spread, and to bring back sufficient toads to ensure their successful establishment in Queensland. Accordingly, this latest importation of the toad into Queensland will mark another step in the gradual conquest of the warmer regions of the earth by this remarkable animal, and this has been made possible through the courtesy and valued co-operation of the Director and Entomologist of the Experiment Station of the Hawaiian Sugar Planters' Association.

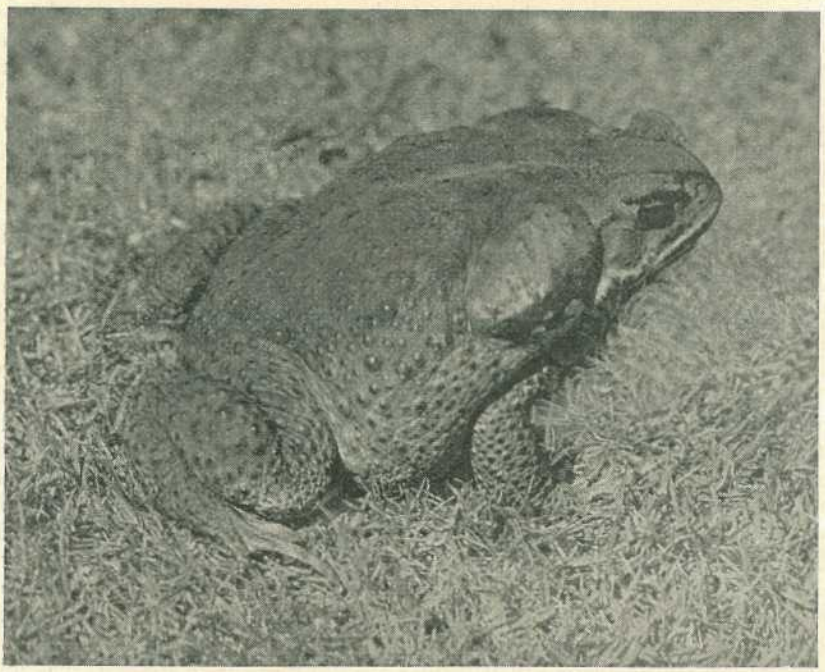


Plate 88.—A Giant Toad, Half Natural Size.

When full grown, *Bufo marinus* is from 6 to 8 inches in length, and usually from 4 to 5 inches in breadth. The colour varies considerably, but it is usually of an irregular yellowish, reddish, or blackish brown, being darker on the back than on the underside of the body. On each side, just behind the head, they are armed with a conspicuous poison sac. This sac is mainly for defensive purposes, as is evidenced when a dog or other animal picks up a toad in its mouth. The dog soon drops the toad in disgust, curling up its lips, and salivates profusely, as if it had suffered some unpleasant sensation. This experience usually suffices to cure the dog of any further desire to molest a toad.

The skin on the back of the female toad is somewhat warty, but smooth, whilst the males have a much rougher skin, due to several raised tubercles, which give it a feeling somewhat similar to a fine grade of sandpaper. For much of the foregoing and following information the writer is indebted to Mr. Pemberton, who has carried out most of the detailed feeding work in Hawaii, and who also has shown the writer these toads operating in various suitable localities around Honolulu.

No complete life history notes are available concerning the toad's development, owing to the fact that it has not yet been possible to induce this species to breed under confined conditions. However, from observations in Hawaii and Puerto Rico, it is apparent that they lay their eggs practically throughout the whole year when they find suitable conditions, and they mature in about a year. We should therefore expect them to behave similarly in North Queensland, and that eggs would be found most plentifully during the rainy period, November to April, when waterholes generally are full of water.

For their establishment in Hawaii two colonies were liberated, each consisting of from 60 to 70 individuals. One colony was turned loose in the upper reaches of the mountain streams which flow down Manoa Valley, and the remainder were given their freedom in a pond adjacent to a low-lying rice field near Waipio. In both cases they have bred successfully, and can now be found far away from the original points of liberation, whilst they appear to be adaptable to a fairly wide variety of conditions. In the low-lying areas they have multiplied most rapidly, and at the present time young toads are being distributed from Waipio at the rate of 1,000 to 3,000 daily. During last year strings of eggs containing as many as 12,000, which had been laid by one female, were sometimes collected in the waterlogged rice and taro fields, and these were hatched out in a specially constructed pond at the Waipio sub-station by officers of the sugar experiment station. The tadpoles usually hatch out two or three days after the blackish eggs are deposited. They are then about $\frac{2}{5}$ of an inch in length, and they remain congregated together before they separate to feed on the small aquatic plants that are commonly found growing in such situations. It has been found that the tadpoles feed readily on boiled rice, oatmeal, or other finely-ground cereal, and it has been possible to hasten up the tadpole period to three weeks as against the normal period of one month. In their normal rate of development the tadpoles develop a pair of fore-legs towards the end of the first fortnight, whilst some few days before they are ready to leave the water the hind pair of legs make their appearance and the tail is gradually absorbed. When this stage is reached the young toads are still only very tiny—just a little over $\frac{1}{4}$ inch in length—and one would scarcely imagine that they are ultimately to grow into such huge creatures as are now seen in the fields or on the garden lawns around Honolulu.

They feed on ants, small vinegar flies which frequent rotting fruit, and, in fact, on any insect which they are large enough to swallow. One consignment of small toads, which were placed out in a large field of young cane infested with "armyworms," immediately impressed the plantation agriculturists by commencing operations against the young caterpillars, which they snapped up, and though unable to accommodate a whole caterpillar, a young *Bufo* toad would be seen to remain there with portion of the caterpillar protruding from its mouth, apparently unconcerned, but well satisfied that it would ultimately accomplish the task before it. Most of their feeding is done by night, and during the day they can frequently be found hiding in the small holes which surround the banks of irrigation ditches. They grow very rapidly and soon learn to consume different kinds of insects, and there is evidence to show that they regularly visit the same spots at which they have been in the habit of making easy captures of large numbers of insects.

In fact, about the only bad point raised against them is that they sometimes loiter near hives of honey bees and jump up and catch the heavily-laden bees returning to the hives, but this can easily be remedied by raising the hives to a height of 2 feet or more from the ground, or by surrounding the hives with small mesh wire netting. As most of the bee-hives in Queensland are usually placed more than 2 feet above the ground this introduction of *Bufo* should not prove any serious hardship to Queensland beekeepers.

Their normal diet consists of all kinds of beetles, cockroaches, mole-crickets, weevils, caterpillars, centipedes, sowbugs, and the like, and the toad will usually snap at any moving object that attracts its attention. It is an amusing sight to watch a toad snap at a centipede, and with one-half of the creature down its throat and the other half protruding from its mouth the toad quickly uses its forelegs to assist in pushing the remainder of the centipede effectively out of view down its huge throat. Centipedes apparently have no ill effects on the toad, neither does the "black widow" spider, a very venomous species which was recently fed to a toad, and which produced no harmful effects whatever on the toad that consumed it.

Certain individuals have raised the question of the toads possibly proving a nuisance owing to the noise they will make. Their call is not objectionable, and certainly not as loud nor as shrill as that of many species of frogs which are indigenous to Australia. It has sometimes been described as being similar to the distant sound of a motor cycle, of that regularity, but more musical. The writer can best describe it as being similar to the latter part of the call of the brown pheasant-coucal, which is commonly found in most Queensland canefields.

To others who scent a "nigger in the woodpile" and suggest the possibility that the toad will, in turn, itself become a pest, we can point to the fact that nearly 100 years have elapsed since it was first introduced into Barbados, and there it has no black marks against its character. Experience with it in other West Indian islands, and in Hawaii, certainly points to the fact that no serious harm is likely to eventuate through its introduction into Queensland.

We, however, wish to raise one important note of warning. This toad, though large, is not the edible species of frog, **and it must not be eaten.** The glands at the side of its head secrete a digitalis-like poison, adrenalin, and other more obscure poisons, and if the toad is eaten the net effect of these poisons is apt to have a very serious effect on the heart. Whilst the writer was in Hawaii a young Filipino child died, and it was alleged that she died as a result of her parents giving her a portion of a toad to eat. Whether these facts are true or not is difficult to ascertain, but this example should be sufficient warning to deter anyone so minded towards a dish of the famous French delicacy to defer it until the edible variety of frog is available, and certainly to give *Bufo* a wide berth.

From Manoa Valley the toads have spread of their own accord down to the city of Honolulu, and at night many individuals from small to nearly full-grown can be seen on the lawns in the residential section, whilst at other times an unfortunate toad can be found dead on the road, having been run over by a passing motor car. At Waipio dozens of smaller ones can be seen hopping along the edges of the irrigation

reservoirs, whilst in shallow shady ponds, where hyacinth and taro are growing, as many as twelve nearly full-grown specimens can be counted hanging around the base of one taro clump. Other taro plants similarly harbour a large number of toads at their bases, and when it is remembered that up to 3,000 toads are daily distributed from this centre it will be apparent to what extent these animals have multiplied during the three years since they were first liberated in these localities. Pools of water are necessary only for the egg and tadpole stages, and once the young toads have forsaken the waterholes they are able to grow up and flourish without having regular access to water. This is evidenced from the fact that toads are often found far distant from any streams or ponds.

The toad has proved a very popular introduction into Hawaii, both amongst the sugar-cane plantation managers and amongst the resident population of Honolulu, and requests are ever forthcoming from them for liberations of toads to be made on their respective properties. Many of the garden owners are loud in their praises of the good work which the toads are doing, and they report a decided decrease in the incidence of many kinds of pests this year. Many garden plants, such as roses, cannas, lettuce, &c., which were severely damaged by the small Asiatic beetle, now show very little injury in places where toads are common. Although it is unwise to draw conclusions too hurriedly as to the benefits resulting from the introduction of *Bufo marinus,* as weather conditions are known to have far-reaching influences on pest activity, still, from these persistent favourable reports that are being received, it seems highly probable that this American toad has contributed in some measure towards this noticeable reduction in some of these major pests.

The *Anomola* cane beetle is so well controlled at the present time by several parasites and predators that cane grub damage was non-existent during the period of the writer's visit to Hawaii; but at the same time, if the trouble ever did become serious again, it is probable that owing to the secluded habits of the beetles prior to and during oviposition, the toad would have little chance of locating and eating them before they had time to lay their eggs. They could, therefore, not be expected to clean up every small outbreak of *Anomola* which might occur periodically in future years. However, as a very excellent parasite and predator complex, supplemented by arsenic treatment of infested soils, appears to be taking care of all *Anomola* grub infestations, *Bufo* may not be needed to assist greatly in this work.

In Puerto Rico the giant toad, through its attack on the local cane beetle (slightly smaller than our greyback cane beetle) has been signally successful in cleaning up white grub damage, and if its introduction into Queensland is followed by a control of the magnitude of that obtained in Puerto Rico, then something very tangible in white grub control will have been attained as a result of this importation. Concerning the status of the Puerto Rican white grub, and the influence of the giant toad, Wolcott has the following to say:—

"In less than ten years after its first importation into Puerto Rico the giant toad, *Bufo marinus* L., has changed the economic status of white grubs on the island from that of a major pest to one of comparative rarity. The most obvious indication of such a change is that fields of sugar-cane on the South Coast, especially in districts where grubs were

formerly most abundant, can now be successfully and profitably ratooned. When white grubs were abundant such a procedure would have been impossible; now it is the rule. Formerly the roots of sugar-cane were so completely destroyed that the stalks had to be harvested in advance of normal maturity; now they are so numerous that ploughing and replanting are obviously unnecessary. To be sure, different varieties of cane are being grown, and some other factors have been changed, but the one of importance is that white grubs are no longer present in sufficient numbers to cause appreciable injury to the cane roots. For this changed condition the imported toad is almost entirely responsible.

Parts of North Queensland are particularly well favoured with mountain streams intersecting or flowing near to canefields, whilst other parts are flatter and more swampy, and provide conditions which are comparable to either the Manoa Valley or Waipio types of country in Hawaii, so that conditions should prove suitable for the establishment of this toad which has hitherto proved so adaptable to rapid multiplication under conditions obtaining in most sugar-cane growing countries.

The greyback cane beetles, against which this toad has been primarily introduced, fly to various feeding trees soon after their emergence from the soil, and a period of approximately 14 days elapses before their eggs are sufficiently developed to be deposited in the soil. During this 14-day period the beetles alternate between the feeding trees and resting trees, but the toads do not ascend trees, so that they are not likely to exact toll from them in these positions. From information gleaned elsewhere it appears that in Puerto Rico a somewhat similar state of affairs exists, where the beetles fly nightly to feed on such trees as poincianas, casuarinas, bananas, pigeon peas, and occasionally on sugar-cane itself, returning to the soil in the early morning, and it is probable that the toads account for large numbers of beetles either when they are emerging from or returning to the soil. It would appear, therefore, that such habits are ideal from the point of view of control of the beetle by the toad, for the fact remains that these animals ultimately account for large numbers of beetles.

With regard to the greyback beetle, the same clear cut daily return of the whole beetle population to the soil does not exist. Therefore, the degree of control which we can expect through the agency of these toads will centre largely around the length of time the beetles actually spend on or near the ground either when they are emerging from or re-entering the soil, and of course around the number of times they subject themselves to this procedure of migration from soil to feeding trees and vice versa. Therefore, in direct proportion to the length of time spent by the greyback, or any other beetle pest, on or near the ground in accessible places (or, rather, in places usually frequented by the toads), so might we expect the degree of control of these pests to rise proportionately high. There seems to be little room to doubt that when these toads have reached saturation point they will greedily devour any beetles of a similar size that may come within their sphere of activities.

Wolcott, who apparently was under the impression that *Bufo marinus* had already been imported into Queensland and Fiji, has the following to say concerning these introductions in a paper read before

the Association of Sugar Cane Technologists of Puerto Rico, December, 1934:—

"If conditions in these countries are at all comparable to those in Puerto Rico, let me now predict that within ten or fifteen years the white grub problems of these countries will be solved."

Whilst all of our species of white grubs may not lend themselves to control by the giant toad, and we may not altogether entertain the same high degree of optimism as that displayed by Wolcott, still we have reason to maintain a certain amount of optimism concerning the effect that this toad is likely to have in minimising greyback grub damage in some of our Northern canefields. Whether our speculations are fully justified is one of the fascinating problems met with in economic entomology, and time alone will show whether our cherished hopes for the total elimination of grub damage in Queensland canefields will be realised.

THE COUNCIL OF AGRICULTURE.

An Order in Council has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, declaring that the number of members of the Council of Agriculture shall be twenty-nine. This number is made up as follows:—The Secretary for Agriculture and Stock (President), the Director of Marketing, two members of the Butter Board, and one member of each of the remaining commodity boards, including the Wheat Board, the Committee of Direction of Fruit Marketing, and the Queensland Cane Growers' Council; representatives of nine districts embracing local producers' associations are also included.

A Regulation has been approved covering the members of commodity boards who shall be members of the Council of Agriculture, and these are:—

Messrs.—	
J. McRobert (Maryborough) .. .. } W. J. Sloan (Malanda) .. .. .. }	Butter Board
H. T. Anderson (Dalby)	Cheese Board
J. Beck (Stanwell)	Cotton Board
J. Gargan (Atherton)	Atherton Maize Board
C. Brumm (Woongoolba)	Arrowroot Board
A. G. Whiting (Atherton)	Peanut Board
R. V. Woodrow (Woodford)	Honey Board
M. Kessler (Cambooya)	Barley Board
W. T. Hughes (Middle Ridge, Toowoomba)	Egg Board
H. Niemeyer (Hatton Vale)	Broom Millet Board
G. D. O'Neill (Allora)	Canary Seed Board
D. Johnston (Malanda)	Northern Pig Board
W. Ranger (Brisbane)	Committee of Direction of Fruit Marketing
G. Johnson (Mirani, Mackay)	Queensland Cane Growers' Council.
W. J. Brimblecombe (Pirrinuen)	Wheat Board
G. A. Duffy (Brisbane)	Plywood and Veneer Board
G. A. Duffy (Brisbane)	Northern Plywood and Veneer Board

Executive approval has also been given to the appointment of the following representatives of districts embracing local producers' associations:—

Messrs.—	*District.*
R. R. Nothling (Hut Creek, via Ambrose)	No. 1—Central Queensland
V. Baker (Gayndah)	No. 2—The Burnett
W. L. Osborne (Wondai)	No. 3—South Burnett
P. Daley (Maleny)	No. 4—Wide Bay
C. Bateman (Woodford)	No. 5—East Moreton
W. A. Fielding (Blenheim)	No. 6—West Moreton
J. Buckley (Rose Hill)	No. 7—Darling Downs
W. E. Ashford (Hannaford)	No. 8—Western Downs
J. P. McCarthy (Tolga)	No. 9—Atherton Tablelands

QUEENSLAND STATISTICS.

A copy of the 1935 issue of the "A B C of Queensland and Australian Statistics" has been forwarded to us by the Registrar-General (Mr. George Porter).

This useful booklet is to all intents and purposes the Official Year Book of Queensland, and is presented under the authority of the State Government. The 1935-edition contains, in addition to the main features appearing in the 1934 issue, information relating to (*a*) Consideration of Sales, Mortgages, Bills of Sales, Liens on Crops, &c., for five years; (*b*) The names of the several Friendly Societies with their numerical strength and capital as at the 30th June, 1933; (*c*) The grades of employment and the causes of unemployment as revealed by the Census of 30th June, 1933; also the numbers belonging to the various industries; (*d*) Employment in principal industries; these figures are collected from selected groups, and the table shows the trend of employment for eighteen months ended 31st December, 1934; (*e*) Additional Tables are included showing the Value of Production in Queensland; (*f*) Postal Notes and Money Orders for Queensland for five years; (*g*) Cargo shipped and discharged at Queensland Ports for the year ended 30th June, 1934; (*h*) Information concerning the Building Revival Scheme; and (*i*) The ages and Nationalities of the population as at the Census, 30th June, 1933. Some of the tables have been remodelled to show more useful and interesting data.

Taxation provisions for all States and the Commonwealth have been revised in accordance with amending legislation; also levies for unemployment relief. Licenses payable are brought up to date, and the scale of fees payable for registration of motor vehicles has been revised.

Information concerning all phases of Production—Primary and secondary—Finance, Labour and Industrial matters, Vital Statistics, &c., is included.

Population.—The population of Queensland at the 31st December, 1934, was 959,752. The crude birth rate of 18.13 per thousand of population is the second highest in Australia, whilst the crude death rate—8.83—is the fourth lowest in Australia and fifth lowest in the world.

Trade.—The value of Oversea Imports for 1933-34 in Australian Currency was £5,821,417; and Exports, £19,617,628; the Excess of Exports being £13,796,211. The Imports and Exports per head of population were £6 2s. 6d. and £20 12s. 9d. respectively.

Finance.—The Public Debt of Queensland at 30th June, 1934, was £117,817,352—£122 19s. 8d. per capita of population. The total amount of taxation was £6 3s. per capita.

Motor and Wireless Licenses.—At the 31st December, 1934, there were 97,390 Motor Vehicles registered, and 62,722 Wireless Listeners' Licenses were in force.

Employment.—For the year 1934 Queensland's percentage of unemployment—11.7—was well below that of any other State; the figure for the Commonwealth was 20.5.

Live Stock.—At 1st January, 1934, there were 5,781,170 cattle, 20,072,804 sheep, 450,024 horses, and 217,448 pigs.

The Wool Production of 1933-34 amounted to 169,989,516 lb. (greasy), and was valued at £10,227,703.

Agriculture and Dairying.—In 1933 the Wheat Crop was 4,361,614 bushels; Maize, 3,715,764 bushels; Sugar made, 638,559 tons; Cotton (unginned), 17,718,306 lb.; Tobacco, 2,079,754 lb.; the Butter made amounted to 114,032,603 lb.

Mineral Production.—The total Mineral Production was valued at £2,103,927 for 1933, including—Coal, £693,383; Lead, £527,696; Gold (at Gold Standard Value), £390,779; Silver, £181,108; Tin, £123,620; and Copper, £105,031.

Value of Production.—The recorded production from all Queensland Industries for 1933-34 was valued at £52,551,225, or £55 5s. 8d. per capita of population, Primary providing £39 6s. per capita and Manufacturing £15 19s. 8d.

These are but a few of the interesting features of the "A B C," which is now available at a nominal cost of 2s. (posted 2s. 3d.). Copies may be had upon application at the Registrar-General's Office, Treasury Buildings, Brisbane.

Analyses of some Wheats, 1934-1935 Harvest.

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

FOR the purpose of comparing some of the commonly-grown Queensland wheats the State Wheat Board was asked to have forwarded average samples from various districts.

In this connection 152 samples were received and analysed, and the results are given below; also the district and type of soil in which the samples were grown.

It is intended to have samples from future harvests analysed in order to enable comparison to be made of the several wheats which have been grown under possibly varying seasonal conditions. For this reason it would be inadvisable to make any very definite statement concerning the specific protein quality of the various wheat samples detailed below; and, again, only one or a few samples of some of the varieties in this season's harvest have been analysed.

The analyses were made upon the whole wheat ground to pass through a 1 mm. sieve.

The figures given below, showing the area sown with the different varieties analysed, were taken from the Queensland State Wheat Board's census of the wheat varieties grown during the 1934-35 season.

Variety.	Acres.	Per cent.
Florence	46·682	16·27
C.C.C.	44·924	15·67
Flora	33·951	11·84
Gluyas	24·392	8·51
Pusa	23·388	8·15
Clarendon	21·277	7·41
Cedric	17·290	6·03
Cleveland	12·423	4·33
Currawa	8·950	3·12
Nabawa	7·648	2·67
Novo	6·491	2·26
Ford	6·436	2·24
Warren	5·091	1·77
Seaform	2·868	1·00
Amby	1·927	0·67
Duke of York	1·927	0·67
Quality	1·634	0·57
Canberra	1·034	0·36

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4874	Oakey	Amby	Light black	11·2	10·4	10·5	156	14·8	62·4	37·77
4875	Ditto	ditto	ditto	11·8	10·3	10·5	131	12·5	62·7	38·30
4863	Brookstead	B.F.G.	Heavy black	11·5	13·4	13·6	149	11·0	62·5	39·90
4864	Ditto	B.F.G., B.F.G.	ditto	11·8	13·5	13·8	34	2·5	61·5	40·76
4888	Oakey	Canberra	Light black	11·4	12·0	12·2	53	4·3	60·8	43·56
4889	Ditto	ditto	ditto	11 5	12·3	12·5	37	3·0	..	..
4861	Brookstead	C.C.C.	Heavy black	10·3	13·9	13·9	123	8·9	62·8	39·23
4862	Ditto	ditto	ditto	11·0	13·4	13·6	122	9·0	63·3	39·51
4935	Dalby	ditto	ditto	11·2	12·6	12·8	120	9·4	62·9	41·74
4936	Ditto	ditto	ditto	10·4	13·0	13·1	79	6·0	63·7	40·63
4967	Nangwee	ditto	ditto	11·1	14·7	14·9	125	8·4	62·6	40·85
4984	Pittsworth	ditto	Light black	11·7	12·3	12·5	84	6·7	61·2	37·61
4985	Ditto	ditto	ditto	11·2	16·4	16·6	78	4·7	62·3	41·36
4853	Brookstead	Cedric	Heavy black	10·4	12·4	12·5	24	1·9	62·7	36·99
4854	Ditto	ditto	ditto	10·6	10·8	10·9	24	2·2	63·3	35·25
4883	Oakey	ditto	..	10·8	11·7	11·8	29	2·5	60·7	35·26
4884	Ditto	ditto	..	11·7	9·8	10·0	24	2·4	..	..
4905	Bongeen	ditto	Heavy black	10·0	14·1	14·1	30	2·1	62·1	32·09
4908	Ditto	ditto	ditto	11·6	13·9	14·2	45	3·2	62·6	33·59
4921	Perrinuan	ditto	ditto	11·3	13·2	13·4	64	4·8	62·2	37·48
4922	Ditto	ditto	ditto	10·7	12·0	12·1	25	2·1	63·3	37·75
4944	Dalby	ditto	ditto	10·5	13·4	13·5	27	2·0	61·5	38·02
4950	Ditto	ditto	ditto	10·8	12·0	12·1	33	2·7	62·1	41·02
4978	Nangwee	ditto	ditto	11·5	12·5	12·7	38	3·0	61·1	37·43
4979	Ditto	ditto	ditto	11·2	11·7	11·9	23	1·9	62·4	39·14
4987	Pittsworth	ditto	Light black	10·8	12·5	12·6	22	1·7	62·3	35·63
4991	Ditto	ditto	ditto	10·5	11·2	11·3	23	2·0	63·8	37·11
4881	Oakey	Clarendon	..	10·3	10·9	10·9	24	2·2	61·1	38·98
4882	Ditto	ditto	..	11·1	10·7	10·8	25	2·3	61·6	39·65
4859	Brookstead	ditto	Heavy black	10·7	13·4	13·5	30	2·2	63·0	42·00
4860	Ditto	ditto	ditto	11·3	13·9	14·1	38	2·7	63·2	42·65
4904	Bongeen	ditto	ditto	9·9	13·8	13·8	28	2·0	59·8	39·94
4907	Ditto	ditto	ditto	10·7	13·3	13·4	30	2·2	63·4	40·13
4957	Dalby	ditto	ditto	11·8	11·5	11·7	25	2·1	..	..
4992	Pittsworth	ditto	Light black	11·0	13·7	13·9	32	2·3	63·5	36·02
4999	Ditto	ditto	ditto	10·7	14·6	14·7	33	2·3	62·6	39·16
4876	Oakey	Cleveland	..	11·3	10·0	10·1	19	1·9	59·0	41·14
4877	Ditto	ditto	..	11·4	9·8	10·0	24	2·4	58·9	40·25
4906	Bongeen	ditto	Heavy black	10·8	12·9	13·0	29	2·2	59·6	36·52
4912	Ditto	ditto	ditto	11·8	11·6	11·8	21	1·8	59·7	43·88
4930	Perrinuan	ditto	ditto	11·3	10·2	10·3	27	2·6	..	..
4942	Dalby	ditto	ditto	11·2	11·0	11·1	25	2·3	58·2	36·05
4954	Ditto	ditto	ditto	11·8	10·8	11·0	15	1·4	56·6	35·17

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST—*continued.*

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4990	Pittsworth	Cleveland	Light black	10·8	11·7	11·8	21	1·8	59·7	40·14
5000	Ditto	Club	ditto	11·1	12·5	12·7	26	2·1	63·6	33·09
5003	Ditto	ditto	ditto	10·6	12·3	12·4	23	1·9	63·4	32·56
4869	Oakey	Currawa	Sandy	11·7	11·2	11·4	42	3·7	..	..
4870	Ditto	ditto	..	11·5	9·9	10·1	36	3·6	58·1	39·84
4871	Brookstead	ditto	Heavy black	10·5	12·6	12·7	35	2·8	58·8	40·10
4909	Bongeen	ditto	ditto	11·0	13·7	13·9	43	3·1	59·7	46·85
4916	Ditto	ditto	ditto	11·2	13·5	13·7	25	1·8	59·1	44·06
4934	Dalby	ditto	Light black	11·6	10·3	10·5	43	4·1	60·1	50·76
4963	Nangwee	ditto	Heavy black	10·7	10·9	11·0	33	3·0	60·0	47·44
4969	Ditto	ditto	ditto	11·4	11·5	11·7	37	3·2	55·6	43·27
4994	Pittsworth	ditto	Light black	10·6	12·8	12·9	31	2·4	63·8	50·99
4997	Ditto	ditto	ditto	10·9	12·1	12·2	28	2·3	59·0	44·00
4900	Bongeen	Duke of York	Heavy black	11·6	13·1	13·3	40	3·0	63·0	44·36
4910	Ditto	ditto	ditto	11·5	14·0	14·2	33	2·3	62·3	43·42
4945	Dalby	ditto	Light black	10·7	11·3	11·4	27	2·4	61·9	47·13
4965	Nangwee	ditto	Heavy black	10·9	12·4	12·5	42	3·4	61·7	39·85
4976	Ditto	ditto	ditto	11·2	12·9	13·1	37	2·8	61·7	39·78
4948	Dalby	Durac	ditto	10·8	12·3	12·4	37	3·0	..	..
4949	Ditto	ditto	ditto	11·2	13·0	13·2	24	1·8	50·7	31·86
4893	Oakey	Flora	Sandy	11·2	10·6	10·7	48	4·5	62·7	35·24
4894	Ditto	ditto	ditto	11·7	12·3	12·5	40	3·2	61·3	33·48
4895	Bongeen	ditto	Heavy black	10·8	14·1	14·2	48	3·4	63·9	37·67
4914	Ditto	ditto	ditto	11·5	13·0	13·3	52	3·9	60·3	32·11
4920	Perrinuan	ditto	ditto	11·0	12·3	12·4	84	6·8	..	38·96
4932	Ditto	ditto	ditto	10·8	12·5	12·6	69	5·5	62·2	35·97
4940	Dalby	ditto	ditto	10·9	12·3	12·4	84	6·8	63·7	36·00
4951	Ditto	ditto	ditto	10·7	12·5	12·6	85	6·8	62·7	35·21
4973	Nangwee	ditto	ditto	10·9	12·6	12·7	48	3·8	64·7	36·71
4986	Pittsworth	ditto	Light black	11·1	11·9	12·0	18	1·5	64·0	38·67
4961	Nangwee	ditto	Heavy black	10·9	13·2	13·3	32	2·4	64·3	37·07
4995	Pittsworth	ditto	Light black	11·1	13·4	13·6	22	1·6	64·5	35·77
4872	Oakey	Florence	Sandy	11·3	13·0	13·2	52	3·9	62·9	43·04
4873	Ditto	ditto	ditto	11·4	12·8	13·0	57	4·4	61·6	40·79
4898	Bongeen	ditto	Heavy black	10·6	15·3	15·4	47	3·1	63·2	39·83
4913	Ditto	ditto	ditto	11·6	15·4	15·7	44	2·8	63·7	39·91
4929	Perrinuan	ditto	ditto	11·9	12·7	13·0	91	7·0	61·9	41·24
4931	Ditto	ditto	ditto	11·3	12·9	13·1	101	7·7	62·9	49·02
4941	Dalby	ditto	ditto	10·8	12·9	13·0	44	3·4	63·2	42·45
4952	Ditto	ditto	ditto	11·0	13·0	13·1	91	6·9	62·3	42·59
4959	Nangwee	ditto	ditto	11·0	12·4	12·5	73	5·8	61·6	42·04
4971	Ditto	ditto	ditto	11·2	12·2	12·4	74	6·0	62·2	44·89
4982	Pittsworth	ditto	Light black	10·5	15·2	15·3	45	2·9	62·8	38·87
4988	Ditto	ditto	ditto	10·9	15·9	16·1	40	2·5	61·8	39·33

4857	Brookstead	Ford	Heavy black	10·7	11·0	11·1	56	5·0	62·9	43·04	
4858	Ditto	ditto	ditto	10·4	12·0	12·1	70	5·8	62·5	41·14	
4915	Bongeen	ditto	ditto	11·4	12·8	13·0	83	6·4	62·6	43·12	
4917	Ditto	ditto	ditto	11·0	13·6	13·8	94	6·8	61·6	39·79	
4946	Dalby	ditto	Light black	11·1	10·9	11·0	26	2·4	59·1	40·70	
4947	Ditto	ditto	ditto	11·1	10·7	10·8	31	2·9	59·9	44·44	
4977	Nangwee	ditto	Heavy black	11·3	10·9	11·1	79	7·1	61·2	45·44	
4980	Ditto	ditto	ditto	11·3	11·3	11·5	73	6·4	60·4	44·54	
5001	Pittsworth	ditto	Light black	11·7	13·4	13·7	79	5·8	63·4	41·01	
5002	Ditto	ditto	ditto	11·3	13·0	13·2	75	5·7	63·3	40·91	
4890	Oakey	Gluyas	ditto	11·3	10·6	10·8	24	2·2	60·8	43·91	
4891	Ditto	ditto	ditto	11·0	11·7	11·8	36	3·1	61·6	43·50	
4892	Ditto	ditto	..	10·6	10·2	10·3	34	3·3	61·0	45·60	
4897	Bongeen	ditto	Heavy black	11·2	12·8	13·0	32	2·5	61·6	42·58	
4911	Ditto	ditto	ditto	10·5	13·3	13·4	27	2·0	61·8	41·62	
4964	Nangwee	ditto	ditto	11·5	12·3	12·5	25	2·0	59·6	40·23	
4974	Ditto	ditto	ditto	11·2	13·4	13·6	34	2·5	61·7	44·96	
4993	Pittsworth	ditto	Light black	11·9	10·1	10·3	21	2·0	61·4	43·17	
4996	Ditto	ditto	ditto	11·4	10·8	11·0	23	2·1	60·9	41·40	
4867	Oakey	Nabawa	..	11·7	13·9	14·2	36	2·5	59·1	40·91	
4868	Ditto	ditto	..	10·2	14·5	14·5	30	2·1	58·7	41·61	
4896	Bongeen	ditto	Heavy black	10·9	13·0	13·1	41	3·1	61·5	45·94	
4918	Ditto	ditto	ditto	11·0	12·3	12·4	63	5·1	60·8	45·37	
4924	Perrinuan	ditto	ditto	11·0	10·2	10·3	29	2·8	59·3	46·27	
4960	Nangwee	ditto	ditto	11·4	12·7	12·9	28	2·2	..	46·53	
4966	Ditto	ditto	..	11·2	12·3	12·5	29	2·3	..	42·26	
5004	Pittsworth	ditto	Light black	10·9	12·3	12·4	33	2·7	59·7	38·82	
5005	Ditto	ditto	ditto	11·4	12·3	12·5	30	2·4	60·1	38·77	
4927	Perrinuan	Novo	Heavy black	10·9	11·4	11·5	25	2·2	61·7	32·96	
4928	Ditto	ditto	ditto	11·8	11·1	11·3	75	6·6	..	35·52	
4943	Dalby	ditto	ditto	10·9	10·3	10·4	20	1·9	60·7	33·43	
4956	Ditto	ditto	ditto	10·6	10·7	10·8	18	1·7	62·6	31·93	
4937	Ditto	Pinto	ditto	11·8	12·5	12·7	65	5·1	63·0	44·13	
4953	Ditto	ditto	ditto	10·8	11·6	11·7	55	4·7	62·6	44·50	
4885	Oakey	Pusa	Light black	11·4	14·2	14·4	166	11·5	63·8	38·06	
4886	Ditto	ditto	..	11·3	11·4	11·6	134	11·6	63·6	37·28	
4887	Ditto	ditto	..	11·9	15·1	15·4	159	10·3	..	..	
4919	Bongeen	ditto	Heavy black	11·0	13·7	13·9	150	10·8	60·3	37·50	
4925	Perrinuan	ditto	ditto	11·6	11·6	11·8	137	11·6	63·6	39·17	
4933	Ditto	ditto	ditto	11·0	11·6	11·7	101	8·6	63·1	39·84	
4938	Dalby	ditto	ditto	11·7	12·7	12·9	155	12·0	63·2	40·75	
4958	Ditto	ditto	ditto	10·3	12·1	12·1	137	11·4	62·5	39·43	
4962	Nangwee	ditto	ditto	10·9	11·6	11·7	132	11·3	63·5	37·95	
4972	Ditto	ditto	ditto	10·5	14·1	14·2	163	11·5	63·7	41·60	
4983	Pittsworth	ditto	Light black	10·2	13·9	13·9	155	11·2	63·0	38·44	
4998	Ditto	ditto	ditto	10·5	14·0	14·1	174	12·4	62·9	38·87	
4865	Brookstead	Quality	Heavy black	11·8	13·0	13·3	103	7·8	63·4	41·29	
4866	Ditto	Roma red	ditto	11·7	10·7	10·9	25	2·3	..	..	
4939	Dalby	ditto	Light black	10·7	13·9	14·0	26	1·9	61·6	38·04	
4955	Ditto	ditto	Heavy black	11·9	13·5	13·8	20	1·5	58·8	37·66	
4968	Nangwee	ditto	ditto	11·3	10·4	10·6	23	2·2	61·2	40·56	
4981	Ditto	ditto	ditto	11·5	10·9	11·1	29	2·6	62·1	41·37	

WHEATS FROM STATE WHEAT BOARD, 1934-1935 HARVEST—*continued.*

Laboratory No.	District.	Variety.	Class of Soil.	Moisture.	Protein.	Protein on 10 Per Cent. Moisture.	Average Settling Time (Minutes).	Specific Protein Quality.	Bushel Weight in Lb.	Weight of 1,000 Grains in Grams.
4899	Bongeen	Sea foam	Heavy Black	11·6	15·3	15·6	105	6·7	59·8	38·98
4923	Perrinuan	ditto	ditto	11·5	12·3	12·5	92	7·4	62·8	43·19
4926	Ditto	ditto	ditto	11·4	13·0	13·2	140	10·6	62·3	39·37
4989	Pittsworth	ditto	Light black	11·1	12·6	12·8	115	9·0	62·7	36·98
5006	Ditto	ditto	ditto	11·0	12·4	12·5	119	9·5	61·8	37·62
4855	Brookstead	Warren	Heavy black	10·0	11·6	11·6	80	6·9	60·2	39·58
4856	Ditto	ditto	ditto	9·9	11·9	11·9	69	5·8	59·8	37·94
4878	Oakey	ditto	Sandy	11·3	10·9	11·1	65	5·9	60·8	42·51
4879	Ditto	ditto	ditto	11·9	11·3	11·5	83	7·2	58·5	35·43
4880	Ditto	ditto	ditto	11·7	11·5	11·7	86	7·4	60·8	41·37
4970	Nangwee	ditto	Heavy black	10·8	11·6	11·7	97	8·3	58·7	41·60
4975	Ditto	ditto	ditto	11·2	11·3	11·5	81	7·0	58·2	41·91

A New Quarantine House.

By A. F. BELL.*

ON this page we reproduce a photograph of a new insect-proof glass house which has been constructed in Brisbane for the reception of new cane varieties imported by the Bureau from overseas. This house has been designed in accordance with modern quarantine requirements and will be put into commission during August, when five new varieties will be received.

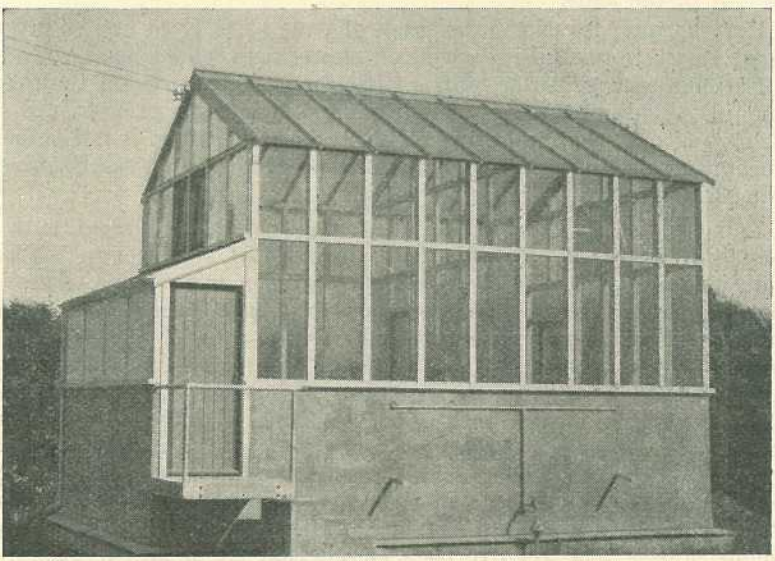


Plate 89.—Quarantine House Recently Completed in Brisbane.

The structure is of reinforced concrete, with the superstructure composed of glass, which is reinforced for protection against hail-storm damage. Ventilation is provided by panels in which copper gauze is substituted for glass; on the far side of the house, and at either end, the gauze is set within hinged glass doors so that the draught can be regulated. In summer, to prevent excessive temperatures, canvas blinds can be drawn across the underside of the roof. Entrance is gained through a double closed compartment, one half of which is painted black inside and is completely dark when closed. The object of this is to reduce the probability of insects flying into or from the house when a person is passing in or out. The floor of the house is some 4 feet above ground level and is reached by steps which do not make contact with the main structure, thus preventing the ingress of ants. In addition, the main structure is surrounded by a gutter, let into the concrete, which is filled with water; sticks and leaves which would act as rafts for ants are kept out by a small sheet iron awning.

The interior of the house is divided into two sections, the larger of which will carry six stools of cane and the smaller four stools. The cane is grown in sections of concrete piping 2 feet in diameter and 2 feet

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

6 inches high, and can be grown to maturity without difficulty. The soil in which the setts are planted is sterilized before being placed in the tubs.

Upon being received from overseas the material in which the cane has been packed is destroyed, and the cane is sterilized in corrosive sublimate to kill any fungus spores which may be attached to the surface. The setts are then treated in warm water at 125 deg. Fahrenheit for a period of 20 minutes before being planted; the value of the warm water treatment is three-fold; it stimulates germination of the setts, it cures certain diseases, and it destroys insect eggs which may have been deposited in the cane.

For the purpose of the despatch of cane setts from one country to another they are packed in powdered charcoal to which has been added about 10 per cent. of water, plus a little formalin, to prevent the growth of moulds. This amount of moisture is sufficient to prevent the setts from drying out when placed in a sealed container; but is not sufficient to encourage germination. As a further protection the freshly-cut ends of the setts are pitched before packing.

It is at times argued that, since Queensland is cursed with the presence of nearly all the important diseases of sugar cane, elaborate precautions are unnecessary when introducing new varieties. However, modern investigation has shown that this is a fallacious argument because in very many diseases there exist so-called "strains" of the "germs" which cause the disease. For example, there are at least a couple of dozen strains of the fungus which causes wheat rust and a particular variety of wheat may be susceptible to only three or four of these strains. As only a fraction of these strains are usually present in any one locality it will be seen that a variety which is considered to be resistant to rust in one area might prove very susceptible to a strain present in another area. In the case of the well-known mosaic disease of sugar-cane it has recently been found that there are at least three strains of this disease present in the United States. Furthermore, varieties which are resistant to one strain have been found to be susceptible to one or both of the others. Very probably we do not have these three strains in Queensland, therefore, it will be appreciated that although they have mosaic disease in the United States, and we have mosaic disease in this State, it may not be quite the same; and careless handling of imported setts may introduce a mosaic disease which would attack our most important varieties. It is obvious, therefore, that great care will always have to be exercised in the importation of new varieties, and a quarantine house such as the one illustrated will greatly assist us in maintaining adequate safeguards.

Sale of Seeds.

REGULATORY LEGISLATION.

Definition of Vendor.

A vendor under the Pure Seeds Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds.

Invoice to be Given by Vendor.

The Acts require that on the sale of any such seed of not less than 1s. in value, the vendor shall at the time of the sale give to the buyer, or, if the buyer is not present at the time of sale, forward to him an invoice containing the statements required by the Acts.

The wording of the invoice should be to the following effect:—

> "The seeds mentioned in this invoice are for planting or sowing. Such seeds are of the kind or kinds specified, and contain no greater proportion or amount of foreign ingredients than is prescribed with respect to such seeds."

Seeds Sold in Made-up Packets to have Year of Growing Marked.

In the case of seeds in pictorial or other made-up packets, the year in which such seeds were grown must be clearly and indelibly marked upon the outside of each packet.

Definition of Foreign Ingredients.

"Foreign ingredients" shall include inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; or dead, diseased, insect-infested, non-germinable, or hard seeds.

"Inert matter"—Broken seeds less in size than one-half of a complete seed; or chaff, dust, stones, or any material other than seeds.

"Hard seeds"—Any seeds whose seed coats are so impervious to water as to delay germination.

Prohibited Seeds.

The following seeds are totally prohibited:—Seeds of *Cuscuta* spp. (Dodder), *Datura* spp. (Thorn Apple), *Ricinus communis* (Castor Oil plant), and diseased or insect-infested seeds.

Quantity of Foreign Ingredients Allowed.

The quantity of foreign ingredients allowed in the various kinds of seeds is set out in the Regulations, a copy of which can be obtained on application to the Department of Agriculture, Brisbane.

Efficient Seed-cleaning Machinery.

The Regulations do not apply to—

Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

Samples from Bulk in Sender's Possession.

The Regulations provide for the examination of samples at the Seed Laboratory, Brisbane, the cost being a nominal one of 2s. 6d. for

each Certificate of Analysis. When sending such samples, it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk.

To enable this to be done satisfactorily they should be drawn alternatively from the top, middle, and bottom of the bags, the proportion of bags to be sampled being as follows:—

1 to 20 bag lots—Sample should be drawn from every bag.

21 to 40 bag lots—Sample should be drawn from not less than 21 bags.

41 to 60 bag lots—Sample should be drawn from not less than 28 bags.

61 to 80 bag lots—Sample should be drawn from not less than 32 bags.

81 to 100 bag lots—Sample should be drawn from not less than 36 bags.

100 to 200 bag lots—Sample should be drawn from not less than 40 bags.

200 bags and over—Sample should be drawn from not less than 20 per cent.

If, when drawing samples, it is observed that great variation occurs in the bulk, two or more samples should be obtained, each representing bags whose contents are similar.

After the sample has been drawn as above indicated it should be emptied out on to a large piece of paper, thoroughly mixed, and then a quantity not less than the prescribed weight for such samples should be drawn for purposes of forwarding to the Seed Laboratory. A duplicate sample should be kept for reference.

In the Seed Laboratory, great pains are taken to ensure absolute accuracy of work. It, therefore, follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks from which they are obtained. The minimum weight of each sample and the particulars to be marked on same are as hereunder set out:—

Weight of Samples.

PRESCRIBED WEIGHT OF SAMPLES.

Kind of Seed.	Weight Required.
In the case of seeds containing weed seeds or other foreign ingredients, not less than double the weight mentioned should be sent.	
Mauritius Beans, Peanuts	2 lb.
Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat ..	1 lb.
Canary, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Setaria Italica* (Foxtail Millet), *Sorghum Sudanese* (Sudan Grass), Sorghum, White Panicum	4 oz.
Paspalum dilatatum, Rhodes (*Chloris gayana*), Rye Grass, *Phalaris tuberosa*, Cocksfoot, Couch, *Panicum antidotale*, Mollasses Grass, &c.	3 oz.
Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable Seeds of like size	½ oz.
Vegetable Seeds in made-up packets	5 pkts.
Agricultueal and Vegetable Seeds other than those indicated above ..	2 oz.

Marking of Samples.

All samples must be plainly written on in ink, setting out the undermentioned particulars:—

(1) Name under which the seed was purchased, or is proposed to be sold;
(2) The number of bags from which the sample was drawn, and the number of bags in the whole consignment;
(3) The marks of identification, if any, on such bags;
(4) The name and address of the sender, with date of sampling;
(5) If the sender is not the actual grower, the name and address of the sender's supplier, with date of delivery.

Samples should be addressed as follows:—

Seed Sample for Examination.
Officer in Charge,
Seed Laboratory,
Department of Agriculture,
William Street,
Brisbane.

Special care should be taken to securely fasten up the sample. The examination of samples that have been opened in transit is useless for any determination, as only a sample received intact can be taken as representing any bulk.

Fee of 2s. 6d.

A covering letter, enclosing the prescribed fee of 2s. 6d. per sample, should be addressed to the Under Secretary, Department of Agriculture, Brisbane.

Free Examination.

The Seed Laboratory at Brisbane examines, free of charge, all samples representing seeds that farmers have purchased for their own sowing.

Complaints.

In case of any complaints regarding purity or germination the buyer should at once send a sample of the seed, marked with the particulars as above set out, together with a covering letter to the Department advising of the despatch of the sample; this will be examined free of charge.

Certificates.

Unless the sender is careful to forward a truly representative sample, the report thereon is valueless. Under no circumstances is a certificate or report a guarantee by the Department of Agriculture as to the bulk, but a statement as to the condition of the sample at the time when such sample was examined.

Examine Goods on the Day of Delivery.

Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilizers, pest destroyers, stock foods, or veterinary medicines, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of June, 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.				
Oakvilla Shamrock 6th (365 days)	W. G. Marquardt, Wondai	16,048·67	657·09	Victorious of Oakvilla
Jean 4th of Oakvilla	W. G. Marquardt, Wondai	14,180·74	560·692	Victory of Greyleigh
Dot 5th of Oakvilla (272 days)	W. G. Marquardt, Wondai	13,648·6	545·696	Victory of Greyleigh
Princess 6th of Oakvilla	W. G. Marquardt, Wondai	14,293·49	538·0	Victory of Greyleigh
Oakvilla Champion 7th (268 days)	W. G. Marquardt, Wondai	13,753·24	537·02	Victory of Greyleigh
Champion 4th of Oakvilla	W. G. Marquardt, Wondai	13,377·73	528·851	Victorious of Oakvilla
Rosebud 5th of Oakvilla	W. G. Marquardt, Wondai	13,269·34	524·811	Victory of Oakvilla
Snowdrop II. of Blacklands (272 days)	A. M. Johnson, Gracemere	11,794·1	479·110	Premier of Hillview
Champion 9th of Oakvilla (270 days)	W. G. Marquardt, Wondai	12,268·61	471·608	Victory of Greyleigh
Wunulla Daisy III.	A. M. Johnson, Gracemere	11,189·2	462·461	Rosebuds Success
Rosebud 7th of Oakvilla (216 days)	W. G. Marquardt, Wondai	11,022·62	447·128	Victory of Greyleigh
Melba of Minto Vale	E. O. Althouse, Cloyna	10,278·46	429·803	Sir James of Oakvale
Springleigh Beaudetta's Pearl	Moller Brothers, Boonah	11,279·75	426·918	17th Red Knight of the Cedars
Empress 11th of Sunnyside	P. Moore, Wooroolin	9,699·85	407·918	Emblem of Sunnyside
Wunulla Ultimate	A. M. Johnson, Gracemere	10,017·35	399·291	Rays Togo of Wunulla
Avonel Dream Girl	R. Scott, Toogoolawah	8,095·75	374·222	Madams President of Avonel
Sunnymeade Fairy 2nd	E. O. Althouse, Cloyna	10,188·03	368·254	Masterpiece of Oakdale
Homelea Maggie 3rd (270 days)	G. D. Lindenmayer, Mundubbera	10,689·5	361·150	Emperor of White Park

Junior, 4 Years (under 4½ Years), Standard 310 lb.				
Wandegong Joyce 3rd	G. D. Lindenmayer, Mundubbera	12,642·5	455·026	Emperor of Spurfield
Rocklyn Celia	T. Strain, Wondai	10,132·67	419·113	King of Sunnyside
Waverley Sadie	R. Scott, Toogoolawah	8,877·56	354·351	Skipper of Waverley
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Trevor Hill Starlight	G. Gwynne, Umbiram	11,606·48	505·845	Gambol of Wilga Vale
Wandegong Marjorie	G. D. Lindenmayer, Mundubbera	10,283·25	339·857	Emperor of Spurfield
Waverley Venus	R. Scott, Toogoolawah	7,879·6	315·221	Skipper of Waverley
Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Rocklyn Kate 3rd	T. Strain, Wondai	8,511·26	421·465	King of Sunnyside
Homelea Bessie	J. Savage, Humphrey	8,742·4	336·453	Emperor of Springdale
Springlands Shamrock II. (224 days)	W. G. Marquardt, Wondai	8,924·36	335·465	Boss of Hillview
Stirling Crescent	J. W. Crabb, Woodstock	6,371·25	284·294	Finance of Blacklands
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Stirling Flora	J. W. Crabb, Woodstock	9,219·44	376·702	Defender's Boy of Orchard's Dairy
Mirth IV. of Blacklands (272 days)	A. M. Johnson, Gracemere	7,905·3	341·938	Orama of Blacklands
College Pidgeon 3rd	Queensland Agricultural High School and College, Gatton	7,502·18	315·645	Duplex of Greyleigh
Homelea Joan	J. Savage, Humphrey	6,982·5	264·265	Expert of Springdale
Nina 16th of Morden	Dobson Brothers, Camp Mountain	6,220·64	252·451	Jupiter of Morden
Junior, 2 Years (under 2½ Years), Standard 230 lb.				
Springlands Gold	T. Strain, Wondai	7,861·95	348·377	The Hill Hollywood
Euroa Lauretta	H. T. Lindenmayer, Mundubbera	8,900·5	346·555	Emperor of Spurfield
Empress 3rd of Homelea	J. Savage, Humphrey	7,880·5	313·346	Expert of Springdale
Morden Tulip 9th	R. Mears, Toogoolawah	7,239·1	312·998	Jupiter 7th of Morden
College Diana	Queensland Agricultural High School and College, Gatton	6,088·49	259·027	Duplex of Greyleigh
Wandegong Peggy O'Neill (246 days)	G. D. Lindenmayer, Mundubbera	6,605	250·981	Emperor of Spurfield
Marn Leona	R. Martin, Biggenden	5,468·4	243·494	Glenlee Victory

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
FRIESIAN.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Towerlton Zara	F. C. Noller, Kumbia	15,682·68	587·243	Domino Belted King
Inavale Fanny 5th	A. O. Stumer, Boonah	10,987·5	394·735	Anama Drikjis Pride
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Ryfield Dairymaid 6th	F. C. Noller, Kumbia	7,137·2	250·811	St. Athens Argus
GUERNSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Moongi Cherry Plum 3rd	S. Buck, Millaa Millaa	10,043	501·034	Moongi Slyph's Show Boy
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Auchen Eden Rosebud (272 days)	J. N. Scott, Camp Mountain	7,239·9	290·912	Benbecula Majestic
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Lyndhurst Molly (362 days)	J. B. Keys, Gowrie Little Plains	16,310·65	755·19	Noble King of Ogilvie
Trinity Devotion	F. P. Fowler and Sons, Coalstoun Lakes	7,815·5	505·945	Trinity Governor
Lady III. of Hillview (271 days)	A. Geritz, Oakfield	8,743·76	432·172	Playlad of Hillview
Inasfayl Masters Queen II.	McGeehan Brothers, Kairi	8,896·9	429·677	Werribee Starbrights Masterpiece II.
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Joybelle of Hillview	A. Geritz, Oakfield	6,910·28	381·06	Mike of Hillview
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Greenstock Buttercup	J. B. Keys, Gowrie Little Plains	7,573·41	428·184	Carnation Larks Baron
Wyreene Petsy	J. B. Keys, Gowrie Little Plains	7,934·2	378·808	Lyndhurst Victor
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Trecarne Lockettete 3rd	J. Schull, Oakey	5,063·55	295·244	Trecarne Golden King
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Brooklands Forward Rosebud	W. S. Conochie, Sherwood	9,420·8	451·7	Forward of Brooklands
Fauvic Double Joy	H. Cochrane, Kin Kin	5,059·2	279·102	Condong Double Prometheus

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

Woodside Volunteers Countess (365 days)	J. and R. Williams, Crawford	11,071·65	534·309	Rochettes Volunteer
Narcissus of Calton	J. Collins, Tingoora	9,060·1	433·841	Retford Meteor
Trinity Spotted Lily	J. Sinnamon and Sons, Moggill	7,214·92	432·432	Some Hope
Foxglove of Calton	A. Geritz, Oakfield	7,210·06	365·515	Prince Clair of Calton
Trinity Royal Lily	J. Sinnamon and Sons, Moggill	6,295·28	346·396	Some Hope
Wyreene Gentle Lady II.	J. B. Keys, Gowrie Little Plains	5,794·75	297·213	Milkman of Wyreene
Bellgarth Bequet	R. A. Slaughter, Clifton	5,063·39	290·014	Bellfaire Blondes Bellringer
Inasfayl Royal Larkspur	McGeehan Brothers, Kairi	4,831·7	257·253	Oxford Royal Renown
Waltham Farm Rose	McGregor Brothers, Yalargun	4,438·64	255·42	Trecarne Reminder
Wyreene Cherry Leaf 2nd	J. B. Keys, Gowrie Little Plains	4,499·09	254·761	Lyndhurst Majesty
Fauvic Double Gay	H. Cochrane, Kin Kin	4,688·35	244·341	Condong Double Prometheus
Wyreene Trixie 2nd	McGregor Brothers, Yalargun	3,998·69	230·33	Prospectors Goldfinder of Morago

Answers to Correspondents.

Dairy Cattle Improvement Act—Its Benefit to Producers.

A Murgon correspondent has asked what benefits are derived by producers from their contributions to the Dairy Cattle Improvement Fund; and what benefits are expected to accrue in the near future under the operation of the Dairy Cattle Improvement Act. Following is the reply:—

The benefits accruing to the producers as a result of the operations of the Dairy Cattle Improvement Act are real. The services of four fully qualified veterinary surgeons are available to dairy farmers. These officers are stationed at centres where they are within close call of the principal dairying districts. Provision is made also for the granting of a rebate of the freight, payable to the Queensland Railways, to the purchaser of an approved bull whose dam has passed the standard set down for her age for entry into the advanced register of the various herd books. It is gratifying to note that this is being taken advantage of by an increasing number of dairymen, and it is expected that this will prove an important factor in raising the standard of the dairy herds of the State. The facilities offered under the Grade Herd-testing Scheme have been extended. A better and more efficient service is now available to those dairy farmers who prefer to know, rather than guess, the value of the individual members of their herds. In every other State or country in the world where this service is rendered, varying sums up to 6s. per cow are charged, but in Queensland any farmer availing himself of the scheme does not place himself under any financial obligation. Under the Dairy Cattle Improvement Act, an educational programme has been launched for the benefit of dairy farmers, and those districts which have availed themselves of the facilities offered now enjoy the advantages of a greater knowledge of, and a broader outlook on, their business. Educational courses at the Department of Agriculture and Stock and the Animal Health Station, Yeerongpilly, for the leaders of Dairy Committees have been well attended, and the knowledge gained is being disseminated among the many farmer throughout the districts represented. These educational facilities have been extended to the field, right to every dairying centre, by means of periodical field days. Many of these field days have already been held, and a further programme is now being arranged. The field day consists of lectures and demonstrations by Departmental experts on veterinary science and dairy bacteriology and economics. The popularity of the field day is ample evidence that these services are appreciated by the dairying communities, and shows clearly that the dairy farmer is anxious to acquire a fuller knowledge of the fundamental principles of his calling. Under the Dairy Cattle Improvement Act the acquisition of this knowledge is made possible. As an adjunct to these activities, a modern dairy laboratory, fully equipped and staffed with experienced scientists, will be opened shortly. In the laboratory many problems affecting the welfare of the dairying industry will be studied and investigated. A general improvement in dairy production must result from all these activities.

"Cattle Bush."

E.C. (Texas, Q.)—

The specimen represents *Pittosporum phillyræoides*, sometimes called "native willow," or the "willow pittosporum." It is a native of Queensland, New South Wales, and parts of South Australia, so you will see it is fairly widely distributed. We have seen it in a number of localities, mostly just a few trees, and nowhere in abundance. The plant is not known to possess any poisonous or harmful properties; in fact, the leaves are said to make excellent cattle feed during a dry spell, and "Cattle Bush" is a local name we have heard applied to it.

Mitchell Grass on the Coast.

R.A.W. (Rosedale).

Your specimen represents a variety of Mitchell grass generally known as the Bull Mitchell, *Astrebla squarrosa*, a very common species in parts of the north-west. It is a valuable fodder plant, and not likely to become a nuisance in any way. It would be interesting to see how it does on the coast.

General Notes.

Staff Changes and Appointments.

Mr. F. D. Marshall (Monogorilby, via Mundubbera), a qualified candidate from the recent examination for Stock, Slaughtering, and Dairy Inspectors, has been appointed an Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock.

Mr. G. R. Blair, Acting Secretary of the Australian Sugar Co. Pty., Ltd., Mourilyan, has been appointed Millowners' Representative on the Mourilyan Local Sugar Cane Prices Board, in lieu of Mr. D. G. McLeod, resigned.

Honorary Rangers appointed under the Animals and Birds Acts are:—Messrs. R. M. Foote (Ipswich), T. L. Moon and C. C. Moon (Blenheim, via Laidley), H. H. Rowan (Superintendent, Lockhart River Mission), W. F. McKenzie (Superintendent, Aurukun Mission), S. E. McKay (Superintendent, Weipa Mission), and R. McLelland (Superintendent, Mapoon Mission).

Mr. F. Round, Stock, Slaughtering, and Dairy Inspector, has been transferred from Toowoomba to Pittsworth.

The undermentioned have been appointed Honorary Rangers under the Animals and Birds Acts:—

Messrs. C. W. J. Bedford, junior, Fernleigh Dairy, North Side, Mackay; G. H. Harris, Fairney View; J. E. Summerville, Borallon; C. Bell, J. B. Thornton, T. E. Thornton, W. C. Bell, and W. Fallon, Post Office, Ipswich; P. W. Powell and F. W. Findlay, Mount Crosby; C. H. Summerville, Post Office, Tivoli; J. F. Smith, Post Office, North Ipswich; E. McG. Thornton, Post Office, Ipswich.

Constable M. A. Bergin, Canungra, has been appointed also Slaughtering Inspector.

Mr. F. B. Coleman, Inspector and Examiner under the Fertilisers Act, the Pure Seeds Act, and the Stock Foods Act, Department of Agriculture and Stock, has been appointed Officer-in-Charge, Seeds, Fertilizers, Veterinary Medicines, and Stock Foods Investigation Branch, Department of Agriculture and Stock.

Mr. F. Keogh, who is at present seconded to the Agricultural Chemical Laboratory, has been appointed Analyst, Agricultural Chemical Laboratory, Department of Agriculture and Stock.

The designation of the position of Supervisor of Dairying has been changed to that of Director of Dairying, and Mr. G. H. E. Heers, Supervisor of Dairying, has been appointed Director of Dairying, Department of Agriculture and Stock.

Mr. T. G. Graham, who is at present seconded to the Department of Agriculture and Stock as Instructor in Agriculture, has been appointed Instructor in Agriculture, Department of Agriculture and Stock. Mr. Graham is at present stationed at Mareeba.

Honorary Rangers appointed in pursuance of the provisions of the Animals and Birds Acts and the Native Plants Protection Act include a number of officers of the Forestry Sub-Department, and also Mr. H. E. Young, Assistant to Pathologist, Department of Agriculture and Stock.

Mr. R. M. Cunningham, of Mourilyan, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. R. J. O'Sullivan, Inspector of Stock, Slaughtering, and Dairies, has been transferred from the Bacon Factory, Doboy, to Maryvale.

Mr. F. B. Coleman, Officer in Charge, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch, Department of Agriculture and Stock, has been appointed also an Expert under the Pure Seeds Act.

Mr. E. S. Edgerton, Mourilyan, has been appointed Canegrowers' Representative on the Mourilyan Local Sugar Cane Prices Board.

Constables P. G. K. Brennan (Rosedale), H. Sheehan (Emu Park), J. M. Linnane (Meringandan), and A. E. Genrich (Talwood) have been appointed also Inspectors under the Slaughtering Act.

Commodity Boards.

A regulation has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts empowering the Minister, in the event of any member of a commodity board being unable through illness, absence, or other cause, to attend a meeting of a Board, to appoint some person nominated by such member to act as deputy for such member at the meeting.

Rural Topics.

Pastoral Supplies.

Visitors to the Brisbane Exhibition should make a note to call upon the Queensland Pastoral Supplies Proprietary, Limited. This enterprising firm has its own exhibition at the showgrounds, adjoining Affleck House. For the convenience of country customers a "Reel-Yellow" cab will carry them free of charge within the city area to the Queensland Pastoral Supplies warehouse in Bowen street, near the Fire Brigade. The policy of this firm in supplying direct to the man on the land is becoming more appreciated every year. In addition to supplying the man on the land at wholesale prices, every year there is a new factory established by this firm—their latest factory being for the manufacture of joinery, which embodies the latest machinery, enabling high-class joinery to be sold direct to the consumer at factory prices. This firm issues a comprehensive catalogue, which will be sent to any interested reader free of charge on direct application to the firm. On the roof of their new building at the showground the firm has installed a modern camera obscura, enabling a coloured life moving picture of the whole of the show to be seen. A nominal entrance fee will be charged, and the whole of the proceeds will be devoted to the Crippled Children's Fund.

A Turkey Talk.

Rearing turkey chicks by means of brooders, foster-mothers and other expedients is becoming more and more popular in the old country. Discussing the artificial rearing of turkeys, Edmund Barr has this to say in the current "Farm, Field, and Fireside" (England):—

A broody hen has a natural instinct, and will, to the best of her ability, mother her brood through danger or a bad storm, but where turkeys are being reared by hovers, &c., the operator must think and act for his charges. Two points worthy of mention are wire floors and litter.

Day-old turkey chicks object to some types of wire floors, hesitate to walk for water and food, and soon flag and die; also they will at first eat litter of almost any description with harmful results. The only litter they do not eat is sand, but if this is used it must be clean and dry. Sand, of course, can only be used on a solid floor.

For the first week it is always safest to cut open dry, clean sacks or bags and lay over the wire or the litter. These must be changed for clean ones at least once daily. After a week it is usually safe to use litter, providing it is dry and free from dust. Oat chaff or barley chaff are not suitable. Peat moss or cut straw is far better. The short straw from the thresher also makes suitable litter.

Clean litter should be given at least once weekly; directly it gets obviously dirty, smelly, or damp, it should be changed.

Nearly all the various appliances which rear chickens will rear turkeys successfully, provided they are altered a trifle if necessary. It is not safe to put more than half the number of turkey chicks under a hover intended for a given number of chickens. For the first few days the turkey chicks require a temperature of 95 deg. Fah. in the warm compartment or under the hover.

At first things should be arranged so that the chicks cannot get more than a few inches from the warmth. After three days the amount of exercising and feeding space can be gradually increased, so that at one week they have the entire run of the brooder house.

If semi-intensive rearing is practised, do not be in too great a hurry to let the chicks out. If brooder space is ample they are best under cover for the first two weeks at least. When they are let out they must have an enclosed run, or they wander off and get hopelessly lost.

Chopped green food should be fed, and also a little cod-liver oil should be given mixed in the mash. Brooders admitting direct sunlight should be used. Naturally, the direct sunlight must reach the chicks themselves to prove beneficial.

If huddling or crowding to one certain corner takes place, look for a draught and prevent it, or increase the temperature. Chicks falling over on their backs or breathing with their mouths open denotes that the heat is too great and must be decreased.

This method of turkey rearing needs care and common sense, but in bad weather has a great deal to commend it.

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 planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

MATERNAL INSTINCT.

AMONG what are called the lower animals—we would rather call them our poor relations—maternal instinct is a marvellous thing. Very seldom indeed does it make mistakes. We might go through the whole animal kingdom and give hundreds of examples of this until our readers were tired, but we will content ourselves with one animal, the well-known useful, but certainly not very intelligent, domestic hen. Science has perfected the most ingenious incubators which have become indispensable for the production of chicks on a large scale. Our poultry farmers use them with the skill that comes from long experience. Yet a leading authority among them assured us recently, that for producing the largest number of chicks from a given number of eggs, there is nothing that can equal the broody hen. She sits on her eggs as though they were dearer to her than life. Yet she has the sense to leave them at intervals for a brief cool-off, and does not fail to turn them over when she returns to the nest. Without this there would be a danger of the yolk sticking to the egg-shell, and the spoiling of that chick. Equally well does she mother them when hatched. Not usually courageous, she will risk her life in their defence. She accompanies them in their early scratching expeditions, and when they are tired, she calls them into the shelter and warmth of her body and wings. "Like as a hen gathereth her chickens," said the Master, and we all feel the overwhelming force of this simile.

But what does the maternal instinct do for the human mother? It gives her that most wonderful thing maternal love. It gives her the wish to nourish, to protect, to do her very best for this wonderful babe born of her body. But does it teach her how to do this? Ask the mother of her first-born, whether instinct told her how to give baby his bath, the first time she tried. Instinct probably does impel her to give baby the breast. Yet how weak is that impulse! How many babies have been deliberately fed from the bottle, and so deprived of half their chances of life and health? How many have been weaned early for no good reason? At the least difficulty in breast-feeding, either because the baby did not suck well, or the breast-milk was slow in coming, or the supply appeared scanty, or the mother gave the baby too much, and so upset it, or because some "friend" said, "I think your milk does not agree with the baby," the unfortunate babe was doomed to all the perils of an artificial diet. We have done much to change this, but these practices are not yet extinct.

If instinct fails so often with the average babe, what if the premature babe under five pounds in weight, perhaps only three or four pounds? Occasionally unusually intelligent and careful mothers have succeeded in rearing these delicate infants, but certainly not by

instinct. We are told that one of the world's greatest intellects, Sir Isaac Newton, began life as a tiny red atom of a babe. But how many hundreds and thousands have died, and what may the world have lost? Yet the great majority might be saved if brought early to our Baby Clinics.

Still one occasionally hears a really intelligent woman declare that she thinks the mother's instinct her best guide. This woman may have successfully reared her own family, but she certainly did not do so by instinct. Her success was due to sound traditions received from her own mother or some other, aided perhaps by a little luck. Intelligence (it used to be called reason) is the woman's guide, not instinct. Instinct in our poor relations is certain but narrow, it runs in a groove. Intelligence is capable of meeting any change of circumstance, of combating new and unknown difficulties. It is a much higher endowment than instinct, but it may make great mistakes. It was misguided intelligence that made so many mothers wean their babes; that made our old-time nurses dose the newborn with castor oil, and so upset their little insides from the very start. We might give many other illustrations, but it is unnecessary.

Rearing healthy babes and children is skilled labour, and there are better ways of acquiring skill than by ignorant handling of one's first-born. No woman should be too proud to learn. But, say some, there is so much being printed about Infant Welfare and it is not all in agreement. True, much has been printed. Most of it is good, some poor, some even harmful. That is why these articles are printed always under the same heading to show that they come from a specially trained and responsible service. Do not, however, think that you can acquire skill by reading only. Come to our Clinics and you will understand better what you read.

PACKSADDLE OR COVERED WAGON?

SETTLEMENT OF AUSTRALIA.

By Rev. JOHN FLYNN, of the Australian Inland Mission.

Healthy Motherhood Needed.

ALL who, with growing anxiety, have been reading the writing on the wall, must rejoice that our King's Jubilee has inspired a nation-wide Thanksgiving Fund devoted to Australian Motherhood.

While frankly facing alarming possibilities of the marked downward movement revealed by Australia's recent vital statistics, we who endeavour to think in terms of centuries and continents are cherishing a theory that the present "trough" in the Australian birthrate is due to an interesting combination of circumstances, the like of which may not be seen again for many generations.

We must remember that the "extension complex" inherent in pioneers is intensified in their children. Our first Australian pioneers were compelled by countless obstacles to move slowly and to consolidate their gains with care; but, in their children, the original simple urge to move towards new homes has frequently developed into an aimless wanderlust—a disease fatal to family life.

The Bachelor Habit.

Again, although our earliest Australian pioneering was of the "covered wagon" type, *i.e.*, was carried on by families—men, women, and children travelling out together—our later adventures have been largely of the "packsaddle" type, by men alone. It was inevitable that the bachelor habit should emerge, and that, in many remote areas, the phrase of doom, "No encumbrances," should almost eliminate community significance from so-called "occupation."

In many circles it is customary to mourn that modern young people do not care to venture into regions beyond. While there may be some truth in such a lament, there is still more significance in an earlier fact—so many of our hardiest pioneering parents boasted that they had endured privations long enough; and, from the thrones of their success, they ordained that their children must not be exposed to similar drudgery! So they trained their heirs for lives of comparative ease.

Effects of the War.

And then our world was struck by the Great War Comet, with its enormous tail of fearsome complications, which dazed young minds with primary shocks, and exposed them to slow attrition from continuous reverberations in current literature and conversation. Between the joyous carnivals they frequent, the faculties are numbed—might one say bewitched—by mutterings of half-baked philosophers who forget that, from the beginning, the course of this old world has been just one earthquake after another; and that life has always been a grim, though intensely fascinating, endurance test to raise the human family gloriously erect amid our cyclonic environment. Those ugly mutterings have been put into vivid language by Yeats:—

> "Things fall apart; the centre cannot hold;
> Mere anarchy is loosed upon the world,
> The blood-dimmed tide is loosed . . . "

What are we going to do about it?

In our hearts, I hope, we will not take this loss of national nerve too seriously. Our young people, now undergoing a course of refreshing pleasure, will surely be borne back to the shore by a returning surge of hardy patriotism, which must follow as surely as the flowing tide succeeds the ebb. The slow cycle of travail, exhaustion, recklessness, pleasure, will at last bring them round to quietness and confidence. Impatient critics of modern youngsters frequently forget that, in all history, the rank and file of our people have never been subjected to such a terrible bombardment of international alarms, echoed and re-echoed by countless publicity agencies, many of which are more interested in thrills than in truth.

The New Pioneering.

Contemplating the internal affairs, it is particularly necessary to recognise that our young Australian nation is just now passing from the era of extension to that of intension. News from Alice Springs and Tennant's Creek is now commonplace, and what was once "Mythical Darwin" has its own little regiment of press correspondents, having wrested from Sydney and Melbourne the honour of recognition as "Australia's Front Door."

Not by wandering afar will most future fortunes be founded. The excitement of chasing rainbows is steadily being exchanged for normal human occupations—*i.e.*, making the most of familiar assets, previously appreciated only in part.

This process is amply revealed in statistics of city factories; rural enterprises in water conservations for irrigation, stock, and domestic supply; also revolutionary experiments in cultivation of pastures. Such intensive toil makes possible a greater proportion of citizens of yeomen type, binds them to specific environments, and allows their hearts to generate proper appreciation of home realities—of which the chief are healthy heirs for their beloved heritages.

Faith in Action.

Also, I hope, we will not treat this loss of national nerve too lightly; for possible recovery cannot be won without conscious effort. Our arch-enemy is the invisible loss of parental instinct, rather than visible loss of babies actually born. Nevertheless, it is by visible, continent-wide activity towards preventing the lesser loss that Motherhood will be glorified high above all those easier pleasures which are not sought, first through pain, and afterwards through two long decades of uninterrupted devotion to domestic commonplaces.

In short, the present effort to provide adequate safeguards for expectant mothers is really "sacramental"—*i.e.*, an outward and visible sign of an unseen, returning reverence for Motherhood, as the supreme factor in our national life.

Therefore, additional Maternity Wards together with Baby Clinics now being provided for busy cities and country towns, brought within reach of Australia's most isolated habitations by means of adequate Aerial Medical Services, will constitute tangible proof of national sincerity—that we still believe life is worth living; that the fundamental obligation for all good citizens is to ensure healthy, happy cradledom.

IN THE FARM KITCHEN.

Roast Brisket of Beef.

Take about 4 or 5 lb. fresh brisket of beef and some salt. Rub the meat all over with the salt and let it stand till next day. Take a roasting tin (the bottom of which has been well covered with cold water), place meat in and cover with another tin or enamel dish. Put into gas oven, turning the flame low, for one hour, then remove top tin and increase heat as for roasting. Let the brisket cook near top of oven for half an hour. When cooked place on a hot dish and return to oven until required. Pour off any surplus fat in the tin and make gravy by adding flour and mixing well with liquor in tin, add pepper, salt, and boil till it thickens.

Braised Brisket of Beef.

Take 4 lb. fresh brisket of beef, 2 carrots, 1 turnip, 2 stalks of celery, 1 or 2 leeks, a little parsley, thyme, bay-leaf, 12 peppercorns, salt, stock, a few slices of bacon. For the sauce, take 1½ oz. of butter, 1½ oz. flour, stock. Cut about ¼ pint each of carrot and turnip and put them aside. Slice remainder of carrot and turnip, leeks, and celery, and place them in a stew pan just large enough to contain the meat. Lay the meat on top of the vegetables, and cover with slices of bacon, add parsley, thyme, bay-leaf, a little salt, and nearly enough stock or water to cover the vegetables. Put on a close-fitting lid and cook very gently for four hours. The carrot and turnip dice must be cooked separately, in well-flavoured stock, until tender, and they may be added to the sauce or arranged in groups round the dish, on which meat is served. To make the sauce, put butter in a small saucepan till melted, add flour, stir, and cook slowly until well browned, and then add stock, using that from large saucepan if no other is available. Stir until it boils, add seasoning, and use.

Roast Shoulder of Veal.

Take a shoulder of veal, some bacon rashers, chopped parsley, breadcrumbs, suet, grated lemon rind, salt, pepper, and 1 egg. Make sufficient forcemeat with the parsley, breadcrumbs, suet, grated lemon rind, salt, pepper, and egg to fill cavity after removing bone. Cut off knuckle and remove bladebone from shoulder and fill the space with seasoning. Sew up the opening and press meat into a good shape. Cover with a piece of well-greased kitchen paper and roast, basting constantly. Allow sufficient time for the meat to cook thoroughly. Serve with good rich gravy and garnish with curled bacon bashers and slices of lemon.

Stuffed Breast of Veal.

Take 1 breast of veal, 1 lb. sausages, breadcrumbs, a few mixed herbs, 1 egg. Remove bones, spread meat on board and flatten out with rolling-pin, cover with a thick layer of sausage meat, mixed with breadcrumbs, herbs, and sufficient egg to bind it. Roll up meat, tie with narrow tape, and bake in a moderate oven, basting frequently. When cooked remove tape, dish on a hot dish, garnish with sliced lemon and a nice thick gravy poured round.

Stuffed Breast of Lamb.

Take a lean breast of lamb about 2½ lb., 2 oz. breadcrumbs, 1 oz. suet, 1 dessertspoonful chopped parsley, ½ teaspoonful sweet herbs, ½ grated lemon rind, 1 egg, salt, pepper. Prepare forcemeat with breadcrumbs, suet, chopped parsley, herbs, lemon rind, salt, and pepper. Bind with beaten egg, mix well, and spread over the breast. Roll up and skewer and bake in a fairly hot oven for one and a quarter hours.

Roast Topside Beef.

Take 4 lb. topside beef, ½ lb. dripping (this is a very economical joint, and few take advantage of it as a roast. There is no bone and very little fat on it, which ought to bring it more into favour). Place the joint in a baking dish with plenty of dripping and a little cold water. Cook for about one and a-half hours, basting frequently, as this adds to the success of the joint.

Danish Tripe.

Take 1½ lb. tripe, ½ lb. onions, 1 cupful breadcrumbs, a little sage, salt, pepper, ½ lb. thick slices bacon. The tripe must be large enough to fold over. Make a seasoning of onions, breadcrumbs, sage, salt, pepper, and put a thick layer on tripe. Fold over and sew edges together to keep seasoning in, put in a baking dish, lay slices of bacon on top, and bake for one hour. Put on a hot dish, make a gravy thickened with flour, and pour over tripe. Serve with mashed potatoes.

WAYS OF USING UP CORNED BEEF.

Corned Beef Toast.

Take some cold corned beef, ¾ oz. butter, 2 eggs, 1 tablespoonful milk, 1 tablespoonful gravy, pepper, squares of hot toast. Mince beef, put butter into a saucepan, add meat, milk, gravy, season with pepper. Beat 2 eggs and stir in until the mixture thickens; then pour on squares of toast.

Toad in the Hole.

Take slices cold corned beef, ½ lb. flour, 2 eggs, 1 pint milk, salt, pepper. Mix flour in a basin with salt. Beat eggs in milk and stir into flour gradually, beating well all the time. Cut meat into neat pieces and place in a well-greased baking tin, pour over the batter, and bake in a hot oven for one hour.

Corned Beef Surprise.

Take ¾ lb. corned beef, 1 oz. butter, 1 oz. flour, 1 cup milk, 3 eggs, salt, pepper, small onion. Put beef and onion through mincing machine, make a thick sauce with the butter, flour, and milk, add beef, salt, and pepper, and mix well. Then add beaten egg-yolks and cook for five minutes. Allow to cool, then fold in stiffly-beaten egg-whites and bake in a deep buttered piedish for three quarters of an hour. Serve at once.

Corned Beef Rissoles.

Take cold corned beef, 1 small onion, breadcrumbs, herbs, pepper, salt, 1 tablespoonful chutney, egg, a little gravy. Put beef and onion through mincing machine, mix with breadcrumbs, salt to taste, pepper, chutney. Moisten with half of egg and gravy, and shape into rolls or balls. Dip in egg (using the half left over), then breadcrumbs. Fry in hot fat.

Orchard Notes for September.

THE COASTAL DISTRICTS.

SEPTEMBER is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State— it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around

the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle-borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

Where necessary, manure—using a complete fertilizer rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens—and when the soil requires feeding, it should be manured with a complete manure; which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertilizer in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

BLACK aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

Farm Notes for September.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing..

The following subsidiary crops may be sown during the month:—Peanuts, sweet potatoes, arrowroot, cow cane, and in those districts suited to their production yams and ginger. Plant out coffee.

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in June and July, and have not been renewed. A further large number expires with this issue.

Subscribers whose term expired in June and July have been continued on our mailing list, and a yellow wrapper on this month's Journal (August) is an indication that their subscriptions are now due.

Subscribers whose term expires with this issue are reminded similarly.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

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.	
	June.	No. of Years' Records.	June. 1935.	June. 1934.		June.	No. of Years' Records.	June. 1935.	June. 1934.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·66	34	0·57	2·74	Clermont	1·68	64	1·27	1·18
Cairns	2·82	53	1·89	1·71	Gindie	1·46	36	..	2·62
Cardwell	2·02	63	2·41	3·38	Springsure ..	1·78	66	1·16	3·04
Cooktown	1·99	59	1·38	0·30					
Herberton	1·14	49	0·86	2·73					
Ingham	2·36	43	2·49	3·83					
Innisfail	7·16	54	7·11	7·49					
Mossman Mill ..	2·08	22	5·40	1·02	*Darling Downs.*				
Townsville	1·34	64	0·11	2·39					
Central Coast.					Dalby	1·69	65	0·13	1·60
					Emu Vale	1·54	39	0·07	1·18
					Hermitage	1·80	29	0·03	0·59
Ayr	1·45	48	..	1·40	Jimbour	1·70	47	0·07	1·29
Bowen	1·61	64	0·07	1·75	Miles	1·82	50	0·13	1·67
Charters Towers ..	1·25	53	1·15	0·52	Stanthorpe	1·94	62	0·44	0·94
Mackay	2·65	64	0·68	4·03	Toowoomba ..	2·42	63	0·18	1·11
Proserpine	3·24	32	0 83	1·54	Warwick	1·76	70	0·20	0·64
St. Lawrence ..	2·49	64	0·46	1·56					
South Coast.									
Biggenden	2·22	36	..	3·52	*Maranoa.*				
Bundaberg	2·88	52	0·52	3·77					
Brisbane	2·72	84	0·06	0·76	Roma	1·59	61	0·38	1·06
Caboolture	2·75	48	..	1·46					
Childers	2·52	40	0·12	2·30					
Crohamhurst ..	4·57	42	0·46	1·60					
Esk	2·27	48	0·05	0·89					
Gayndah	1·84	64	..	2·54					
Gympie	2·70	65	0·11	1·44	*State Farms, &c.*				
Kilkivan	2·14	56	0·05	2·47					
Maryborough ..	3·04	64	0·02	1·49	Bungeworgorai ..	1·36	21	0·07	0·99
Nambour	3·82	39	0·03	1·35	Gatton College ..	1·87	36	0·08	0·79
Nanango	2·02	53	..	1·41	Kairi	1·46	21	..	3·13
Rockhampton ..	2·59	64	0·40	2·29	Mackay Sugar Experiment Station	2·35	38	0·80	2·47
Woodford	2·96	48	0·04	1·41					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 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	29·95	79	65	83	30	60	22	138	5
Herberton	..	70	51	80	10	36	18	86	6
Rockhampton	30·11	75	52	85	9	37	25	40	4
Brisbane	30·13	70	50	77	9	41	24	6	2
Darling Downs.									
Dalby	30·16	68	38	76	1	24	24	13	2
Stanthorpe	..	61	31	68	1	18	24	44	3
Toowoomba	..	63	40	72	1	32	18, 24, 26	18	2
Mid-Interior.									
Georgetown	29·99	81	56	89	10	36	18	195	3
Longreach	30·12	73	45	84	8, 9	33	24	343	5
Mitchell	30·18	67	36	78	1	23	24, 25	95	5
Western.									
Burketown	30·03	79	59	89	10	49	27	365	4
Boulia	30·12	71	47	87	4	38	24	261	5
Thargomindah	30·16	66	43	79	5, 6	31	24	188	3

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1935.		September. 1935.		Aug., 1935.	Sept. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·36	5·20	6·9	5·35	7·23	7·23
2	6·35	5·20	6·8	5·35	7·51	7·53
3	6·35	5·21	6·7	5·36	8·20	8·27
4	6·34	5·21	6·6	5·36	8·48	9·5
5	6·33	5·22	6·5	5·37	9·17	9·45
6	6·33	5·22	6·4	5·37	9·51	10·35
7	6·32	5·23	6·3	5·38	10·24	11·32
					p.m.	p.m.
8	6·32	5·24	6·2	5·38	11·4	12·34
9	6·31	5·24	6·1	5·39	11·52	1·39
					p.m.	
10	6·30	5·25	6·0	5·39	12·47	2·47
11	6·29	5·25	5·58	5·40	1·46	3·54
12	6·28	5·26	5·57	5·40	2·50	5·5
13	6·27	5·26	5·56	5·41	4·1	6·11
14	6·26	5·27	5·55	5·41	5·11	7·22
15	6·25	5·27	5·53	5·42	6·22	8·31
16	6·24	5·28	5·52	5·42	7·29	9·39
17	6·24	5·29	5·51	5·42	8·34	10·44
18	6·23	5·29	5·50	5·43	7·42	11·44
19	6·23	5·30	5·49	5·43	10·48	a.m.
20	6·21	5·31	5·48	5·44	11·53	12·40
21	6·20	5·31	5·47	5·44	a.m.	1·31
22	6·19	5·32	5·45	5·45	12·54	2·16
23	6·18	5·32	5·44	5·45	1·52	2·54
24	6·17	5·33	5·43	5·45	2·45	3·28
25	6·16	5·33	5·42	5·46	3·34	3·58
26	6·15	5·34	5·41	5·46	4·17	4·27
27	6·14	5·34	5·39	5·47	4·52	4.56
28	6·13	5·35	5·38	5·47	5·25	5·24
29	6·12	5·35	5·37	5·48	5·56	5·55
30	6·11	5·36	5·36	5·48	6·25	6·29
31	6·10	5·36			6·53	

Phases of the Moon, Occultations, &c.

7 Aug.	☾ First Quarter	11	23 p.m.
14 ,,	○ Full Moon	10	43 p.m.
21 ,,	☽ Last Quarter	1	17 p.m.
29 ,,	● New Moon	11	0 a.m.

Apogee, 3rd August, at 4.6 a.m.

Perigee, 15th August, at 6.6 p.m.

Apogee, 30th August, at 12.18 p.m.

On the 16th, at 6 a.m., Saturn will be 6 degrees south of the Moon, when 16 degrees above the western horizon.

At 8 p.m., on the 24th, Mercury and Neptune will reach a point in the sky near the hind legs of the Lion, and be apparently only one-tenth of a degree apart, and will then be below the western horizon. The planets will set at Warwick at 6.36 p.m., therefore to obtain any view of this apparently-wonderful closeness (though they are really separated by about 3,000 million miles), a telescope must be used sometime before 5 p.m.

Two other planets, Mars and Jupiter, will apparently meet or be within 2¾ degrees of one another on the 28th at 9 a.m., nearly an hour before rising. They will afford an interesting spectacle if a telescope or field-glass is used when they are 15 degrees above the horizon, 16 degrees south of east.

Saturn will be in opposition to the Sun on the 31st, rising as the Sun sets. It will be apparently amongst the stars of Aquarius, nearly 10 degrees south of the celestial equator, and passing over Torres Strait about midnight.

Mercury will be invisible, rising only 35 minutes before the Sun on the 1st, and setting only 22 minutes after it on the 15th.

Venus sets at 8.25 p.m., 3 hours 5 minutes after the Sun on the 1st; on the 15th it sets at 7.52 p.m., 2 hours 25 minutes after it.

Mars sets at 11.41 p.m., 6 hours 21 minutes after the Sun on the 1st; on the 15th it sets at 11.21 p.m., 5 hours 54 minutes after it.

Jupiter sets at 12.39 a.m., on the 1st; on the 15th, it sets at 11.49 p.m.

Saturn rises at 7.37 p.m. on the 1st; on the 15th, it rises at 6.39 p.m.

The Southern Cross will be on the meridian at position XII. at 4 p.m. on the 1st, and at 3 p.m. on the 16th to an observer near the 153rd meridian, but 4 minutes later for each degree west of it.

As Venus will set 1 hour 1 minute after the Sun and Mercury 1 hour 20 minutes after it on the 31st, both should be visible after sunset, after which Venus will very soon cease to be an evening star.

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.

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.