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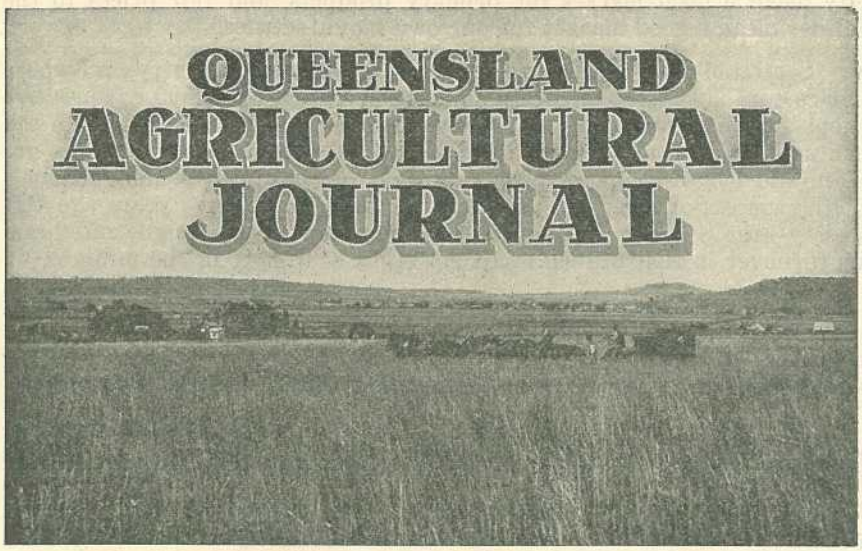

VOL. XLV. 1 APRIL, 1936. PART 4

Event and Comment

Quality of Queensland Butter.

COMMENTING recently on the marked increase in the proportion of choice quality butter produced in Queensland, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, pointed to the legislation passed in Queensland in recent years to induce the production of larger quantities of the choicest butters, and he claimed that the policy thus applied was steadily making itself felt, and that the latest statistics probably represented the highest quality yet reached in Queensland.

The details for February were particularly encouraging, the Minister added, and indicated that factory managements and the dairy farmers generally were realising the absolute necessity for producing the largest possible range of choice butters. This production constituted a direct answer to those who said that Queensland, owing to climatic and geographical conditions, could not produce a large range of the most desirable grades of butter.

Co-operation—A Swedish Example.

SWEDEN provides an outstanding example of the success of scientific organisation as applied to rural industry. An all-embracing system of co-operation in that country provides for definite benefits for both producer and consumer, and recognises the mutual dependence of town

and country interests and industries. Sometimes we, in our desire to further the claims of rural industries, are inclined to ignore their economic relationship with urban industries. Good conditions in the city mean a good market for primary products, and fair prices to the farmer mean a good market for our own manufactures.

Scattered over Sweden, which is not a very large country and where agriculture is subject to severe climatic penalties, are 3,500 co-operative shops for household supplies. Quickness, politeness, and smartness are characteristic of the service in these establishments. These shops are maintained by a co-operative society, and they are conspicuous symbols of the success of Sweden's co-operative movement. Five years ago this society—the Swedish Co-operative Union—went into foreign trade, and its turnover in that branch of its activities is already in the millions.

There are many ramifications of co-operative enterprise in Sweden, including numerous buying and selling societies. There are, for instance, as many as 1,500 organisations purchasing electrical power wholesale and distributing it co-operatively to farmers and householders generally.

The success of the co-operative movement in Sweden has been due to the quality of leadership among farmers and distributors, as well as to the intelligence and loyalty of its members. The co-operative societies there, notwithstanding their success, have not put private enterprise for profit out of business. The co-operative businesses are for the use and service of members only; they do not pile up surpluses and undersell to the general public. They stand ready to push into the preserves of private capital only when the price position becomes abnormal. Thus the co-operative movement has not created a revolution, but has acted as a stabiliser—a guarantee of reasonable prices to both producer and consumer.

The Farm Produce Agents Act.

EVERY farmer who disposes of his produce through an agent should be conversant with the provisions of the Farm Produce Agents Act. The Act was passed to ensure closer supervision over dealings as between the agent and his principal, i.e., the person who sends consignments of farm produce to him for sale on his (the owner's) behalf. The term "farm produce" includes cereals, grain, vegetables, potatoes, and other edible roots and tubers, fruit, hay, and chaff, and all dairy produce; the term also includes live or dead poultry, and game and eggs.

If farm produce is supplied to any person on that person's order and at a fixed price a straight-out sale is effected, and, as no question of agency arises, the transaction does not come within the scope of the Act. However, a trader, whether a merchant or any other person, is not entitled to accept from a grower consignments without a specific agreement as to the price to be paid. Such a price must be fixed at the time of purchase, or before the date of delivery of the produce, whichever date is the earlier.

Clause 5A, in this connection, reads:—

> "No person shall purchase any farm produce from the person by whom it was actually produced unless at the time of the purchase of the farm produce or before the delivery of the farm

produce, whichever date is the earlier, the price for which he purchases such farm produce has been definitely fixed and agreed to by his vendor at a sum of money certain, and which sum is not to be ascertained by reference to any other transaction or otherwise."

This clause does not refer to consignments sent to an agent for sale on the owner's behalf.

Such a clause was found necessary when it was ascertained that some traders who disclaimed the responsibilities of agents, but maintained that they were merchants, were receiving produce and later, when the produce was sold, remitting the grower such a price as they thought fit.

Account sales must be rendered within fourteen days of the date of the sale of produce, and the amount due to the grower remitted within thirty days of the date of sale. The account sales must show the name and address of the agent and of the consignor; the date of receipt and of sale or other disposition of the produce; the rate at which the goods were sold; the class, weight, or quantity received and sold or otherwise disposed of; the rate per cent. of commission charged, and details of all other charges against the produce. The grower should carefully check up account sales, and if part of a consignment has been destroyed or thrown away, the account sales should be accompanied by evidence of destruction, such as a certificate from a health inspector or an officer of the Department of Agriculture and Stock.

An agent or his employee is not entitled to purchase or be in any way concerned in the purchase of produce delivered to him for sale by a grower without having previously obtained the consent, in writing, of such grower. When such consent is given no commission is chargeable.

A grower desirous of dealing with an agent should satisfy himself that such agent is licensed under the Farm Produce Agents Act before consigning to him. This information can be obtained from the Department of Agriculture and Stock, Brisbane, or from the district Clerk of Petty Sessions if the agent is trading in the grower's locality.

Any person who has consigned farm produce to an agent for sale on commission may inspect and take copies of all entries in the agent's books and accounts which relate to the receipt and sale of the produce; or such person may, in writing, authorise another person to make such inspection and take such copies. The authorised deputy must produce his authority when required to do so by the agent. When a grower is not in a position to obtain the information he requires in this way he way write to the Department of Agriculture and Stock, Brisbane, requesting that an investigation be carried out on his behalf. Full particulars regarding dates of consignments, quantities, account sales, and any other information which may be of assistance should accompany the request, which may be directed to the Registrar, Farm Produce Agents, Department of Agriculture and Stock, Brisbane.

Passion Vine Diseases.

By J. H. SIMMONDS, M.Sc., Senior Pathologist.

THE cultivation of the passion vine in this State has not made the progress which the demand for the fruit would justify. This is due in a large measure to the presence of serious diseases which are liable to make the returns a very uncertain proposition. In the past it has been the practice to pay little attention to the culture of the vines once they have become established. Pruning and spraying are rarely attempted, although well justified by subsequent results. Before passion vine growing is placed on a sound footing growers will have to realise that the same care and attention has to be devoted to this crop as is given as a matter of course to others, such as, for instance, the grape.

Brown Spot.

Brown spot is found in all three eastern States of the Commonwealth in each of which it is regarded as one of the most serious diseases to which the passion vine is subject. In Queensland it occurs also on the granadilla (*P. quadrangularis*), the Mexican passion fruit (*P. ligularis*), and certain of the wild Passifloras, especially the white passion flower (*P. alba*).

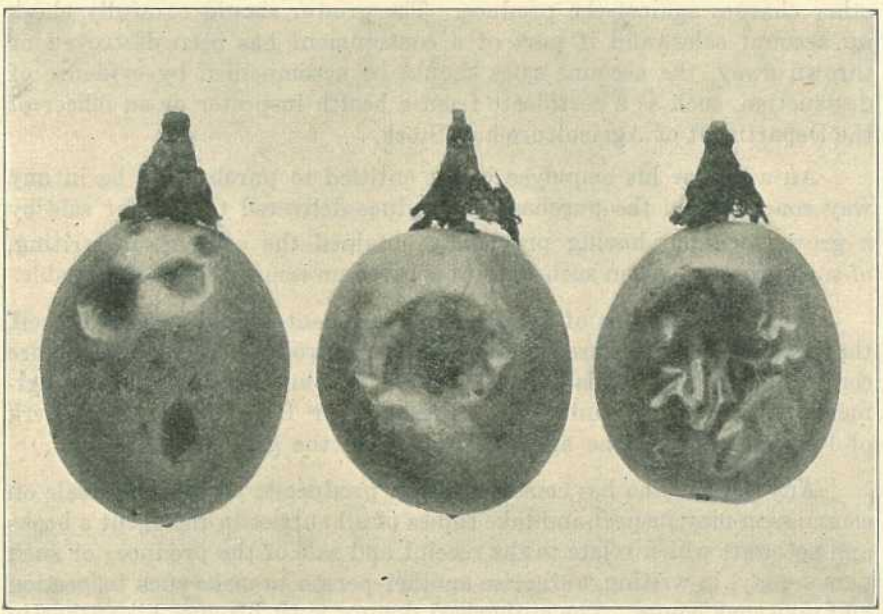

PLATE 99.
Brown spot on passion fruit.

The disease is easily recognised by the characteristic brown spots which appear on all parts of the vine. On the leaf these are from a ¼ to ½ an inch in diameter, at first chestnut-brown in colour and later drying out in the centre to various lighter shades (Plate 100). The runners are usually attacked in the region of a leaf axil, and brown lesions, an inch or more in length, are formed which, although they develop slowly may eventually cincture the runner and cause the

wilting and death of long sections of vine. Fruit spots are light-brown, circular, sunken areas which become shrunken and wrinkled as they enlarge, and may eventually occupy the whole of one side (Plate 99).

Brown spot is favoured by warm, wet weather so that it is the summer and intermediate crops which are most affected. The winter crop is usually comparatively free from the disease.

The cause of brown spot is a fungus (*Alternaria sp.*). The disease is spread by spores which are produced on the surface of the leaf, fruit, and stem lesions where they may be seen as a dusky covering. Once a leaf becomes infected it soon falls, and hence if the vines are kept reasonably thinned out the leaves with their load of spores will fall to the ground more or less out of harm's way. On the other hand, if the vines are allowed to develop a tangled mat of runners, the affected leaves are caught and held and the spores will be washed from them to other parts of the vine and so cause further infection. Pruning is therefore an important adjunct to the control of this disease besides being useful from the crop production point of view. (Plates 101 and 102.)

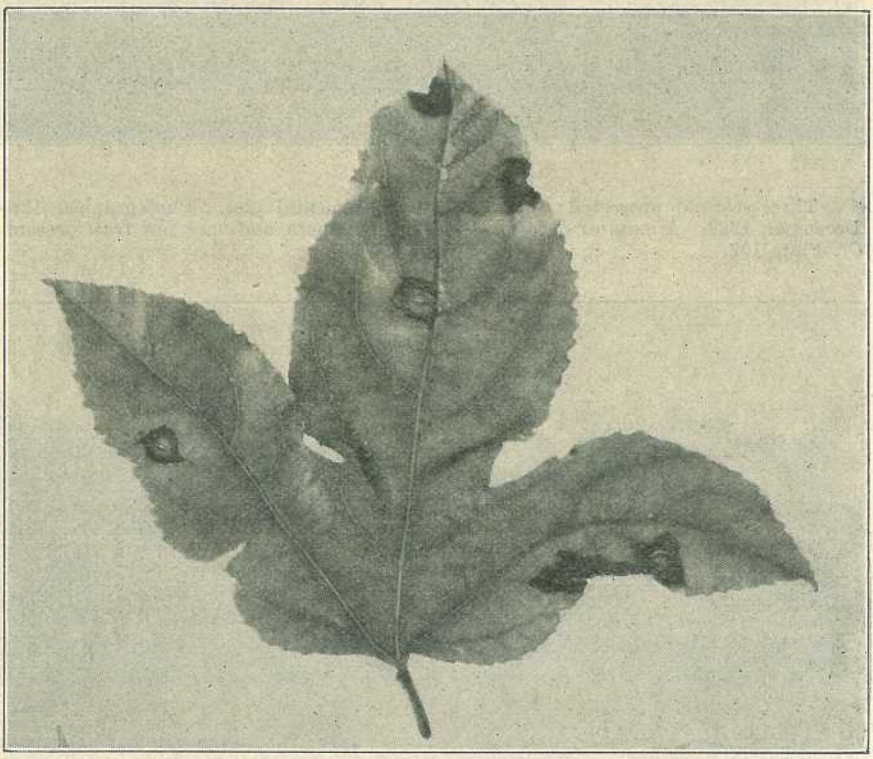

Plate 100.
Brown spot on the leaf of the passion vine.

Control.

The following recommendations are based on experimental work carried out over a number of years:—

(1) Train the passion vine in a systematic manner right from the start, making sure that the main runners are kept well tied to their respective wires, as this will facilitate subsequent pruning.

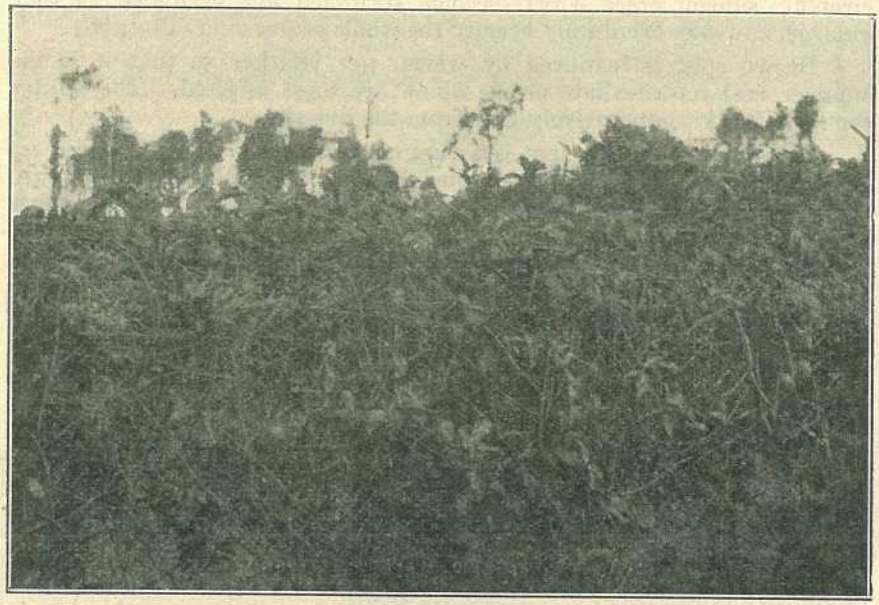

PLATE 101.

Three-year-old untreated vine from an experimental plot. Photographed 12th December, 1929. A mass of defoliated and dead runners, and very few fruit present. *Cf.* Plate 102.

PLATE 102.

Three-year-old vine similar to the one illustrated in Plate 101. Pruned third week in August. Sprayed three times with Bordeaux mixture. Photographed 12th December, 1929. Good summer crop hanging. *Cf.* Plate 101.

(2) Cut the vines well back at least once a year. The time of pruning will depend largely on local conditions, but so far as brown spot is concerned the vines need to be fairly thin during the spring months when the disease is on the increase. Hence, when a heavy summer crop is desired, pruning would need to take place before the flowers for the summer crop are formed, usually about July or August. In districts where the intermediate and winter crop is most favoured pruning should be delayed until the summer crop has commenced to form, as by so doing this crop will be reduced with a resultant increase in subsequent crops.

If woodiness is present in the plantation special precautions will have to be taken during pruning. This matter is fully discussed in connection with the latter disease. Heavy pruning should not be carried out when the vines are suffering from dry weather, as extensive dieback may result.

(3) Follow the pruning with a Bordeaux mixture spray of 4-4-40 strength. For best results this spray should be repeated once a month until the end of January, and then once every six or eight weeks until next pruning. When mature fruit are on the vine ammoniacal copper carbonate may be substituted for the Bordeaux. It is a waste of time to spray old, unpruned vines carrying a dense mass of foliage.

For the first eighteen months most attention should be paid to training the young vine, spraying, except during the winter for scab, being not always necessary.

Scab.

This second foliage and fruit disease is of minor importance, since it occurs only during the winter months and is restricted mainly to districts of high altitude, such as Tamborine Mountain and Springbrook, where the cool, moist conditions favour its development.

It is only the younger shoots and fruit that are attacked by this disease—hence it is young vines which suffer most. On the leaves and young shoots appear small circular translucent spots which eventually become covered with a greyish powdery mass of fungus spores. As in the case of brown spot, affected leaves fall rapidly. Similar spots are formed on the fruit, but later the tissue beneath these grows out into a hard raised scab of about $\frac{1}{8}$-inch diameter (Plate 103). Although the pulp is uninjured the disfigurement is often sufficient to make the fruit unfit for market. The fungus causing this disease is a strain of *Cladosporium herbarum*.

The control measures practised in the case of brown spot are applicable to this disease also. That is to say, the vines should be kept reasonably thinned out, and they should be sprayed during the autumn and winter months with Bordeaux mixture, making certain that the younger shoots and fruit are kept well covered. If it is desired to avoid staining the fruit ammoniacal copper carbonate can be substituted for the Bordeaux, although it is not quite so efficient a spray.

Since more permanent injury can be caused by this disease to young vines up to two years old special care should be taken during this period.

Base Rot.

Unless the plantation is in a neglected condition base rot usually affects a few isolated vines only. A soft decay of the base of the stem and upper part of some of the main roots takes place (Plate 106). The

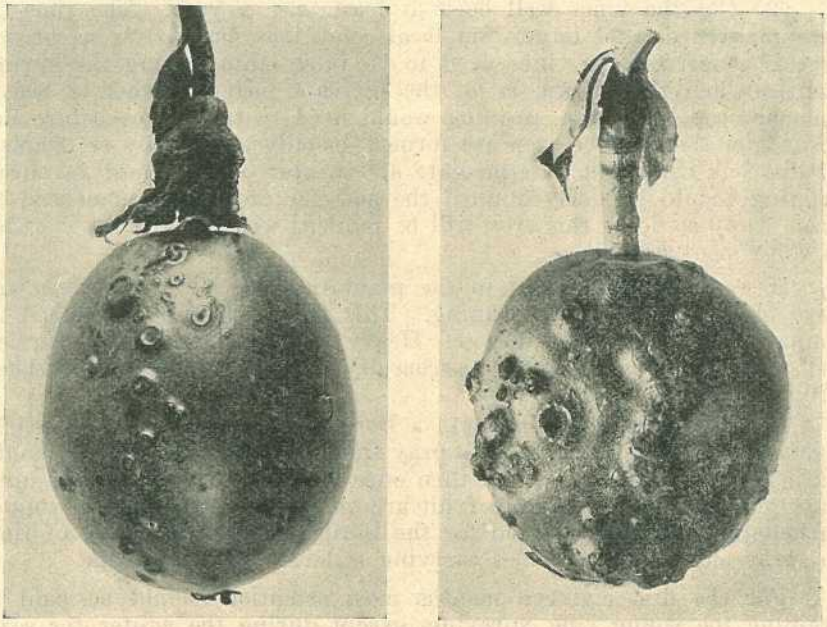

PLATE 103.
Early and late stages of scab formation on fruit of the passion vine.

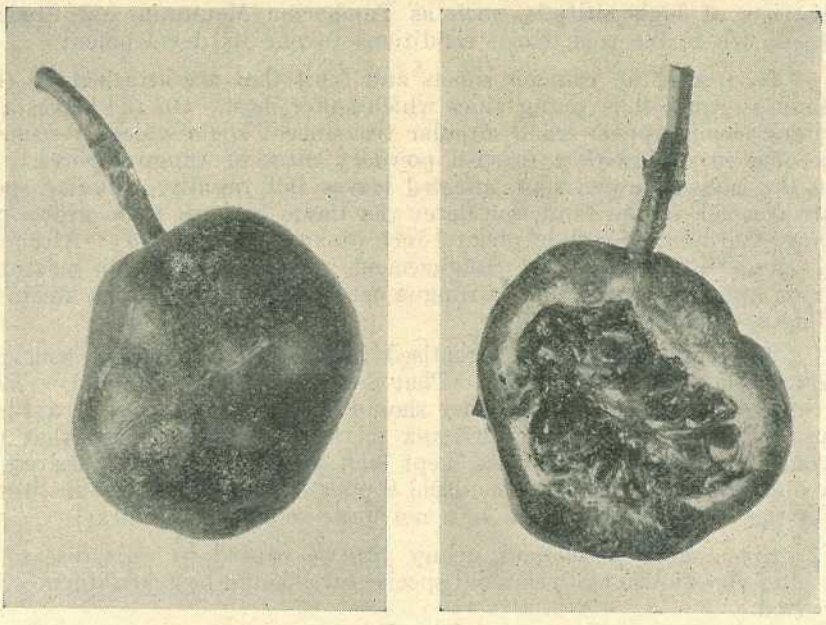

PLATE 104.
External and internal symptoms of woodiness in passion fruit.

process is usually slow, so that an affected plant may linger for months until its water supply is finally completely cut off, when it rapidly wilts. When the vine is in a particularly vigorous condition new tissue will often be formed on the outside as fast as it becomes decayed within, with the result that the base of the stem becomes a hollow structure several times its normal diameter and the vine itself is little the worse.

The exact cause of this disease in Queensland has not been ascertained, but it appears to be a soil-frequenting organism entering by way of injuries to the base of the plant. Care should therefore be exercised during cultivation not to injure the crown or main roots. Pulling weeds away by hand is advisable where necessary. The plants should be kept in a healthy, vigorous condition by good cultural practice, so that if they become infected they will outgrow the disease.

Woodiness.

Woodiness is a disease of a very different type from those already dealt with, by reason of the fact that it is not caused by a fungus parasite but by an ultramiscroscopic virus, such as in the case of bunchy top of the banana. Although this disease has been known for many years in New South Wales, it is only since about 1931 that it has assumed serious proportions in Queensland. Now it has to be reckoned as the most important passion-vine malady. The situation is made more serious by the absence of a definite lesion, such as a spot or rot. Many growers thus fail to recognise the presence of a disease, take no precautionary measures, and are at a loss to understand why their vines are no longer profitable.

The foliage symptoms of woodiness are somewhat obscure. The younger leaves are crinkled and puckered in contrast to the smoothness of the normal ones (Plate 105). The lobes of leaves produced in the winter may be drawn out into a rather narrow, elongated, and often irregular shape. This feature is often a means of detecting the disease later in the year when other symptoms are obscured. With careful examination a faint light-green mosaic or mottling can often be seen. On the older leaves the disease can often be recognised by the presence of numbers of small circular yellow spots about one-sixteenth of an inch in diameter scattered between the veins. When infected with woodiness a vine retains for a time a fairly healthy general appearance, but in time a stunting and coarse, unnatural development is evident. The fruit are characteristic and easily recognised. They are usually small and misshapen, and have a thick, hard, woody rind. This reduces the size of the fruit cavity, from which the pulp is largely or entirely absent (Plate 104).

As with a number of other virus diseases, the symptoms of woodiness are suppressed by hot weather, with the result that a vine may bear a fairly normal summer crop and look apparently healthy at the time, only to produce a crop of worthless woody fruit in the winter. Eventually, however, even the summer crop will become unprofitable.

The virus causing woodiness is located in the sap of a diseased vine. It is infectious, and the disease can be transmitted from a diseased to a healthy vine by transferring sap from the one plant to the other on the hands or pruning knives. Although not definitely proved, it is evident that the disease is also carried by certain sucking insects that feed on the passion vine.

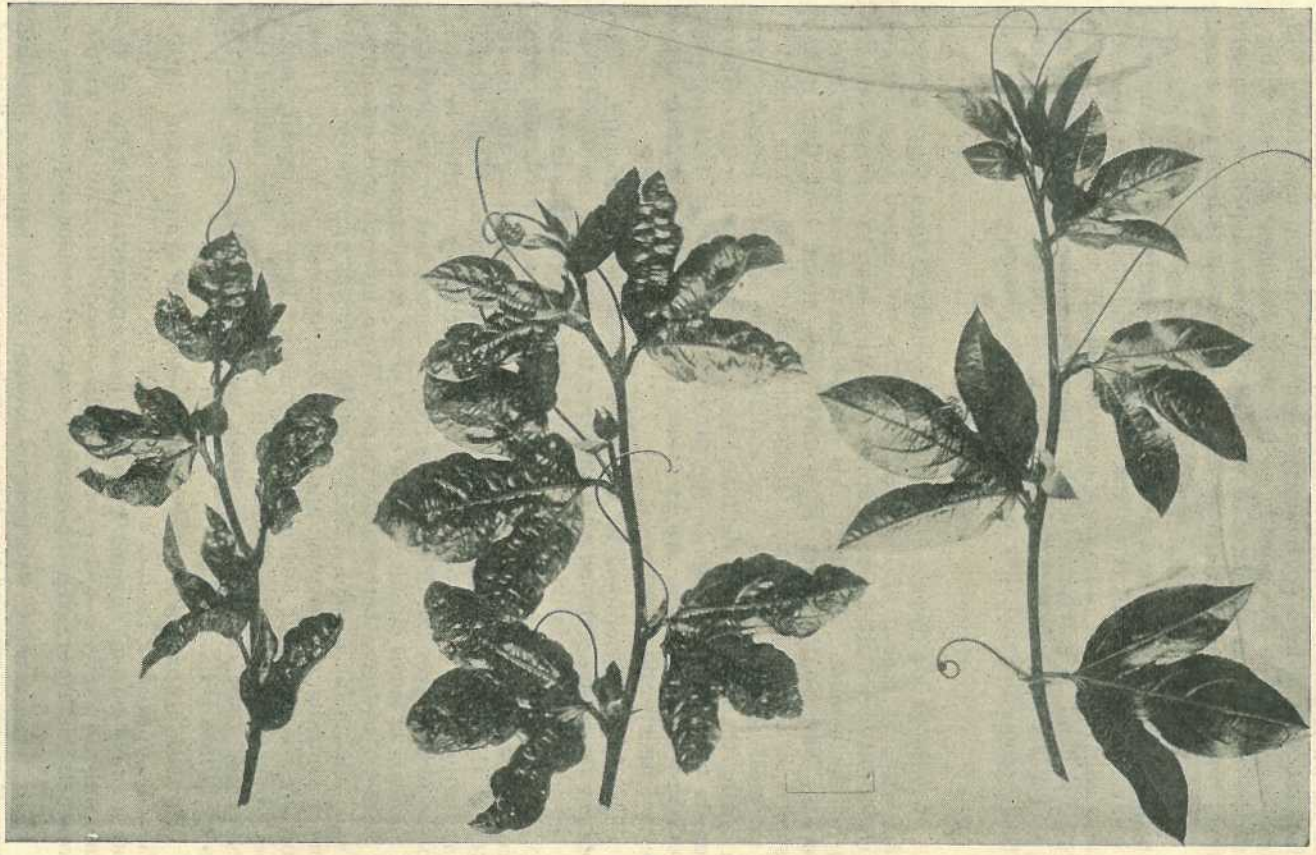

PLATE 105.
The foliage symptoms of woodiness in the passion vine. The two shoots on the left diseased. The one on the right healthy for comparison.

The wild white passion flower (*P. alba*) is also subject to the woodiness disease, as has been shown by cross inoculation. The foliage symptoms in this host are more pronounced than in the cultivated vine, and casual observation discloses that a large proportion of the wild plants are carrying the disease. These form centres from which the cultivated passion may become infected, and in some districts form a definite menace for this reason.

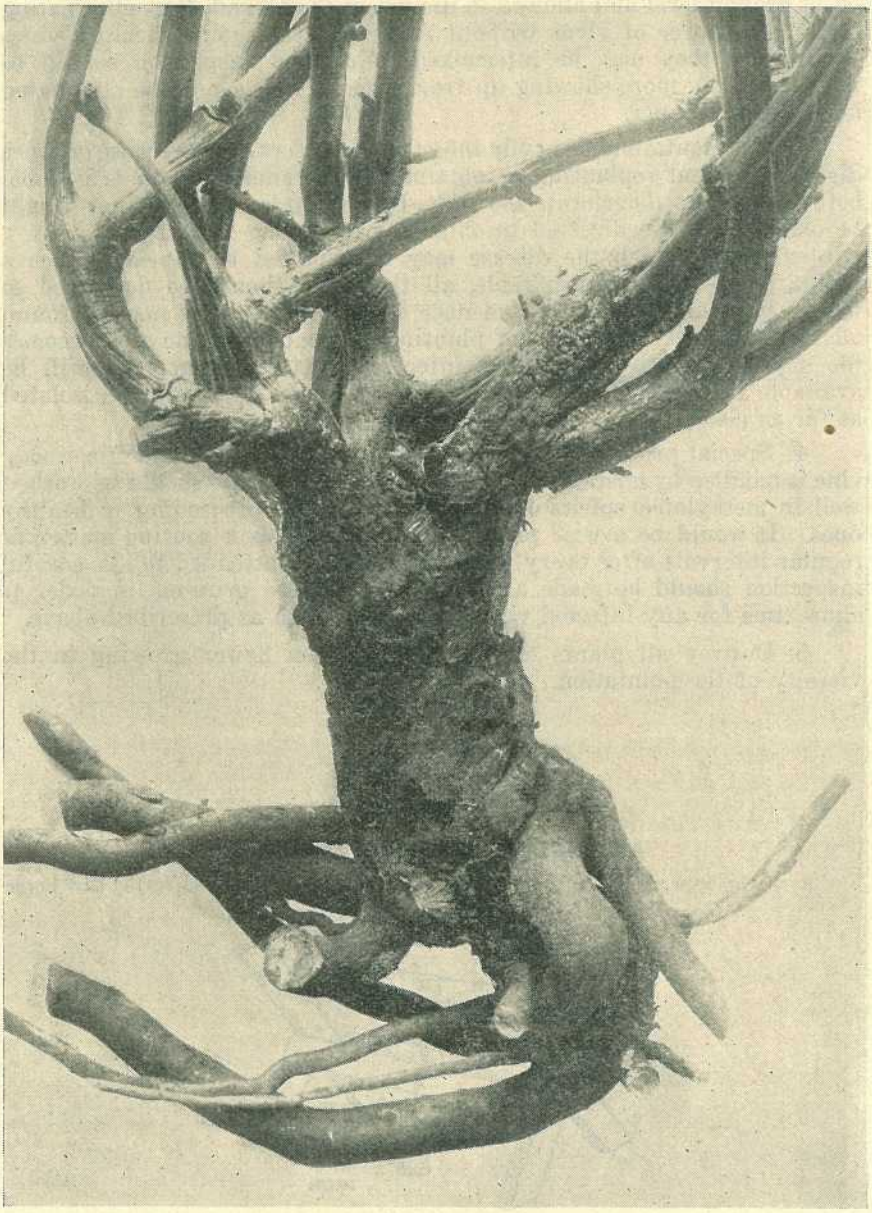

Plate 106.
Base rot of passion vine.

Control.

1. Obtain seed from a healthy vine, and grow young plants as far as possible from other cultivated and wild ones. Inspect them carefully before planting out, and discard any showing the yellow spotting or other symptoms of woodiness.

2. If a plantation has only a few vines affected, these should be cut off at ground-level and allowed to die where they stand, thus eliminating them as a source of virus without rubbing them against healthy vines with which they may be intermixed. Frequent inspection should be made, and any more showing up from time to time should be eliminated in the same manner.

3. If a plantation is heavily infected, it is necessary to choose between digging out and replanting or obtaining what summer crop is possible before the vines deteriorate too far. In the latter case, pruning should be omitted, or else directed to obtaining a summer crop rather than a winter one in which the disease may be expected to appear. Once a plantation becomes unprofitable, all the vines should be destroyed so that they do not remain as a menace to young areas. It may be found advisable to have a sequence of plantings so that when one area becomes too depleted by the removal of infected vines a younger one will be available to take its place. The different plantings should be isolated as far as possible.

4. Special precautions must be taken when pruning, and if a woody vine is handled by mistake, the hands and pruning knife should be washed well in methylated spirits or soapy water before proceeding to healthy ones. It would be a wise precaution to do this as a routine matter at regular intervals after every few vines had been attended to. A careful inspection should be made a week or two before pruning, in order to allow time for any infected vines to be dealt with as prescribed above.

5. Destroy all plants of the white passion flower growing in the vicinity of the plantation.

ATTACHMENT FOR SAW HORSE.

A stirrup iron attached to a short piece of chain and fastened to the saw horse.

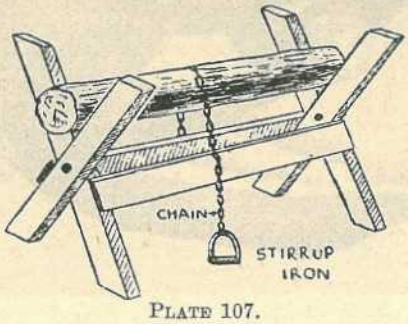

PLATE 107.

as shown in diagram, is very useful for keeping timber steady. The chain has only to be thrown over the log and the foot placed in the stirrup.

Leaf Miner and Stem Borer of Tobacco in North Queensland.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

(*Continued from March*, 1936.)

CONTROL OF LARVÆ.

BOTH species continue breeding in old tobacco plants left standing in the field even after all the leaf has been picked. This capacity for survival in crop residues led to the inclusion of a clause in "*The Tobacco Industry Protection Act of* 1933" providing for the eradication of tobacco plants on the completion of harvesting.

Passing to the possibility of insecticidal control, it is obvious from the larval habits already described that neither species is likely to be controlled by contact insecticides.

As the epidermis is rejected when entering the plant, the chance of success with stomach poisons did not seem to be much brighter. However, many authors have recommended arsenicals for the control of *P. operculella,* and numerous growers insisted that lead arsenate gave control in seed-beds at Mareeba. Under the circumstances, some investigation of this insecticide, employed either as a spray or a dust, was inevitable. The spray form has been frequently used in the past by local farmers, and recommended in the literature of Australia and other countries.

Legislation.

To enforce the removal of crop residues and reduce the number of live tobacco plants during the winter months, the following clause was included in "*The Tobacco Industry Protection Act of* 1933":—

"19. (1) Every occupier (or where there is no occupier, then the owner) of land used in the growing of tobacco plants shall, within one calendar month after the leaf has been harvested from the plants growing on such land, uproot the whole of the plants on such land and destroy such plants in a manner to be prescribed.

"(2) Where an area of land is comprised of two or more contiguous paddocks in the occupation of the same person or belonging to the same owner, the uprooting and destruction of the plants shall be effected within one calendar month after the leaf has been harvested from each individual paddock.

"(3) Where there have been plantings at separate intervals in different parts of the one area, the uprooting and destruction of the plants shall be effected within one calendar month after the harvesting of the leaf from each separate planting.

"(4) An inspector may enter upon any land upon which tobacco plants are present and have not been dealt with as prescribed and cause the same to be uprooted and/or destroyed at the expense of the occupier, or where there is no occupier, then the owner.

"(5) Any person failing to comply with the provisions of this section shall be guilty of an offence against this Act and shall be liable to a penalty not exceeding fifty pounds."

It is impossible to give figures proving the value of rigidly enforcing this measure, but there is no doubt that it must decrease the number of moths which survive the winter to initiate the spring infestation.

Lead Arsenate Spray.

Applied in spray form on plants in the field, lead arsenate has proved ineffective against the leaf miner (Weddell, 1934). It also failed to prevent infestation by this pest in experimental seed-beds when applied at the rate of 1½ oz. per gallon of water, though treated beds were not so severely attacked as controls. The mixture mentioned is three times the normal strength, and is the concentration for which Mareeba growers claimed success. This experimental evidence obtained during the investigation indicates that a wet spray of lead arsenate is ineffective in the field and little better in seed-beds against leaf miner. There is no evidence of its value against stem borer.

Lead Arsenate Dust.

Laboratory experiments showed that a dust cover of lead arsenate reduced the effective attack by stem borer larvæ hatched on treated leaves by about 60 per cent. A dust cover of inert kaolin afforded no protection against larvæ of that species.

The results obtained with the dust against the leaf miner in the laboratory can be summarised briefly. The effective penetration by larvæ hatched from eggs placed on dusted leaves was reduced by about 60 per cent. Developing leaf miners of all stages, after removal from untreated plants, were unable to mine successfully in dusted leaves. Mines were often begun on these leaves, but they were never carried on to any extent, although dead larvæ were sometimes observed at or in such incipient mines. Larvæ removed from untreated plants, starved for several hours, then released on dusted leaves, died before mining to any extent. No protection against leaf miner was afforded by a dust cover of kaolin.

The effect of dusting seed-beds with lead arsenate was observed experimentally, and it was noted that dusting twice a week afforded some protection against leaf miner. The efficiency seemed to vary directly with the concentration of the dust up to 75 per cent., but a concentration of 50 per cent. was considered suitable. More extensive trials of the dust at this concentration were made, but for convenience their discussion is postponed till later.

A seed-bed in which plants were pricked out 6 inches apart was used to determine whether more frequent applications of the dust would give more effective protection. One section of the seed-bed was dusted with 50 per cent. lead arsenate daily after watering, while another section was untreated. This procedure was followed for two and a-half weeks, and the result definitely indicated that such treatment was decidedly useful, dusted plants being very slightly infested compared with the controls (Plate 9; fig. 2—see p. 30, January issue).

As the larvæ do not consume the epidermis when commencing a mine, these results are somewhat difficult to explain. Obviously the effect of the arsenical dust is not mechanical only, as the ineffectiveness of the kaolin shows, but possibly larvæ wandering about on dusted leaves are contaminated with the poison, carrying it into the mine and polluting the interior.

Ovicides.

Owing to the exposed nature of the places in which they are laid, the eggs of both species can be reached by ovicides; but, as the egg-stage occupies not longer than four or five days in summer, an effective ovicide would need to be applied every three or four days to give control. Thus the use of ovicides would necessarily be confined to seed-beds, as the labour costs for field treatment would be prohibitive.

Some exploratory investigations of ovicides were conducted in the laboratory in two series. In the first series the eggs were treated in petri dishes, and the more promising ovicides were then tested in a second series against eggs placed on the leaves of plants. Only leaf miner eggs laid on the cloth covers of breeding jars in the laboratory were used, and none had been laid more than a day at the time of treatment.

Kerosene Emulsion.

The mixture was composed of 2½ per cent. kerosene emulsified with soft soap in water. Thirty-nine eggs were placed in the petri dish and sprayed till thoroughly wet. On the third day after treatment several eggs had hatched, and observations made a fortnight after treatment showed that ten of the eggs, or 25·5 per cent., had failed to hatch. In most of the unhatched eggs development had proceeded up to a point, and therefore it is suggested that the toxic effects are not immediately felt by the embryo. This spray was not considered in the second series of trials.

Linseed Oil and Soft Soap.

Forty-nine eggs were sprayed in the petri dish, and three days later the eggs were still unhatched and lacked their normal lustre. A fortnight after treatment an examination showed that only one larva had emerged—i.e., 98 per cent. of the treated eggs failed to hatch. The oil seemed to desiccate the eggs, and their contents shrivelled within a short time of treatment. In the second series twelve eggs were used, and within twelve hours after treatment spray injury appeared in spots on the leaf, and eventually practically the whole leaf succumbed. Seven of the eggs hatched, and one larva became established on the leaf. In a supplementary trial four larvæ were placed on a previously sprayed leaf, but none established mines.

Lime Sulphur.

In the first series thirty-three eggs were treated with a 1 in 50 dilution of commercial lime sulphur. Three days later some of the eggs hatched, and after a fortnight larvæ had emerged from all but nine, thus giving an apparent kill of 27·3 per cent. In the second series twelve eggs were used and treated with a 1 in 40 dilution of lime sulphur. Ten of these eggs hatched, and in due course six of the larvæ established mines. In a supplementary trial with this spray four larvæ were placed on a previously sprayed leaf, and one successfully established a mine.

White Oil.

Forty-six eggs were treated in a petri dish with a 1 in 50 dilution of a white oil, and although some eggs had hatched in three days, 30, or 65·3 per cent., had failed to yield larvæ a fortnight after treatment. There had been some development in the unhatched eggs after treatment. Twelve eggs were placed on a leaf in the second series and then sprayed

with a 1 in 40 dilution of white oil, and all these eggs hatched, although only one larva successfully established a mine. In the supplementary trial with this spray none of the four larvæ placed on a previously sprayed leaf established a mine.

Precipitated Sulphur.

A greyish precipitated sulphur with the following analysis—sulphur 99·6 per cent., ash 0·2 per cent., chancel degree of fineness 85 per cent.—was also used in this experiment. In the first series fifty-seven eggs were treated, and after four days some had hatched, while a fortnight later only thirteen remained unhatched, representing an apparent kill of 23 per cent.

Control.

Thirty-one untreated eggs were used as a control, and two of these remained unhatched after fourteen days, this representing a natural mortality of 6.4 per cent.

From the above data it is apparent that white oil and linseed oil and soap might have some value as ovicides. The latter, however, can be useful only if a concentration innocuous to the plants can be devised. One interesting fact emerging from these trials is that lime sulphur, which has reputed ovicidal properties, proved comparatively ineffective.

A further trial of white oil as the most promising ovicide was arranged in experimental seed-beds. At a concentration of 2½ per cent. the spray induced serious injury in the foliage of small seedlings, and the effect on leaf miner infestation was completely masked. However, the progress of leaf miner control in seed-beds by other means reached such an advanced stage that no further work on either white oil or linseed oil and soap was considered necessary.

CONTROL IN SEED-BEDS.

During the course of experiments with sprays for the control of blue mould in tobacco seed-beds at Mareeba it was observed that beds sprayed with either colloidal copper or copper emulsion remained comparatively free of leaf miner and stem borer so long as the sprays were applied regularly (A. V. Hill, personal communication), but when spraying was discontinued the pests appeared in the plants of such seed-beds. These observations led to the inference that copper sprays exerted some control on the pests, but strictly controlled commercial seed-beds were necessary for confirmation. Such seed-beds were also required to confirm the laboratory results with lead arsenate dusts, and a comprehensive seed-bed experiment was therefore designed and conducted at Mareeba.

No seed-bed site was available in which both pests were prevalent, but the eggs and newly emerged larvæ of both species are so much alike that measures which check one can be expected to check the other, and leaf miner was selected as the most suitable species for attention. The site chosen was part of a field which had been cropped for three years, and was only about 50 yards from some previously established seed-beds which were heavily infested by leaf miner and were expected to supply a suitable infestation in the experimental beds.

The treatments compared were as follows:—(*a*) Colloidal copper spray followed by 50 per cent. lead arsenate dust next morning; (*b*) colloidal copper alone; (*c*) control plots—untreated; (*d*) copper emulsion spray alone; (*e*) copper emulsion followed by 50 per cent. lead arsenate dust next morning; (*f*) 50 per cent. lead arsenate dust alone.

Notes on the preparation of colloidal copper and copper emulsion sprays have been published by the Queensland Department of Agriculture and Stock (Mandelson, 1933).

Six seed-beds were prepared side by side, each 3 feet wide and 30 feet long, and separated from its neighbour by a 2-foot pathway, with its longitudinal axis approximately north and south. Before sowing, each seed-bed was divided into six 5-foot sections, thus providing thirty-six plots, and as six treatments were included, this arrangement allowed the appearance of each treatment once in each seed-bed (Table 13).

TABLE 13.

Yield of "Plantable Plants" from each Plot in the Experimental Seed-beds at Mareeba. Yield given in Number of Plants in a Representative 3-square-feet Section from each Plot.

East.

a	*b*	*c*	*d*	*e*	*f*	*A*
142	202	..	151	88	..	
b	*c*	*d*	*e*	*f*	*a*	*B*
31	..	155	166	130	71	
c	*d*	*e*	*f*	*a*	*b*	*C*
..	72	160	..	278	223	
d	*e*	*f*	*a*	*b*	*c*	*D*
14	79	12	132	30	..	
e	*f*	*a*	*b*	*c*	*d*	*E*
40	..	66	183	..	62	
f	*a*	*b*	*c*	*d*	*e*	*F*
..	68	26	..	33	44	

West.

Seedlings germinated in from five days to seven days, and the treatments were first applied twelve days after sowing, applications being made thereafter twice a week for the duration of the experiment. On the day selected for spraying all the seed-beds were watered in the afternoon, and the (*a*) and (*b*) plots and the (*d*) and (*e*) plots were then sprayed with colloidal copper and copper emulsion respectively. The following morning all the seed-beds were watered early, and afterwards the (*a*), (*e*), and (*f*) plots were dusted with 50 per cent. lead

arsenate. The amount of spray required to effectively treat the seedlings increased from four-fifths of a gallon during the early stages to 1½ gallons per 90 square feet at the conclusion of the experiment. The dust was applied as evenly as possible, and on no occasion was a heavy coating of dust visible on the treated plants.

About three weeks after the appearance of the seedlings there were two light storms, each yielding about 30 or 40 points of rain. Blue mould occurred at this time in one of the (*f*) plots, and in this plot killed about half the seedlings. Apparently the dry weather checked the outbreak, and there was no further occurrence of the disease. A few days after the rain a small Pyraustid moth, *Loxostege affinitalis* Led., was common in the seed-beds, and by the time the seedlings were four to five weeks old its larvæ were present in the undusted plots, particularly in the untreated (*c*) plots. No second generation of this pest appeared, and it was not responsible for any serious damage. There had been very little invasion of the experimental area by moths from the old infested seed-beds when the seedlings were four weeks' old. It was therefore considered advisable to collect leaf miner moths immediately by sweeping over the old seed-beds and to transfer the catch to the experimental area. This procedure was adopted and proved successful in augmenting the population of the experimental seed-beds.

With the exception of the light storms already mentioned, the weather was very dry. This probably accounts for the relative freedom from blue mould even in the untreated (*c*) plots. In the early stages of growth the copper sprays were undoubtedly responsible for the smaller size of sprayed plants compared with those in the control plots, but after five or six weeks the depredations of leaf miner in the (*c*) and (*f*) plots precluded comparisons of growth. The stunting effect was in all probability due to the waterproofing action of the sprays on the surface of the soil, and from this point of view the colloidal copper was the less undesirable of the two sprays.

Three weeks after the introduction of leaf miner moths in numbers the (*c*) plots were practically destroyed by leaf miners, little more than the stalks being left (Plate 9), and at the same time the leaf miner infestation of the dusted (*f*) plots was generally evident. Sprayed plots were not seriously attacked by leaf miner at this stage, though in parts obviously stunted where the surface was encrusted with spray residue.

The necessity for the employment of statistical methods of analysis in the interpretation of results obtained during the investigation of agricultural problems cannot be overlooked, but it must be remembered that such methods have their limitations, and these limitations are nowhere more evident than in entomological research. The methods developed during recent years depend on the adoption of some definite measurable criterion for the comparison of results obtained by varying one factor of production, but in entomological research it is often impossible or impracticable to measure accurately the selected criterion.

A modified Latin square layout was adopted for these experimental seed-beds, principally because such an arrangement allowed several replications of each treatment. In most field experiments where statistical methods are to be used for the interpretation of results, the criterion selected for comparison can be definitely measured—e.g., yield in lb. per acre, but in the experiment under discussion the selected

criterion was not a definitely measurable quantity. The treatments involved in field trials usually necessitate the application of the varying operations twice or thrice at most, but in these seed-beds the varying treatments had to be applied twice a week for two months. Therefore, in order that risk of confusion during application should be minimised, it was considered advisable to arrange the treatments systematically rather than at random. Thus the results are not amenable to statistical analysis.

One difficulty in ascertaining the value of the treatments against leaf miner arose from the drought-producing effect of the copper sprays, the number of commercial-sized plants occurring in any sprayed plot being reduced in comparison with the number in any unsprayed plot. Finally it was concluded that counting the plants in a representative 3 square feet portion of each plot would give sufficient data for comparative purposes.

The number of commercially plantable seedlings in each plot was chosen as the criterion for analysing the value of the various treatments, and the term "commercially plantable" is used to describe plants large enough and sufficiently free of damage to be successfully transplanted to the field. The number of such plants obtained from a representative 3 square feet section of each plot is recorded in Tables 13 and 14.

TABLE 14.

Yield of "Plantable Plants" from each of the various Treatments in the Experimental Seed-beds at Mareeba.

Treatment.	A.	B.	C.	D.	E.	F.	Mean.
a	142	71	278	132	66	68	126·2
b	202	31	223	30	183	26	115·8
c	..	..	..	..	..	..	0·0
d	151	155	72	14	62	33	81·2
e	88	166	160	79	40	44	96·2
f	..	130	..	12	..	..	23·7

The tabulated results of this experiment indicate that leaf miner infestation of seed-beds can be reduced by the judicious application of either colloidal copper or copper emulsion. The regular use of both sprays prolongs the life of the plants exposed to heavy leaf miner infestation by about four weeks, but colloidal copper is superior to copper emulsion, for several reasons. It is cheaper; it is easier to prepare satisfactorily; it produces no clogging of the spray nozzle during application; it has less waterproofing action on the soil surface; and, furthermore, it is slightly more efficient in leaf miner control than copper emulsion. Dusting twice a week with 50 per cent. lead arsenate apparently gives the plants some protection against the pest, though not so much as the copper sprays, the life of the dusted plants being prolonged by only two weeks compared with the effective existence of plants in the untreated control plots. The seed-bed experiments also demonstrated that lead arsenate dust used in conjunction with the copper sprays does not greatly increase the effectiveness of the latter.

These results were tentatively explained by ascribing ovicidal properties to the copper sprays. Several attempts were made to substantiate this assumption in the laboratory with eggs of both the leaf

miner and the stem borer, but it was soon established that the copper sprays had no ovicidal value against either species. Two alternative theories remained: Firstly, it was possible that the foliage of the sprayed plants became toxic after repeated applications of the sprays, or, secondly, that the sprays had some deterrent action on gravid females. If the former theory were true, larvæ entering sprayed leaves should be killed, but in the laboratory newly emerged larvæ of both species successfully entered plants which had been sprayed three times, and this explanation must therefore be discarded. The other theory would explain the facts quite adequately, but it was very difficult to secure confirmation in the laboratory, though a small duplicate test gave interesting results. One sprayed plant and an unsprayed control were enclosed together under a large glass jar with moths, and although the scope for selective oviposition under these circumstances was not great, interesting results were obtained and are given in Table 15.

TABLE 15.

EGG-LAYING OF LEAF MINER AND STEM BORER ON SPRAYED AND UNSPRAYED CONTROL PLANTS.

Test.	Leaf Miner.		Stem Borer.	
	Eggs Laid on Sprayed Plant.	Eggs Laid on Control Plant.	Eggs Laid on Sprayed Plant.	Eggs Laid on Control Plant.
A	0	2	198	353
B	0	4	155	347
Both	0	6	353	702

The small number of eggs laid on the plants by leaf miner moths could be expected, as this species prefers the ground for oviposition. Twice as many eggs were laid by the stem borer moths on control plants as on sprayed plants. This may be significant when the unsatisfactory experimental design is taken into consideration, and it is thus not unlikely that these copper sprays adversely affect oviposition in sprayed seed-beds, and that therein lies the explanation of the experimental seed-bed results.

DISCUSSION AND RECOMMENDATIONS.

The information set out in this paper indicates that the losses caused locally by the leaf miner and the stem borer are relatively greater than elsewhere, and it is possible that the mild climate of North Queensland may have some bearing on this aspect of the problem. Costs are high in North Queensland, and control measures, to be practical, must dispense with the necessity for much labour on account of the expense involved.

Measures against Moths.

A reduction of losses would be achieved if it were possible to reduce the number of newly emerged or gravid females economically, and with this objective in view two methods of destroying adult moths were considered.

The moths usually fed on sugary solutions in the laboratory before egg-laying began, and it was hoped that fluid baits incorporating attractant syrups would be effective lures in the field against gravid moths.

Several such fluid baits were tested under field conditions, but the unsatisfactory results suggest that these baits do not attract the moths, and control by luring is not likely to be achieved in the future.

The use of light traps for reducing the moth population has been recommended by some entomologists from time to time, and a knowledge of the recommendations led to an experiment with light traps in the field. Several types of traps were used, but, although moths were caught, only one species—namely, the leaf miner—was taken to any extent. The percentage of females in the whole catch was low, and there was no obvious reduction in the moth population in the field. It was concluded, therefore, that although light traps attracted leaf miner moths, their influence covered only a small area and was ineffective in materially reducing the moth population.

Adults may be excluded from the seed-bed by the proper use of shade covers. A mothproof cover of calico, hessian, or stockinette is constructed and fitted with flaps by means of which the ends are effectively closed, and the sides are designed so that they are held firmly against the timbered border of the beds. Care should be taken to ensure that the shade or storm cover is really mothproof when completed and in position. Having constructed such a cover, it should not be removed except between 9 a.m. and 5 p.m., and then only for watering and hardening off the plants. This measure undoubtedly assists in keeping the seed-beds free of leaf miner and stem borer infestation, and thus aids in the production of healthy seedlings. The only danger of infestation in such protected seed-beds is that moths may be disturbed during the day and after a short flight may alight in the seed-beds, but attacks from such sources have not proved serious. The fact that this seed-bed modification favours the development of blue mould in wet seasons is a disadvantage that should not be overlooked.

Measures against Larvæ.

Neither of the two wild tobaccos has yet been discovered in the Cairns hinterland, but several solanaceous weeds known as hosts of the leaf miner occur in the area, and the destruction of weed growth in winter is thus vitally necessary in order to restrict the breeding of the pests. The leaf miner and the stem borer breed in the stalks of abandoned plants left standing in the field, and the value of the "clean up" clause in "*The Tobacco Industry Protection Act of* 1933" must accordingly be stressed, for strict attention to the requirements of this clause will reduce the numerical strength of over-wintering generations of both species.

Experimental evidence does not support the contention that lead arsenate applied as a spray is effective in controlling the leaf miner in the seed-bed or in the field, but the same insecticide applied in dust form gives much better results. Loss of healthy seedlings after transplanting can be avoided by dusting lightly and often with 50 per cent. lead arsenate and maintaining a protective dust cover continuously until the plants are about 9 inches high. If dusting is discontinued after the plants have reached this height, the danger of contamination of the harvested leaf by arsenical residues is reduced to a minimum. The objective is to maintain a dust cover protection until vigorous growth is resumed after the inevitable check associated with transplanting.

Plants which have become infested with stem borers after transplanting can often be saved. These plants should be cut back during good growing weather to the most vigorous sucker, which then develops into the commercial plant, but it is essential to wait for favourable weather before cutting back. If galls denoting stem borer attack are noticed on plants in which the growing point has not been affected, less drastic treatment is sometimes successful, and a longitudinal slit through the side of the gall with a sharp knife generally kills the larva, and, unless again attacked, the plant usually produces commercial leaf.

Ovicides.

Unfortunately, there are several inherent disadvantages in the use of ovicides against either leaf miner or stem borer. One of the chief of these is that ovicides cannot be used in the field because of the necessity for frequent applications and the high costs thus involved. Furthermore, in the seed-beds there is such a dense mass of foliage that thorough wetting of the plants is almost impossible, and it is therefore impracticable to reach eggs laid on the ground and among the glandular hairs on the lower surface of the leaves. As yet, no thoroughly effective ovicide has been developed.

Control in Seed-beds.

The advantages of using mothproof seed-bed covers have already been mentioned. On account of the prevalence of blue mould, the use of the copper sprays in seed-beds must become a routine procedure and should help in the control of both the leaf miner and the stem borer. Lead arsenate used in dust form for the control of other leaf-eating caterpillars should also decrease the incidence of the two pests under discussion. The provision of mothproof storm covers, the regular use of colloidal copper spray, and the regular dusting with 50 per cent. lead arsenate should therefore render possible the production of commercial seedlings in North Queensland.

Biological Control.

The biological control of insect pests, when effective, is a most inexpensive method, but few pests have so far been successfully controlled in this manner. Three Braconid parasites of stem borer larvæ already occur in the areas north of Bowen, and are now recorded for the first time, but, as the stem borer remains a serious pest in spite of these well-established parasites, they are obviously of little consequence as control factors. Unfortunately, overseas records have yielded evidence of the existence of only one parasite of the stem borer.

The position with respect to the leaf miner is somewhat different, for in other countries many larval parasites have been recorded, whereas in North Queensland, despite the quantity of field material handled, only one—a Braconid—has been observed. At least four of the leaf miner parasites of other countries have occurred in considerable numbers in their respective localities and are credited with partial control of the pest in certain regions in particular seasons, and it might therefore be advisable to consider the possibility of introducing some of these reputedly effective species from other countries. Steps, however, should not be taken to do so until their absence from other Australian States has been established.

SUMMARY.

The recent increase in the area under tobacco and in the weight of commercial flue-cured leaf produced in North Queensland is paralleled by a proportionate increase in the attention paid to the control of pests connected with this crop. Two of the more destructive insect pests are the leaf miner *Phthorimæa operculella* Zell. and the stem borer *Phthorimæa heliopa* Low.

A section of this paper, in which the bionomics are described, is devoted to each of these insects. The species *P. operculella* is probably indigenous in tropical America, but is now cosmopolitan. The species *P. heliopa* apparently does not occur in that continent, but seems to be indigenous in many of the countries bordering the Indian Ocean. The present distribution of both pests is noted. Native and cultivated host plants of *P. operculella* are enumerated, and attention is drawn to the fact that no host other than tobacco is recorded for *P. heliopa* in the available literature. Two native hosts of the latter in North Queensland —*Nicotiana suaveolens* and *N. glauca*—are now recorded for the first time.

There is a brief description of the adults and copies of the original descriptions. The various life-history stages are described, with notes on the bionomics pertaining to each stage. The larvæ are discussed at some length, with notes on the injury by each species, the relationship of temperature to development, agreement with Dyar's hypothesis, and general habits. There are four larval instars in *P. operculella*, but five in *P. heliopa*, and whereas larvæ of the former require 351 ± 33, the latter require 703 ± 81 effective day-degrees for development. Attention is drawn to the fact that neither pest is in the habit of consuming any of the epidermal portion of the host. The larvæ reject the epidermis after biting it away when initiating attacks through the leaves or other parts of the plant.

The habits of the adults are described, with notes on flight and egg-laying. Whereas the stem borer habitually oviposits on the plant, the leaf miner prefers the ground near the base of the host, and seldom oviposits on the plant. Stem borer moths lay up to 400 eggs—about three or four times as many as leaf miner moths. Attention is drawn to the adult's habit of seeking seclusion during the greater part of the day. Probably ten or eleven generations annually for the leaf miner and seven or eight for the stem borer are normal under local conditions.

The immature stages, the adults, and the injury of the two species are compared. Similarities in the life histories and habits of the two are such that any measures for the control of the pests need to be similar, if not identical. The adults of *P. operculella* are attracted to lights; but those of *P. heliopa* are not.

Interesting differences in the status of natural enemies for the two species are described. Parasites of *P. operculella* are quoted from the literature, but none are recorded from Australia. There are no records of larval parasites of *P. heliopa* in other countries, but several, as yet unidentified, are now recorded from Queensland. One of these also parasitises the leaf miner locally.

Control experiments are described. The pests have been excluded from seed-beds by the manipulation of moth-proof storm covers. Honey and water and molasses and water baits were tested in the field without success. Acetylene lamps modified as four types of light traps were

tested in the field, but none of the traps were capable of materially reducing the moth population. Legislation has been introduced to enforce the removal of crop residues. Lead arsenate applied as a spray at the rate of 1½ oz. per gallon of water is not effective against the leaf miner, and is probably ineffective against the stem borer also, but the same insecticide applied as a dust seems to exert some degree of control on both species. Several ovicides were tested in the laboratory, but were ineffective. Two copper sprays, developed for the control of blue mould, *Peronospora tabacina* Adam, in seed-beds also give considerable control of the leaf miner and stem borer as well.

The interesting features of this investigation, with their effects on the control of the pests, are discussed in conclusion. Recommendations embracing practices which may be expected to reduce commercial losses, particularly in seed-beds, are advanced. The need for further investigation of the possibilities of parasite introduction is mentioned.

A bibliography is included. This embraces several papers describing methods for trapping other moths, as well as the literature on the two pests. The papers have been consulted in abstract where the original was not available, and wherever possible the reference in "The Review of Applied Entomology" is also cited.

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BLUESTONE AND NICOTINE SULPHATE DRENCH FOR WORMS IN SHEEP.

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

TRICHOSTRONGYLOSIS or "black scours" is a disease of sheep, more especially of young stock, associated with infestation by very small species of worms known as the small trichostrongyles or hair worms. These tiny worms may be present in thousands in the small intestine where they occur buried in the mucous of the intestine wall. They are very difficult to see with the naked eye and appear as reddish streaks about a quarter of an inch in length, being most numerous in about the first 15 feet of the intestine. Drenches such as bluestone, arsenic, and carbontetrachloride, which are very efficient against the barber's pole worm in the fourth stomach, have little effect on these hair worms, and in the past these could be controlled only by preventive measures.

Recent work by the McMaster Animal Health Laboratory, Sydney, has shown, however, that if nicotine sulphate is combined with bluestone, the majority of the hair worms will be removed.

Formula—

Bluestone	1 lb.
Nicotine sulphate	16 fluid oz.
Water	5 gallons.

Dose—

Sheep, 18 months and older	2 fluid oz.
Sheep, 12 to 18 months	1½ fluid oz.
Sheep, 4 to 12 months	1 fluid oz.
Sheep, under 4 months	½ fluid oz.

Anyone who has had experience with the ordinary bluestone drench for barber's pole worm infestation, where the adult dose is also 2 fluid oz., will have observed that one of the disadvantages of this drench is the bulkiness of the dose, which slows up treatment considerably. The

McMaster Laboratory has shown, however, that with the bluestone and nicotine sulphate drench the dose may be greatly reduced in bulk without impairing the efficiency of the treatment or harming the sheep.

Formula—

Bluestone	1 lb.
Nicotine sulphate	16 fluid oz.
Water	2 gallons.

Dose—

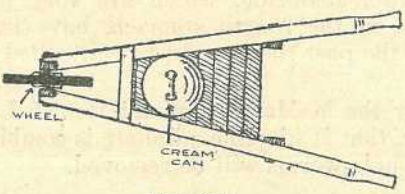
18 months and older	20 cubic centimetres.
12 to 18 months	15 cubic centimetres.
8 to 12 months	10 cubic centimetres.
4 to 8 months	8 cubic centimetres.
Under 4 months	5 cubic centimetres.

No starvation is required either before or after treatment.

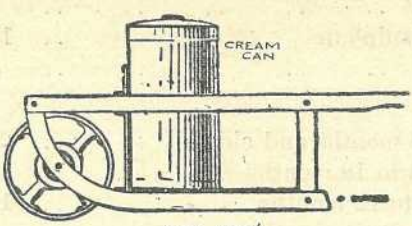
The bluestone should be of good quality and should be kept in a closed container. The required amount (1 lb.) is dissolved in hot water, and the nicotine sulphate is added when the solution is cool. The quantity of nicotine sulphate is measured in fluid ounces not in ounces by weight, and the sample used should contain 40 per cent. nicotine. Only earthenware or enamel vessels should be used for mixing this drench as bluestone reacts with metal surfaces, destroying the vessel and impairing the efficiency of the preparation.

This bluestone and nicotine drench is very effective against the barber's pole worm and tape worms as well.

BARROW FOR CREAM CANS.



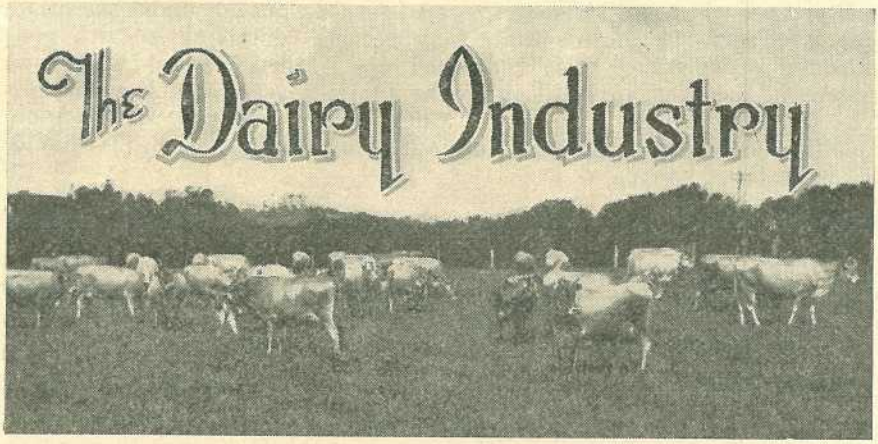
TOP VIEW.



SIDE VIEW.

PLATE 108.

These sketches show how a very useful barrow is built. It is invaluable when cans have to be taken downhill and the ground is wet and slippery. Let the load rest on the two bottom runners, which act like a sledge.



FERMENTED AND GASSY MILK AND CREAM.

By E. B. RICE, Dairy Research Laboratory.

THE warmer months of the year bring in their train many defects in milk and cream of which none is of more frequent occurrence than that variously described as gassy, fermented, fruity, and yeasty. The defect is always associated with a copious evolution of the gas carbon dioxide, which is derived from the chemical decomposition of the milk sugar by certain organisms. It is especially noticeable during a period when the days and nights are both hot. In sour cream gas formation is so vigorous at times that the lids of the cans are forced up in transit, and loss results from the cream overflowing from the can. Factors which materially contribute to any of these conditions are careless methods of production and handling, high holding temperatures, and infrequency of delivery to the factory. Cream which is affected by any of these ferments is always graded down upon arrival on the factory platform, as it is only fit for manufacture into inferior grade butter. Although pasteurisation destroys the offending organisms, the by-products resulting from their action on the cream are not removed by this process, and carry the taint through to the finished butter.

Milk contaminated by organisms responsible for gassiness, fruity flavours, or yeastiness is much dreaded by the cheesemaker. In spite of the special methods which have to be adopted during the processing of such milk, a cheese of defective flavour always results. The comparatively high temperatures in the latter stages of cheese making are ideal for the injurious organisms, which suppress the activities of the desirable lactic acid bacteria. Pasteurisation of cheese milk assists to overcome the difficulties of manufacture and the extent of the depreciation in quality of the cheese, but it is not a remedy for the treatment of milk which has been carelessly produced. Occasional testing of the milk of all suppliers by the methylene blue reduction test, or the Wisconsin curd test in suspected cases, will enable the detection of the suppliers whose milk is at fault.

Another source of the organisms may be the "starter" itself. "Starters" which have been propagated for long periods under the usual factory procedure in this State may become contaminated with gas-forming organisms. Their continued use is then fraught with considerable risk, for, in addition to the desired lactic acid bacteria the cheese milk is seeded with germs which have a damaging influence on quality. Any starter suspected of containing foreign organisms should be immediately abandoned.

Causative Organisms.

Many micro-organisms are capable of producing a gassy fermentation, but those responsible for the defects referred to under farm and factory conditions may be classed as under:—

1. Coli-aerogenes group of bacteria.
2. Yeasts.
3. Butyric acid bacteria.

Coli-aerogenes Bacteria.—Of this group, the *B. coli,* as their name implies, are derived from the colon (large intestine) of animals; hence their presence in a sample is indicative of pollution, either directly or indirectly, from excremental matter. They may reach the milk or cream by many directions, such as, small particles of dung falling from the animal's body into the pail during milking, or being blown from the floor of the bails into the pail; dust becoming attached to the coat of the animal from lying where dung has accumulated or also being blown in from the bails; the use for washing-up purposes of water from places into which animals have waded. Even if polluted water is not used for cleaning utensils, cows watering in it stir up muddy liquid which is splashed on to their coats. The bacteria later find their way into the milk pail.

Apart from the undesirable fermentation which takes place, the presence of *B. coli* is regarded with suspicion on account of its close association with certain disease-producing germs.

Bacterium aerogenes, on the other hand, is comparatively rare in the intestines, and its habitat is generally the soil, on cultivated plants, grain, water from streams draining cultivated fields, &c. It produces a larger volume of gas than does *B. coli,* along with a more objectionable odour. Contamination with these bacteria arises from dust, unsterile utensils, unsterile straining cloths, and impure water.

The optimum temperature for the growth of both species is blood heat (98·6 deg. Fahr.). The so-called "fruity" flavours in cheese originate from the use of milk contaminated by *Coli-aerogenese* bacteria. While milk and cream are held at low temperatures these germs are kept in check, and the acid developed from the normal souring leads to their destruction.

Shelton drew attention to a case in New South Wales where the milk of one herd, which had been accustomed to lying in the shade of a tree where manure had accumulated, upset the whole batch of milk at a factory. When this contaminating influence was removed by cleaning up the yard no further trouble was experienced.

Yeasts.—Certain varieties of yeasts can be obtained from almost any sample of dairy produce, but those which are responsible for any of the defects mentioned belong to a class which is able to ferment milk

sugar with the production of gas and a yeasty odour, this odour being due to small quantities of alcohol formed from the milk sugar. Owing to their slower growth than bacteria, deterioration due to yeasts is usually not evident until bacterial activity has almost ceased. The bacteria, and particularly the lactic acid bacteria, assume control of the primary fermentation of fresh milk and cream. However, when the acidity reaches a concentration of about 0·6 per cent. the bacteria gradually die out and, provided suitable temperature requirements are met, the yeasts which had remained dormant up to this stage begin their multiplication. They are able to flourish in sour cream and milk, as, in contrast to bacteria, they can tolerate fairly large quantities of acid. Thus the occurrence of yeastiness in the warmer weather is explained partly by the quick development of acid, which then inhibits bacteria, and partly by the higher temperatures which favour these organisms. There

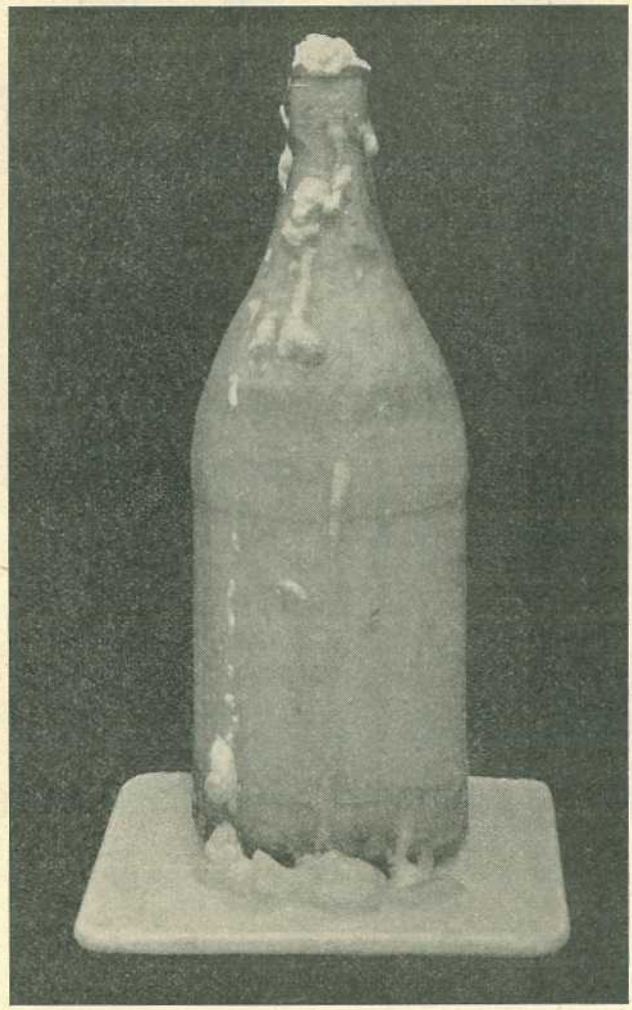


Plate 109.
Yeasty cream overflowing container.

may be just as many yeasts present in milk and cream produced in the cooler months, but climatic conditions prevent them from increasing sufficiently to deteriorate the article. The characteristic foaming of yeasty cream is due to the escape of the gas bubbles being hindered by the thick, sour cream.

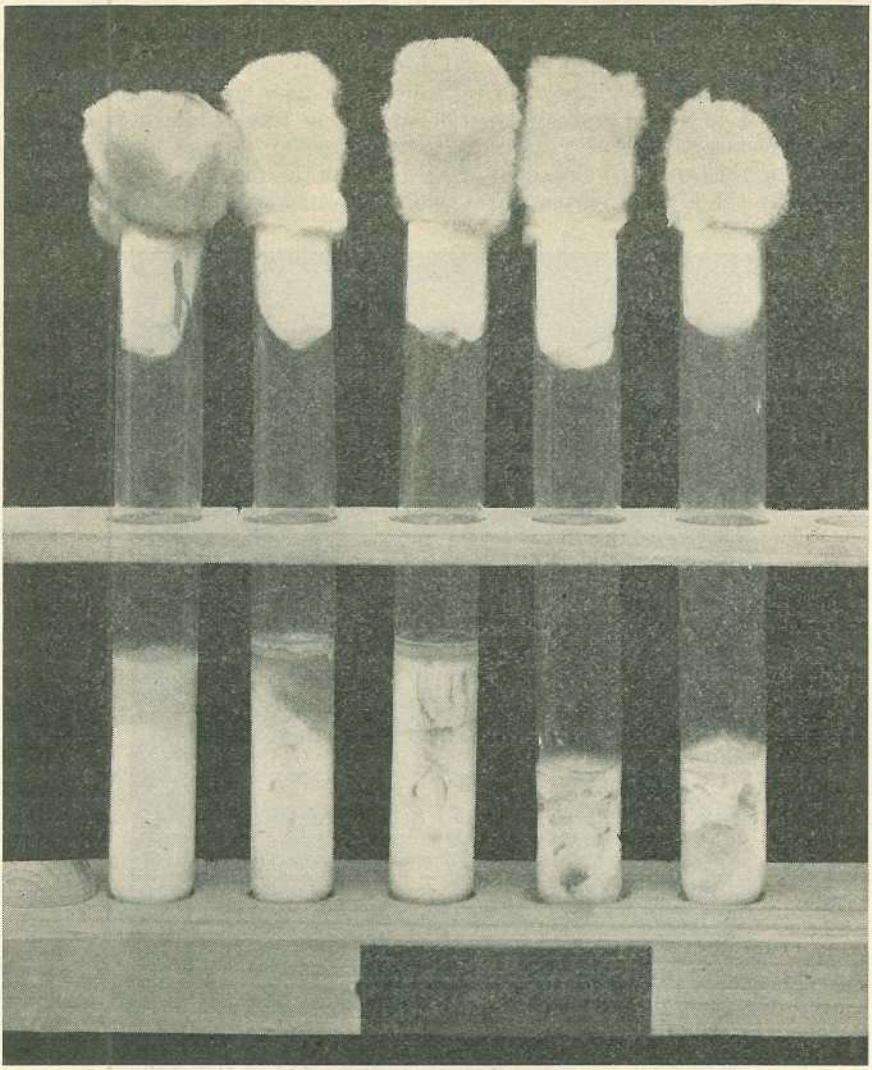


PLATE 110.
Tube on extreme left shows normal milk curd. The other tubes contain type of curds showing gas formation.

The source of origin of the yeasts gaining access to the milk is usually on dust from feeding stuffs or the bails.

Butyric Acid Bacteria.—These bacteria are known as anærobes on account of not growing in the presence of air. They are abundant in the dung of animals and soil, the common mode of infection of dairy products being by manurial contamination. In market milk, or in

fresh or sour cream, they are not usually significant, their growth being retarded by other germs, and they also soon die out in the unsuitable environment. Occasional stirring assists in providing these unfavourable conditions. They form bodies known as spores, which are resistant to heat, and so in pasteurised milk and tinned cream and condensed milk they sometimes cause gassiness. They can also cause the "blowing" of cheese.

Control Measures.

The gas-forming microbes belong to several classes which are widespread in nature. The care taken in the production determines largely the number which will be present when milk or cream is placed in the dairy. This in turn influences the speed with which gassiness will develop in the event of exposure to unfavorable temperatures for any length of time. The greater the initial contamination the sooner will "off" flavours appear and the more serious will be their nature.

The main steps in control on the farm in order to exclude the gas-forming organisms as far as possible are—

1. Thoroughly clean all utensils.
2. Prevent contamination from dust from the animals' bodies, floor of the bails, &c.
3. Keep flies, which are carriers of these germs, out of the cream.
4. Avoid the use of impure water for the cleaning of utensils.

In Queensland, where average summer temperatures approach the optimum for the growth of the causal organisms, it is also necessary to take steps to prevent their rapid numerical increase. To accomplish this, attention needs to be given to the undermentioned points:—

1. Cool cream as far as possible.
2. Stir at intervals throughout the day.
3. Keep in a cool, well-ventilated dairy.
4. Deliver to factory as often as possible in the summer months.

The Pig Farm.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

These notes, which were published in the Journal for June, 1935, are reprinted, after revision, in response to numerous requests from pig-raisers and others contemplating entering the pig-raising industry.—Ed.

IN providing accommodation for his pigs, the farmer must consider the health and comfort of his stock and plan to prevent disease as far as practicable; he must also consider his system of feeding and management and bear in mind the class of pigs that is required by the pork and bacon trades.

During recent years the general demand has changed towards leaner meat, and pig-raisers are now endeavouring to produce pork and bacon pigs which have an abundance of lean meat and a minimum of fat; this, of course, necessitates a change of methods in breeding, feeding, and management.

Investigations into disease in pigs have shown that certain rules in sanitation regarding pig accommodation will, if carried out, control most of the serious troubles which occur in pigs, particularly infestation by internal parasites.

Although certain features must be considered for the pig's health and comfort, one must also consider the cost of providing pig accommodation, for pig-raising is a business, and if too much capital is expended on the insurance of health of the stock, the additional income may not give sufficient return on the capital invested. Fortunately, under the mild climatic conditions which prevail in Queensland, ample accommodation may be provided for pigs at a comparatively low cost and the outlay on good piggery equipment is usually well repaid.

The class of accommodation required for any piggery depends upon the system of pig-raising to be carried out. There are several fairly well-defined systems in Queensland. The coastal dairy farmer who keeps pigs to utilise separated milk usually has very little cultivation and rarely grows grain, depending on the separated milk, perhaps some sweet

potatoes and arrowroot, together with some pasture, to feed his pigs. Under these conditions the pigs are usually kept fairly convenient to the dairy to reduce the labour required in conveying milk to the pigs, and, if practicable, the pigs are fed at a place lower than the dairy, the milk being conveyed from the separator room to the piggery by means of an open gutter pipe. On this class of farm pigs are usually given access to grazing on permanent pastures.

The mixed farmer who combines dairying with crop-growing keeps pigs to use his milk by-products and a portion of his grain, root crops, lucerne, and pumpkins. He studies the market prices of pigs and of the various crops to determine when to market his crops direct and when to sell them by way of the pigs. Under these conditions more pigs are kept per cow than where milk is the main source of food supply. The pig accommodation on this type of farm should be such that the pigs can be turned on to portions of the cultivation land to enable them to harvest some of their own food when desired.

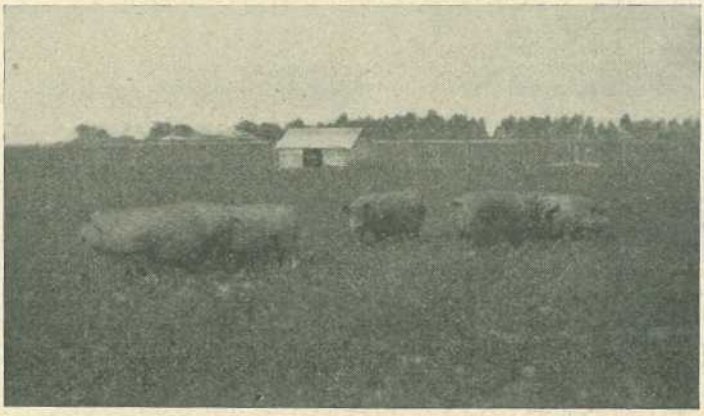


PLATE 111.
Berkshire sows being kept economically on lucerne. Their movable shelter shed may be seen in the background.

Pig-raisers who do not use milk, but substitute meat meal in the pig's ration and grow grain, lucerne, and other crops especially for pigs, have a different proposition again and should aim at having all their paddocks suitable for holding pigs.

Pig farmers who run large numbers of pigs on small areas of land adjacent to cities or towns or near dairy factories, and feed their pigs on table refuse or factory by-products, usually keep their pigs on a different system to farmers who have fairly large farms and produce most of their pig food.

Bearing in mind the most important feature of pig accommodation —namely, sanitation—there can be only two clearly defined systems of keeping pigs which are completely satisfactory; one is the grazing system, wherein pigs are kept on fresh pasture or crop land which is either rested or cultivated and grazed in rotation; the other is the intensive system in which the pigs are kept on impervious floors, such as concrete, which are properly drained and regularly cleansed. In both of these systems the object should be to keep the pigs on clean ground

or on a clean floor, for a good deal of the infection to which pigs are subject lurks on the ground or floor of pig pens which are not rested or are inconvenient to cleanse.

Where there is a sufficient area of good grazing land or cultivation land the grazing system has many advantages, and should be adopted either entirely or in combination with the intensive system, which is often convenient for sows with young litters of pigs. If sufficient paddocks can be cropped for the pigs to do the harvesting, the paddocks being ploughed a couple of times each year, infection will be kept at a minimum, the pigs will receive benefit from the exercise gained in grazing or harvesting their own food, a good deal of labour is saved in the harvesting of the crop, and the fertility of the land benefits.

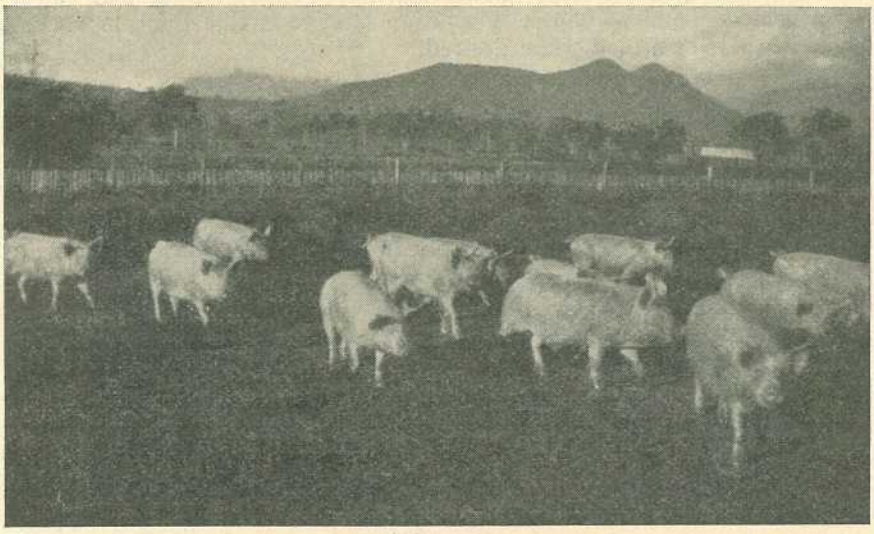


PLATE 112.
These prime baconers were "finished" under paddock conditions, never having been penned.

On grazing land where cultivation is not practicable it is necessary to have sufficient paddocks of ample area to keep them always well grassed and to enable the resting of the paddocks at frequent intervals. Pig paddocks should not be over-stocked so that they become bare, unless they can be cultivated or rested for several months. Even if pigs are paddocked as suggested, the ground near the troughs will become "pig sick" after a time, and it is most desirable that such equipment should be movable. Sheds of convenient size—say, with a floor space of 8 ft. square—should be provided in the paddocks to shelter the pigs from the extremes of the weather, and these sheds should be built on skids to allow of their easy transport about the paddock or from one paddock to another. Food troughs and platforms, self-feeders, and water fountains should also be mounted on skids for easy transport.

With movable equipment and sufficient paddocks, there is no necessity for cleaning up with broom and shovel, and where pigs are kept on the grazing system the whole piggery is found to be free of

noxious odours which are usually associated with small pen piggeries; these features make pig-raising a much more congenial undertaking when the grazing system is adopted.

When the intensive system of pig-raising is adopted, impervious floors and good drains are essential; a good supply of water and labour is also required to clean the pens daily. Intensive pens are necessarily small, and a portion of each pen is roofed to provide the pigs with shelter from the extremes of the weather. (*See* plan of intensive pig pens.)

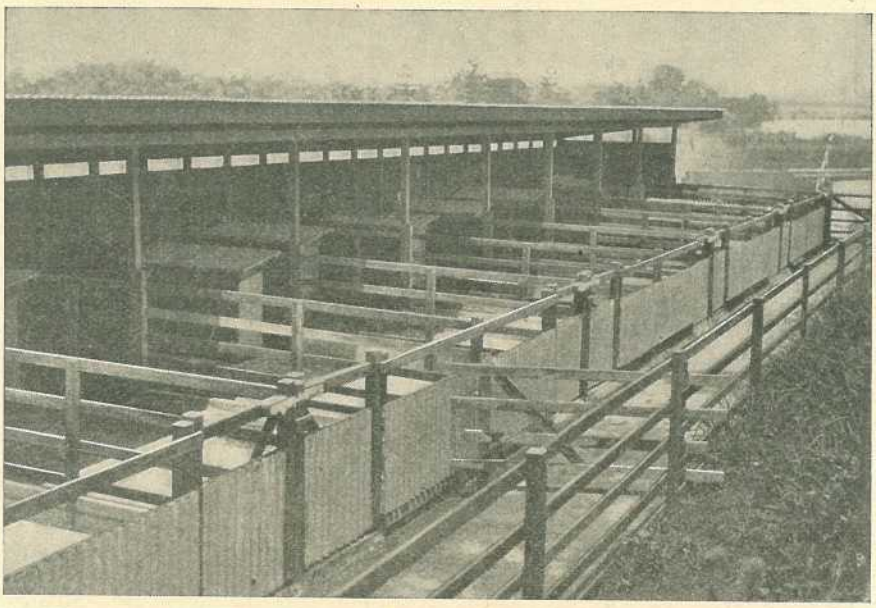


Plate 113.
Intensive pig pens in use at the Animal Health Station, Yeerongpilly.

A Suggested Layout.

The plan of a piggery shown in Plate 114 suggests a layout which has proved very satisfactory where suitable cultivation or grazing land is available. This plan gives scope for cultivation and rotational grazing of paddocks with a view to providing a maximum of pasture for the pigs and control of disease and parasites. The lane in the centre of the runs with a loading race at one end and two movable hurdles provides ample facilities for drafting pigs.

The usual fencing should be replaced by movable hurdles at the ends of the runs adjoining the lane, so that when paddocks are being cultivated implements may work right to the end of the run, for it is this portion around the troughs which becomes most fouled.

It is not suggested that the pigs will obtain all their food from the 3 acres of grazing shown in the plan, and the grazing can only be expected to carry the pigs if other food, such as grain and milk or grain and meat meal, are provided in addition.

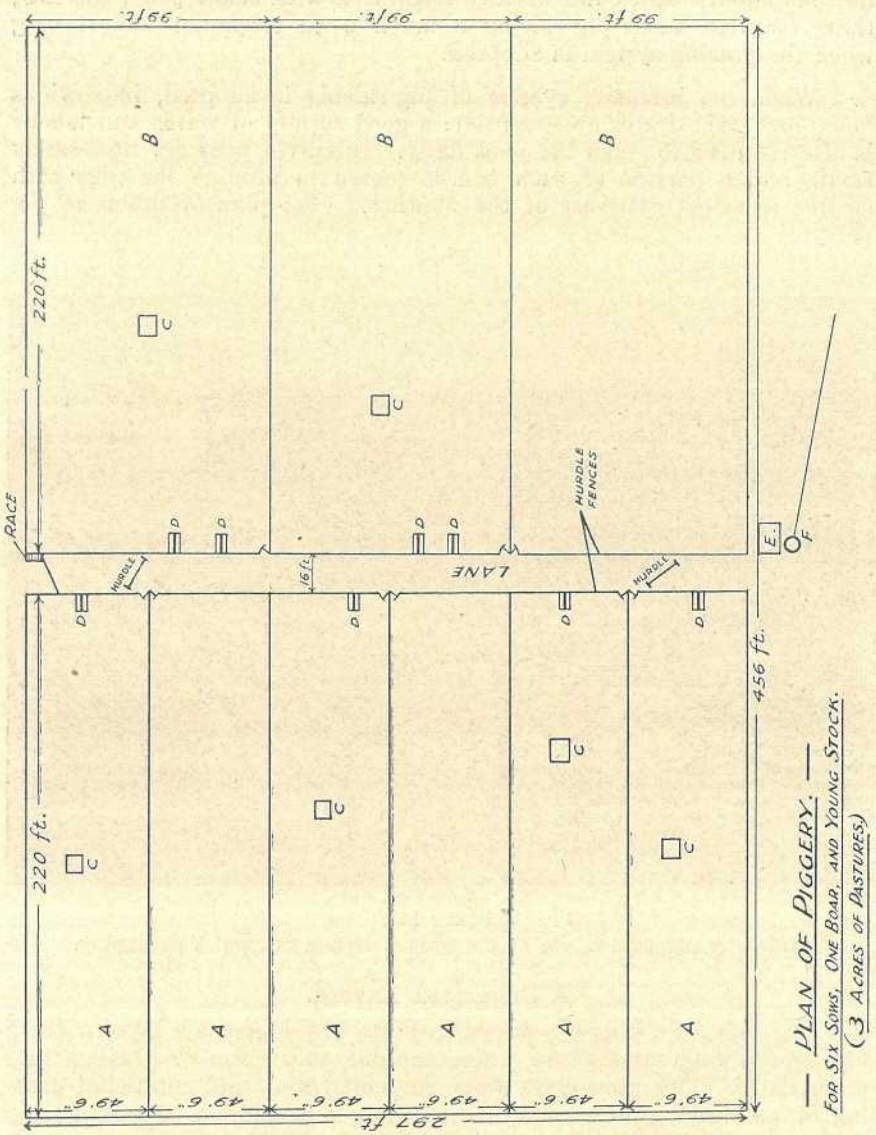


PLATE 114.

(*a*) Indicates paddocks of ¼ acre each for the use of dry sows, sows with litters, and the boar. At most times two of these paddocks could be under cultivation and later be grazed in rotation.

(*b*) Indicates paddocks of ½ acre each in extent to be used for growing pigs. As one paddock could usually be spared they can be cultivated and grazed in rotation.

Six movable sheds (*c*) should be sufficient shelter for the pigs, as these may be moved from one paddock to another as required.

Troughs built on movable platforms (*d*) will be found convenient if drawn against the fence and moved along as the surrounding ground becomes fouled.

(*e*) Shows the feed shed.

(*f*) Shows the milk tank connected by a line of open gutter pipe from the separator-room.

Where the correct type of pig is bred and feeding conditions are good, pigs may be kept in paddocks as suggested, from birth to slaughter, with excellent results.

On every farm where pigs are bred and reared a certain number of paddocks or pens are necessary so that pigs of various classes and ages may be kept separately. Breeding sows when dry should be run in a separate enclosure to other pigs, and in some cases it is even desirable to run the forward sows separate from the backward sows. Dry sows will secure the greatest part of their food requirement from good grazing and give best results when kept out in the open.

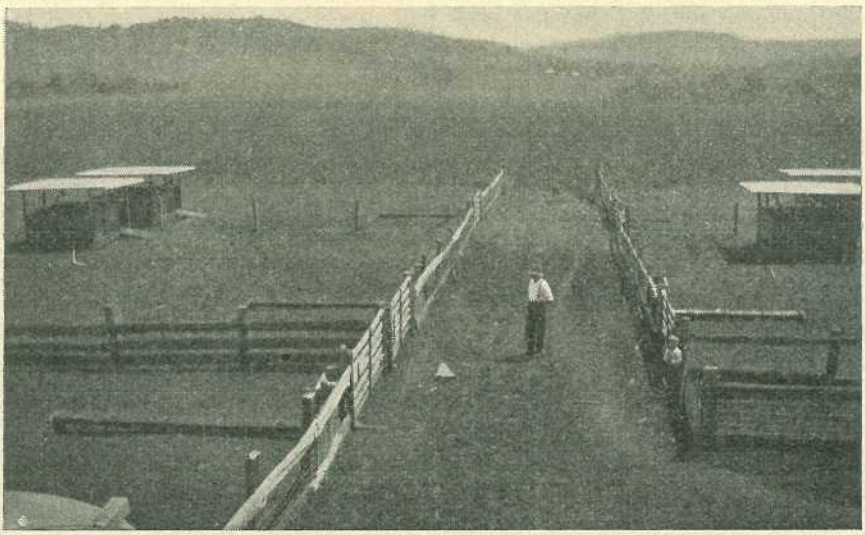


Plate 115.

A section of a paddock piggery on Mr. W. F. Kajewski's property at Glencoe, showing the laneway, portions of paddocks, and movable shelter sheds. The long narrow paddocks are cropped regularly, and the system has been working satisfactorily for some years.

The best results are obtained when sows with young litters are kept in individual enclosures, and as it is rather difficult on large piggeries to give each sow and litter a separate paddock large enough to be cultivated, the intensive pen is often resorted to for sows and young litters. However, the sows and litters may be kept separately on pasture by providing each one with a hut to which are affixed three hurdles, making a small run; the whole unit should be movable so that the pigs can be put on to fresh pasture as each patch becomes fouled.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-inch by 2-inch hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

Individual care is most necessary for sows and litters until the youngsters are about three weeks old, and after that time several sows with litters of approximately the same age may be run together with good results; however, no other pigs should be run with these. When the pigs are three or four weeks old they may be provided with a self-feeder containing grain or meals; the sows may also be given access to the self-feeder during this latter half of the lactation period, one feeder being sufficient for several sows and litters. When a feeder containing dry foods is providd, there should also be an accessible water supply, even if the pigs are given milk in addition. The young pigs do very well on this system of feeding, and when it is desired to wean them at eight weeks old the self-feeder should be enclosed with hurdles, which enable the young pigs to enter, but exclude the sows. The sow's food supply is so reduced that her milk flow ceases, and at the same time the young pigs take a larger amount of food from the trough, and thus weaning is achieved satisfactorily.

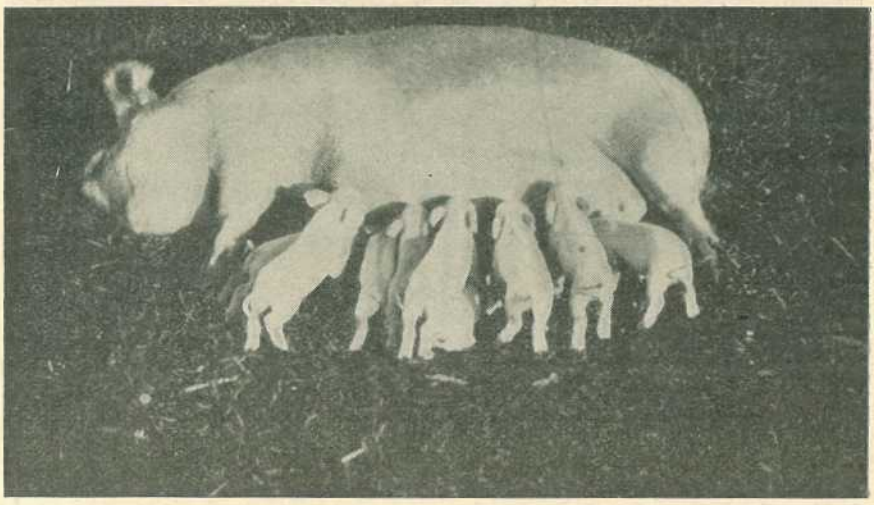


PLATE 116.

This litter of Middle Whites on Mr. H. O. Rees's farm, Maleny, appear to appreciate clean conditions.

After weaning the sows should be returned to the dry sows' paddock and the weaners should be graded into lots according to size.

From weaning time until marketing the growing pigs should be graded according to size into as many lots as convenient; under the grazing system, provided there is ample trough space to feed the pigs comfortably, two or three lots will be sufficient for the growing pigs; under the intensive system, pigs are usually kept in smaller lots.

Situation.

In selecting a site for intensive pig pens, consideration should be given to the aspect so as to provide shelter from the prevailing winds and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable.

PLATE 117.

The system of pasturing sows and litters in movable huts with three hurdles attached to provide a yard is here illustrated in use at Mr. W. Dawson's farm, Woolooga.

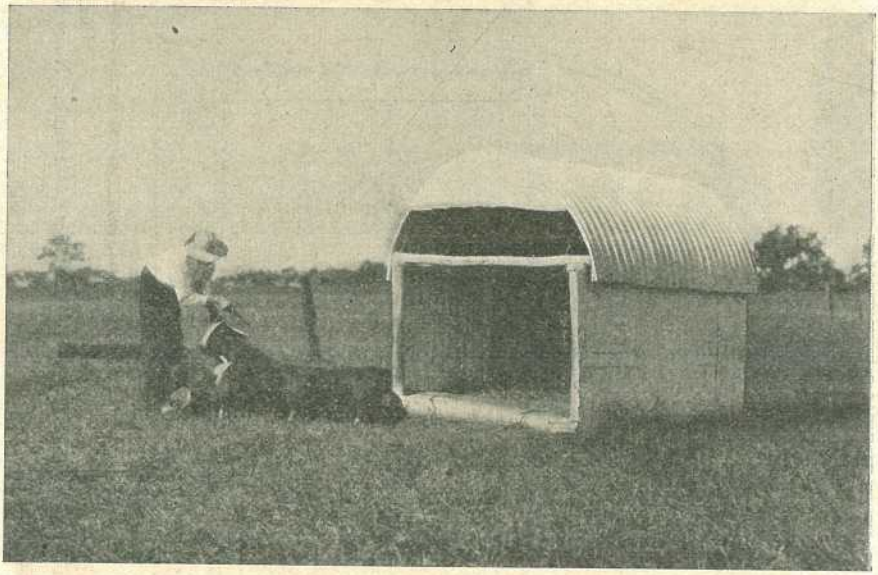


PLATE 118.

A half-tank movable shed in use at the St. Lucia Training Farm.

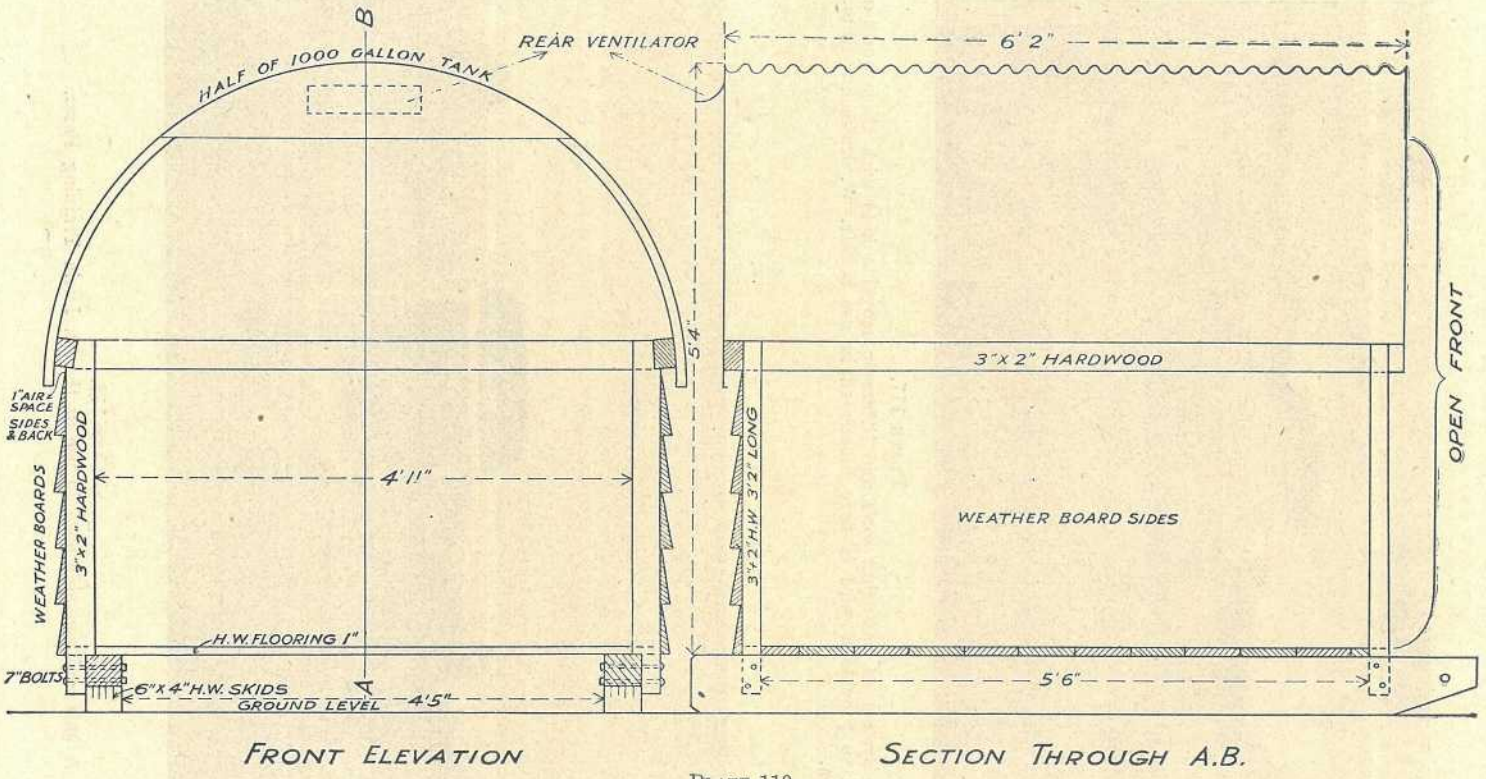


PLATE 119.

Plan of a portable shelter shed, using half a water tank. Note skids on which this shed is constructed, providing for ready means of moving the house when required.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 feet from dairy yards and buildings.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Legislation.

Pig-raising is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable, when about to construct or alter a piggery to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress or at increasing the cost of production.

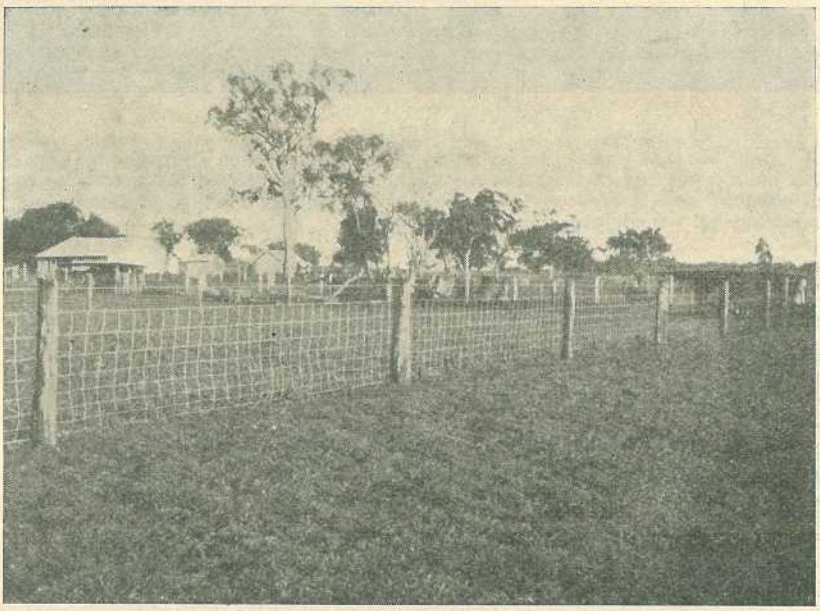


PLATE 120.

The fence illustrated consists of "pig netting" of eight horizontals, 30 inches high in all. In addition, a barbed wire has been provided on the ground to prevent rooting, and another 6 inches above the netting to prevent jumping.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time.

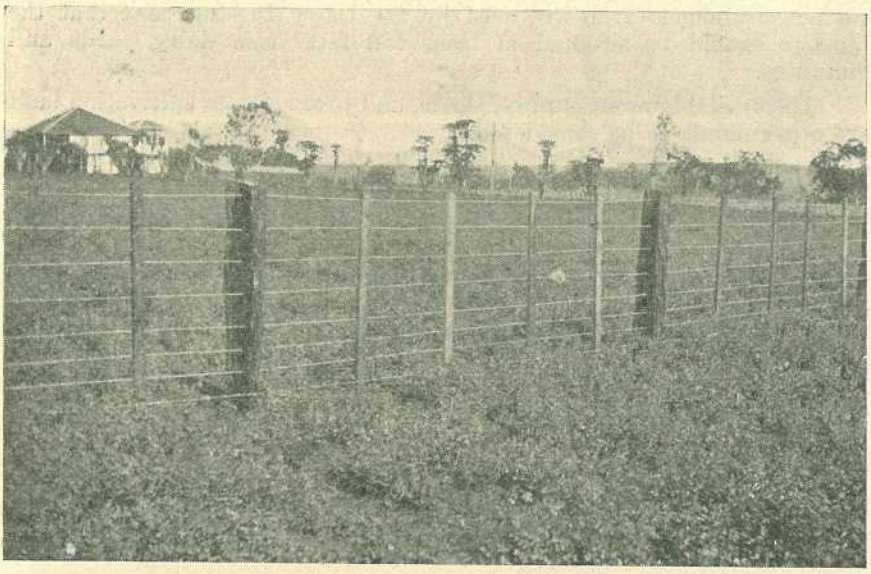


PLATE 121.

This fence has posts 10 feet apart, with four wooden droppers to a panel; seven plain wires run through the posts, and a barbed wire at the bottom prevents pigs rooting below the fence. If it is kept well strained, this type of fence is useful for all but very small pigs, and is cattle-proof.

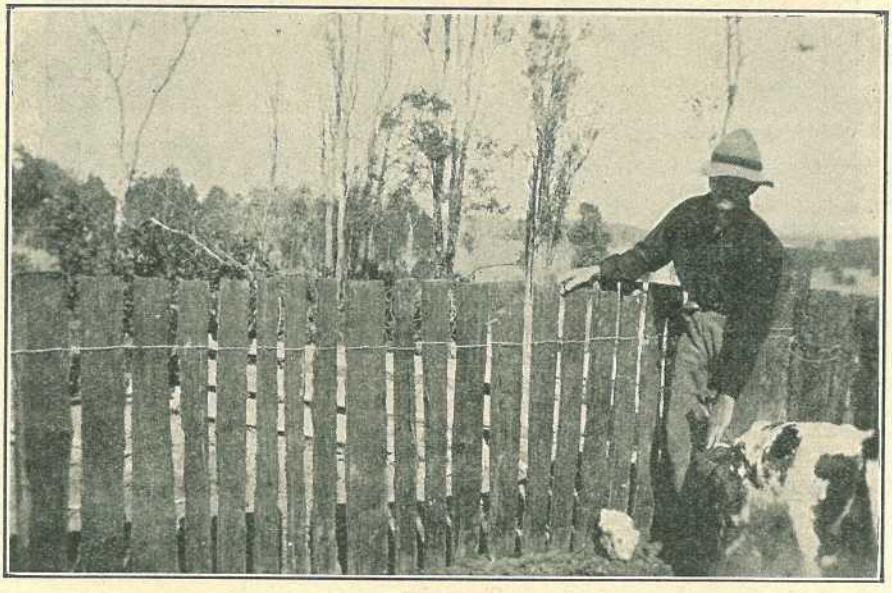


PLATE 122.

Where palings are readily available they can be used for pig fencing, as shown in this illustration.

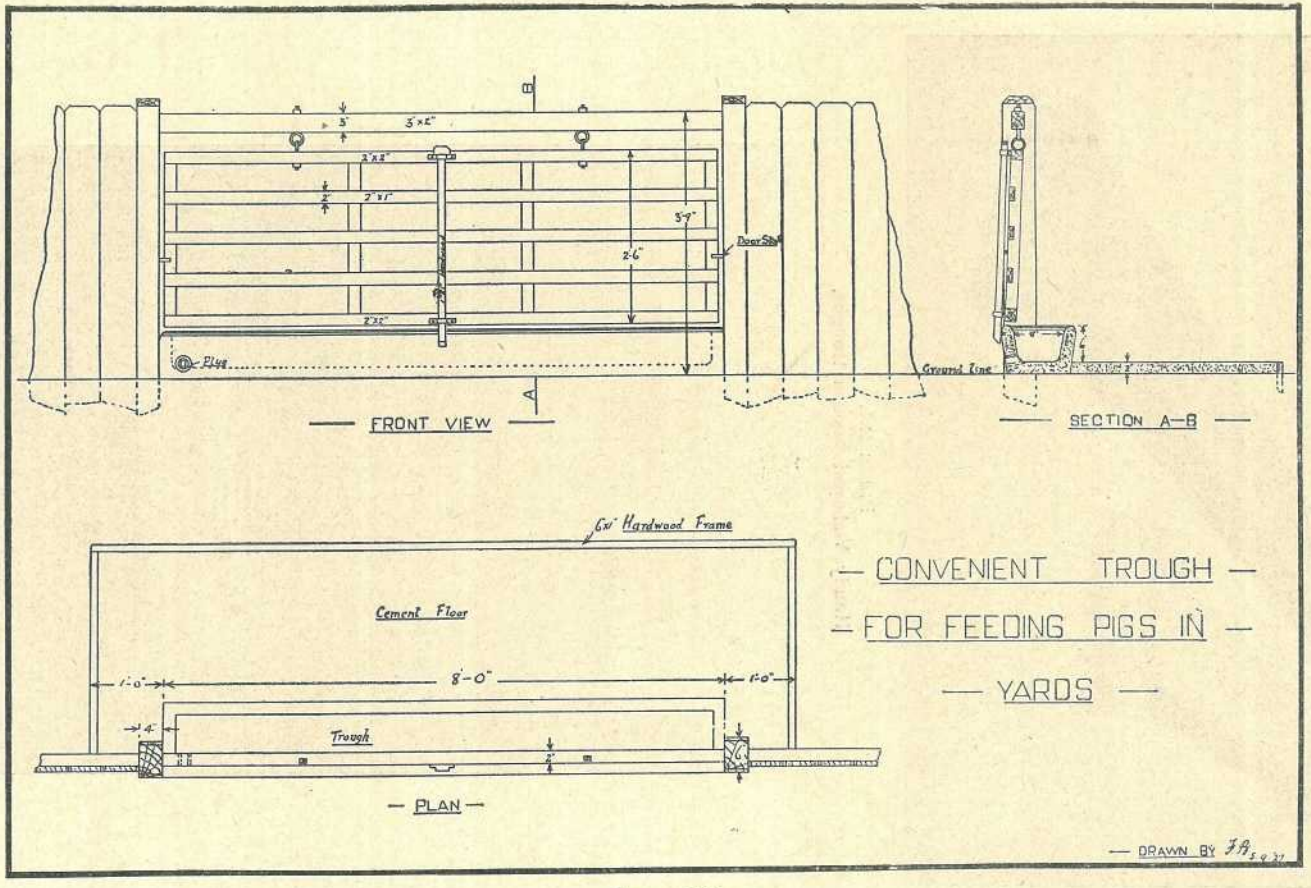

FRONT VIEW
SECTION A–B
Door Sill
Ground Line
6x1" Hardwood Frame
Cement Floor
Trough
1'-0"
8'-0"
1'-0"
PLAN
CONVENIENT TROUGH
FOR FEEDING PIGS IN
YARDS
DRAWN BY

PLATE 123.

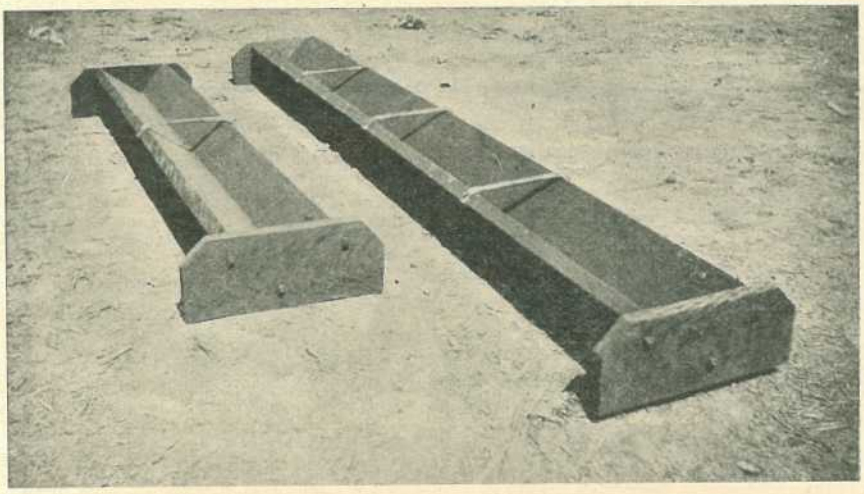


PLATE 124.
Handy V-shaped wooden troughs.

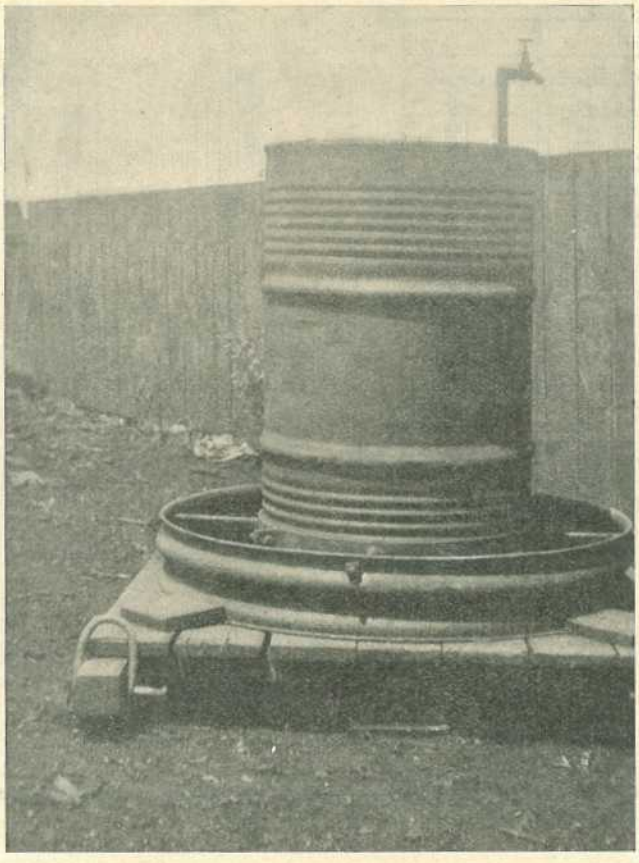


PLATE 125.
Automatic water fountain suitable for pigs in paddocks.

Plate 126 illustrates a type of self-feeder which has given satisfactory results in practice.

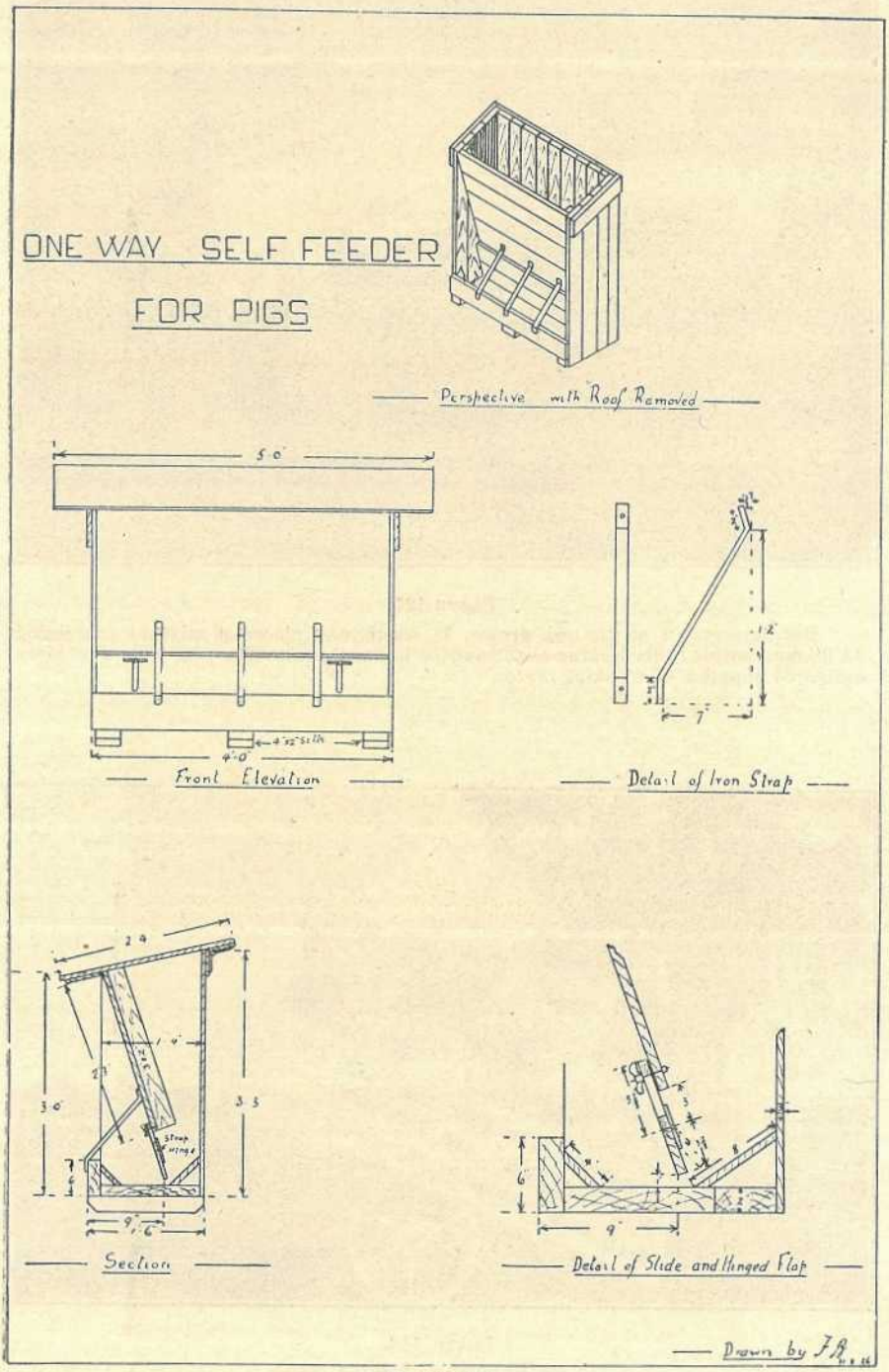


PLATE 126.

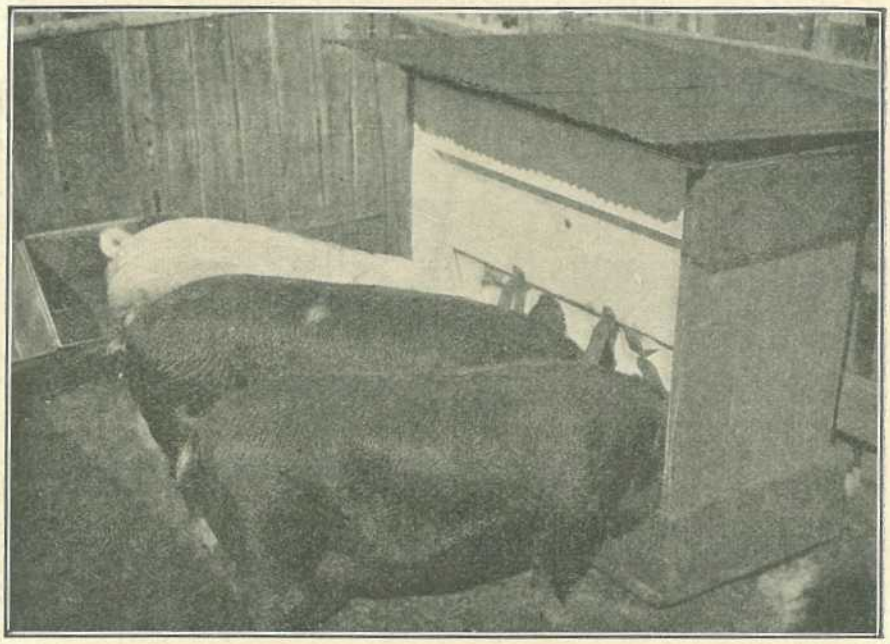


PLATE 127.

Baconers grown on the self-feeder, in which was placed a mixture containing 80 lb. maizemeal, 10 lb. lucerne chaff, and 10 lb. meatmeal. The pigs were also given unlimited supplies of drinking water.

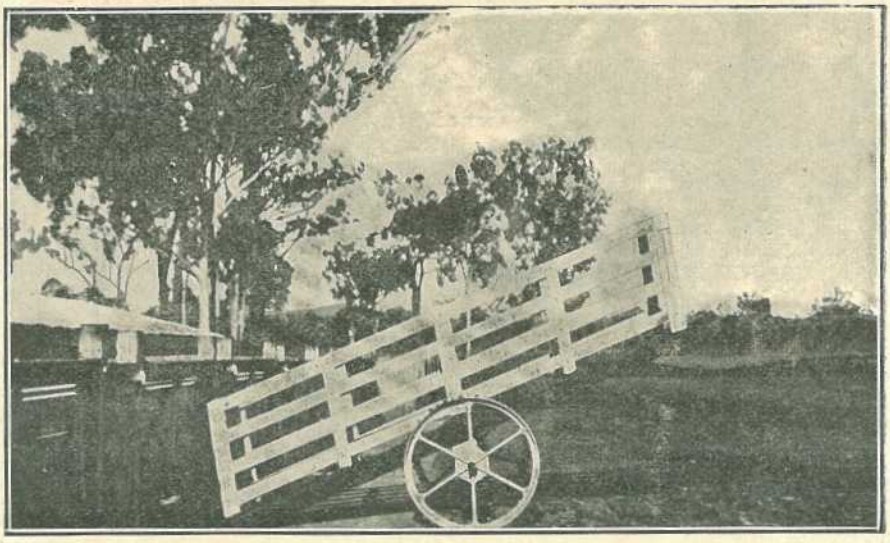


PLATE 128.
A useful portable loading race.

An average space of 10 in. should be allowed for each adult pig. The trough should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made, they should be of a size which allows of their being easily carried or hauled on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete, brick, or timber to prevent the pigs from making an objectionable mud wallow beside the trough. The most serviceable troughs are of concrete, built into a concrete floor, as shown in Plate 123.

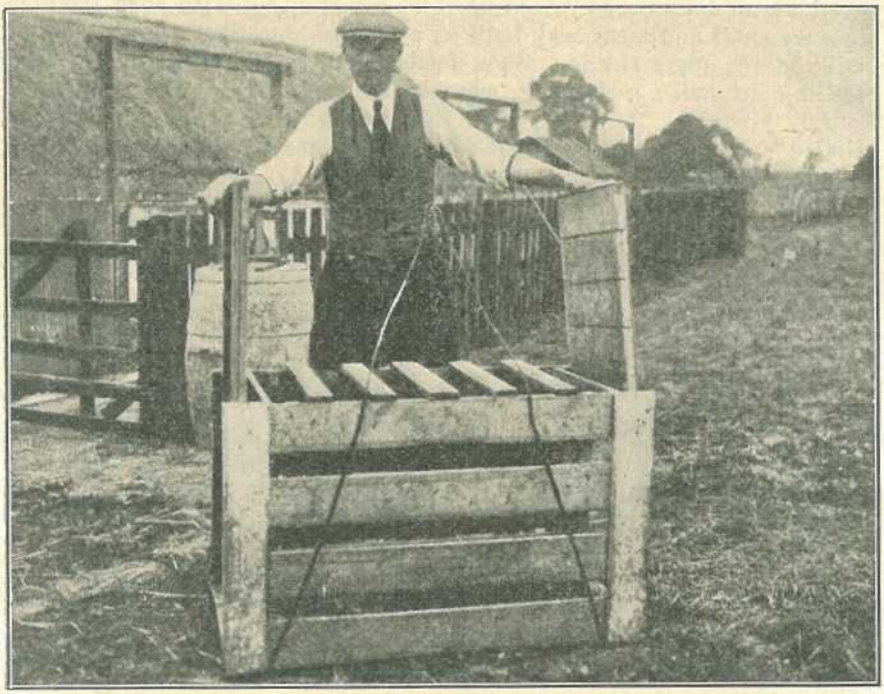


PLATE 129.

A wooden crate suitable for weighing pigs. Note the strong construction, "slide up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Pine should be used in the construction of the crate so that its weight will not be too great.

The V-shaped wooden trough as illustrated in Plate 124 is very useful as a movable trough. This type of trough can be made of varying sizes to suit requirements. The timber must be tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood and also makes it water-tight and more hygienic. Such a trough built on a movable wooden platform is very convenient for paddock use.

Automatic Waterer.

Plate 125 illustrates a watering device suitable for paddock use. A 40-gallon drum is set into a trough 6 inches deep, and the whole is fixed on to a slide. The drum has a ½-inch plug hole 1½ inches from its bottom, and a larger plug hole for filling at its top. The lower hole

allows the water to flow out to a sufficient height to allow of the pigs drinking from the trough; and to fill the drum, the bottom hole is plugged and the top hole opened.

Self-feeding of pigs is as yet little practised in Australia, because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig-raising must be considered from a somewhat different viewpoint.

The grain-grower who keeps pigs but has no milk foods can make good use of his grain by feeding it in combination with such foods as lucerne chaff and meatmeal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry-feeding through a self-feeder, whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves. Under certain conditions, self-feeding has many advantages and is worthy of trial.

ONE-WAY SELF-FEEDERS FOR PIGS—MATERIALS REQUIRED.

Members.	Number.	Length.	Size.	Material.
		Ft. in.		
Skids	Three ..	1 6	4 in. x 2 in.	Hardwood
Trough	One	4 0	6 in. x 2 in.	Pine
Trough	One ..	3 10½	12 in. x 2 in.	Pine
Trough	One ..	3 10½	4 in. x 2 in.	Pine
Trough	One ..	3 10½	8 in. x ¾ in.	Pine
Trough	One ..	3 10½	4 in. x ¾ in.	Pine
Front Panels	Five ..	3 10½	6 in. x ¾ in. T. & G.	Pine
Front Panels	Two ..	2 3	3 in. x 2 in.	Pine
Sliding and hinged flaps	Two ..	3 10½	4 in. x ¾ in.	Pine
Ends and back	Twenty-four	3 3	6 in. x ¾ in. T. & G.	Pine
Ends and back	One ..	7 0	6 in. x ¾ in.	Pine
Top	Ten ..	2 4	6 in. x ¾ in. T. & G.	Pine
Top	Two ..	5 0	6 in. x ¾ in.	Pine

Hardware—Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

Shade.

Pigs should be provided with ample cool shade in hot summer months, either by planting shrubs or hedges or by building a framework of 3-in. by 2-in. hardwood and covering the top with bushes or thatching it with grass.

Weighing Pigs.

As pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per lb. varies according to specified weight limits, it is important to the pig-raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig-trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Plate 130.
Crate in position, ready for use, with front door closed. Note the arrangement of the top beam, lever, and spring balance.

Even after years of practice, guessing the weights of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use, they soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

The weighing crate should be light yet strong; a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide.

If the weighing crate is arranged in a race, the pigs can be brought from their pen, weighed, and then returned to the pen conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig-raisers.

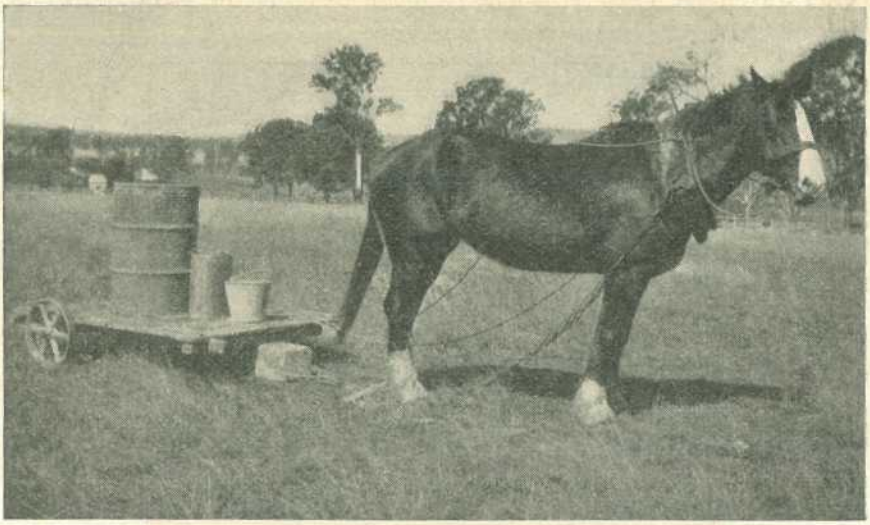


PLATE 131.
A good feeding outfit in use on Mr. R. Turpin's pig farm, Lowood.

MARKETING OF VEGETABLES—ADVANTAGES OF COLD STORAGE.

Cold storage is essential if fruit and vegetables are to be marketed with advantage, pointed out Mr. W. J. Williams, Superintendent of Markets, Sydney, at the recent Illawarra district conference of the Agricultural Bureau of New South Wales. In an address containing information concerning the storage of various primary products, the following facts were given with regard to vegetable crops:—

Potatoes and onions can be placed in cold storage to great advantage. For a long time they have been kept in common storage, where the loss is somewhere in the vicinity of 18 per cent., whereas when these products are kept in a controlled temperature the loss is rarely above 4 per cent. There is an added advantage that in common storage potatoes and onions sprout, whereas in cold storage this does not occur.

That this alone means a great saving in the weight will be readily understood; besides this, the potatoes come out of store fresh and without wrinkles, and it would be very difficult to detect them from fresh vegetables. Care must be taken, however, to see that the temperature is not too low. The right temperature is 35-38 deg. with 80-84 per cent. humidity. If the temperature is too low, then the starch is converted into sugar, and the potatoes become very sweet. Potatoes can be stored for seed purposes with great advantage.

Vegetables, such as lettuce, cauliflowers, celery, peas, and beans can be kept in cold storage for a period of four to six weeks. If, however, it is desired to keep beans and peas for any lengthy period, they should be "quick frozen."

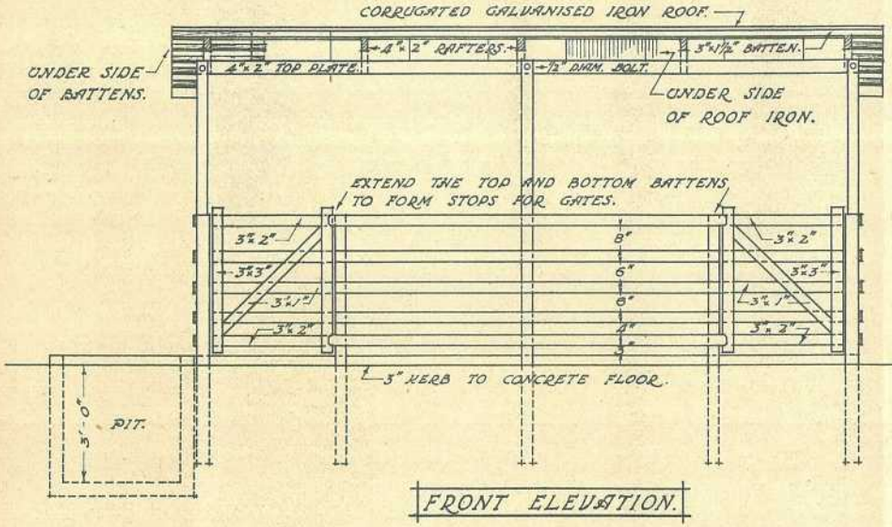
Tomatoes can be stored when ripe for a period of three weeks and green for a period of a month, the best temperature being 45 degrees with 85 per cent. humidity. Tomato pulp can be kept for months if frozen and kept at a temperature of 15 degrees.

All fruit and vegetables should be post-cooled—taken out of the cold storage room and placed in a room at a temperature approaching that of the outside air.

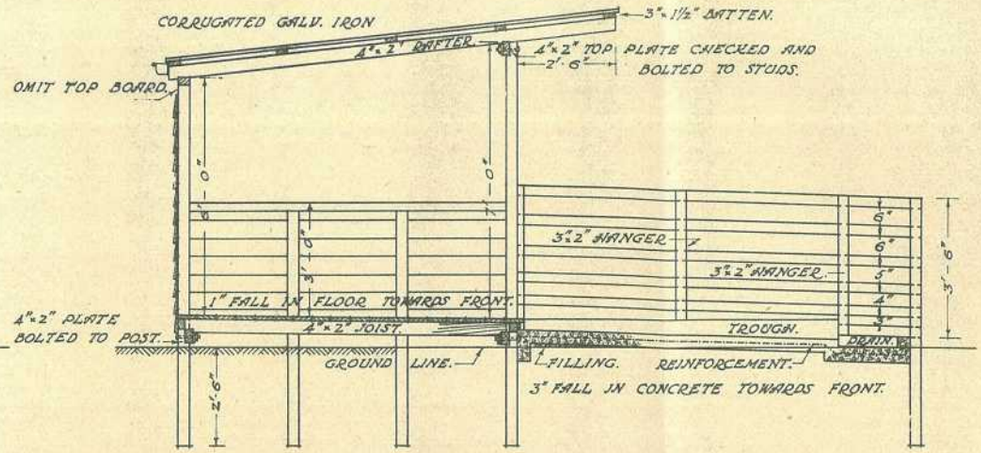
DEPARTMENT OF AGRICULTURE AND STOCK.

QUEENSLAND.

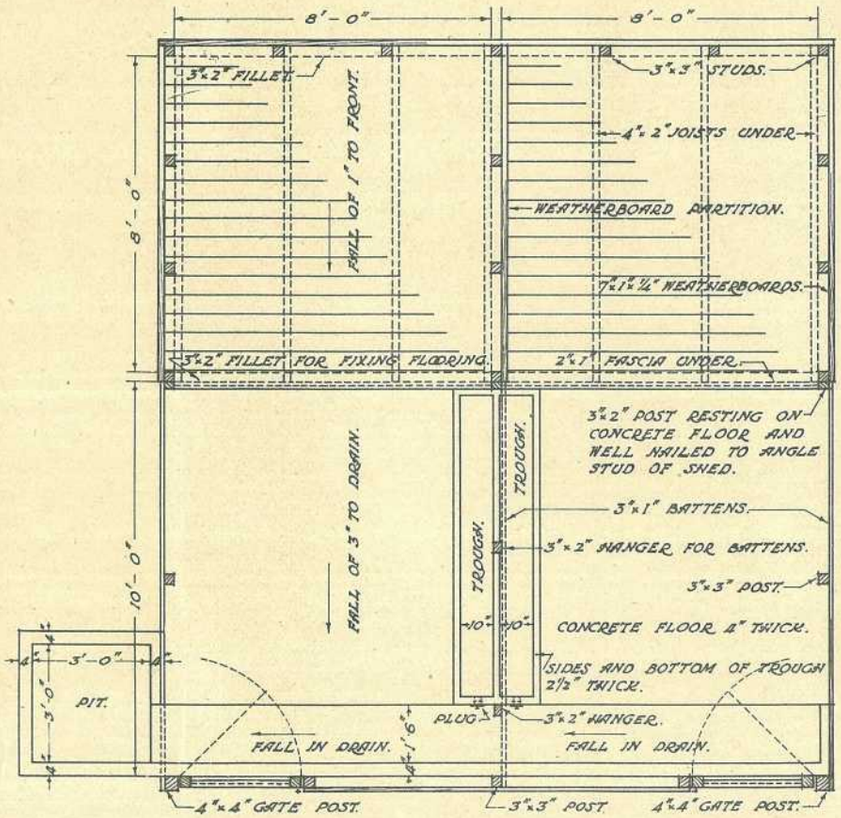
PIG PENS FOR INTENSIVE HOUSING.



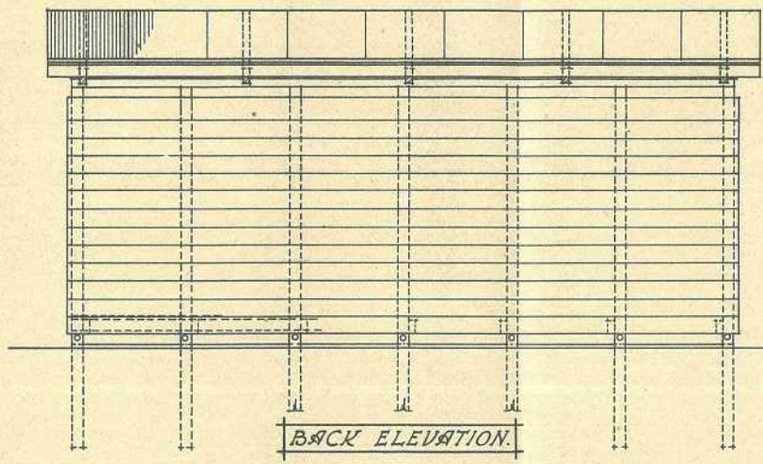
FRONT ELEVATION.



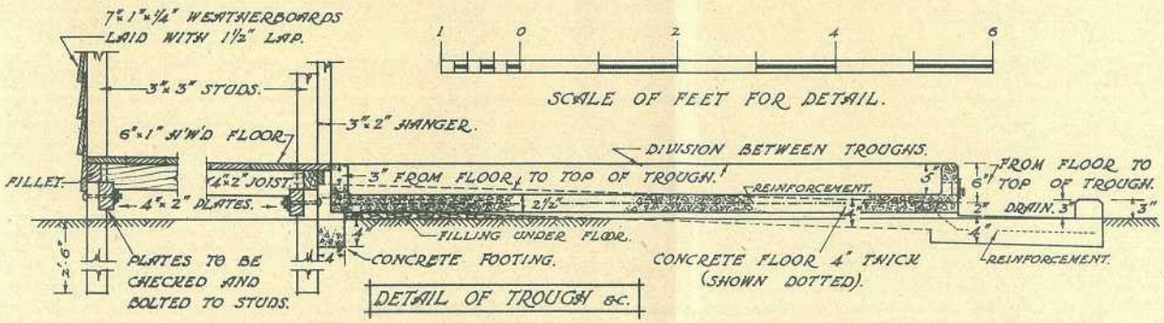
CROSS SECTION.



PLAN.

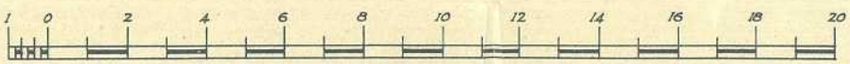


BACK ELEVATION.



DETAIL OF TROUGH &c.

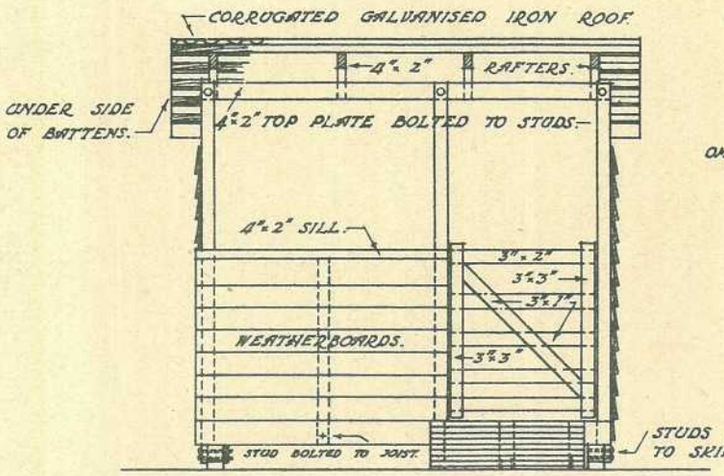
SCALE OF FEET FOR DETAIL.



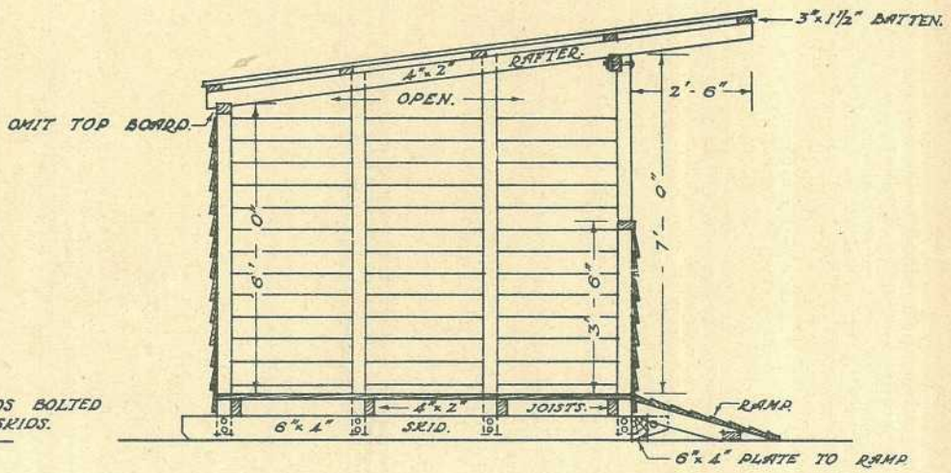
SCALE OF FEET FOR PENS.

DEPARTMENT OF AGRICULTURE AND STOCK.
QUEENSLAND.

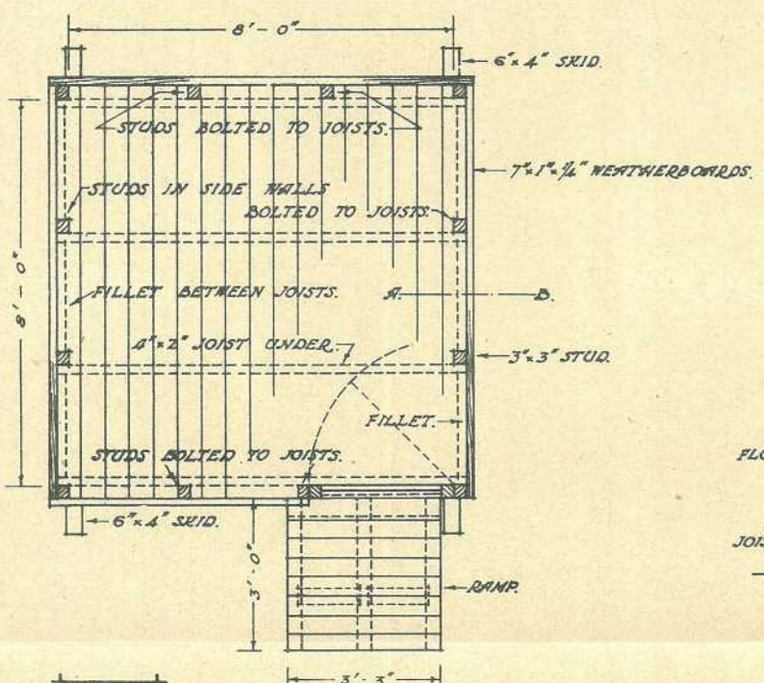
PORTABLE PIG SHED.



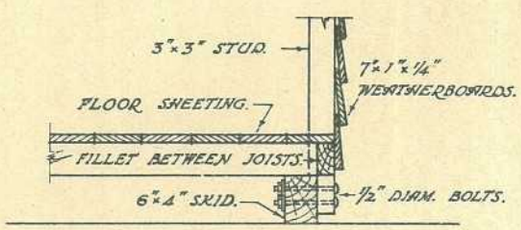
FRONT ELEVATION.



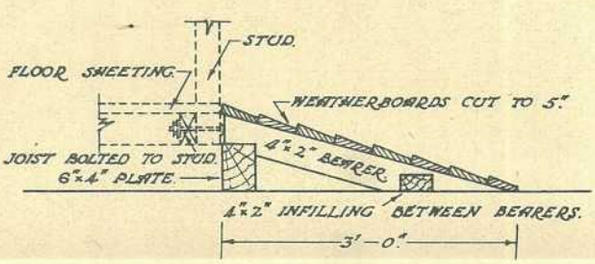
SECTION THROUGH SHED.



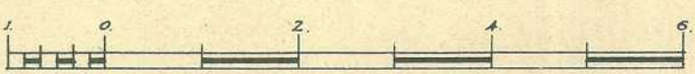
PLAN.



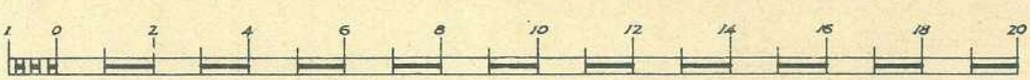
DETAIL SECTION A-B.



DETAIL OF RAMP.



SCALE OF FEET FOR DETAILS.



SCALE OF FEET FOR PENS.

Acid and Water-Proofing Concrete Floors and Troughs.

By T. ABELL, Agricultural Branch.

FARMERS who have laid down concrete feeding floors and troughs in piggeries, and concrete floors in the milking bails, will find that after some time the surfaces become pitted, and eaten away, and when once this condition is evident, the concrete rapidly deteriorates. In the piggery this is due chiefly to the action of the acids contained in the foods, particularly lactic acid of milk. When allowed to remain on ordinary concretes these acids will eat away the cement around the filler, thus causing the surface to become rough, and finally, in the case of poor concretes, to break up.

Research work on this subject has revealed that concrete may be treated in a simple and cheap manner, the result being a surface which is practically impervious to water, resists the action of all but the strongest acids, and at the same time is not slippery, the latter being an important item to be considered when stock have to walk on the treated surface.

The material used to bring about the abovementioned condition in concrete is silicate of soda, commonly known as "water glass," a substance which closely resembles glass, and is soluble in water. It is safe to handle, and its use does not call for any implements other than those customarily used in concrete working.

The action of silicate of soda is as follows:—When mixed with the requisite quantity of water the solution thus obtained is sprinkled over the surface of the concrete. As the concrete is porous, and readily absorbs moisture, the solution penetrates the surface, combines with the concrete, and forms a tough coating, which, after three treatments, will be up to one-quarter of an inch deep.

Quantity to Use.

One gallon of the concentrated silicate of soda should be thoroughly mixed with 4 gallons of water. Five gallons of the solution, prepared as above, will be sufficient for three applications to an area of a little over 300 square feet when treating average concretes. Very dry or porous concretes will require a fourth application of solution.

Method of Use.

For New Concrete.—The concrete floor or trough is made in the usual way. When finishing the surface care should be taken to avoid rendering it over smooth, and consequently slippery. When the concrete is drying, and sufficiently firm to bear the worker's weight, the solution of silicate of soda and water is applied evenly by means of a spray pump, a watering can, with a fine sprinkler, or a soft mop. Do not apply more of the solution than can be absorbed by the concrete. When the concrete has again dried out, a second, and later, a third application should be made as for the first. For average concretes three applications should be sufficient.

Worn Floors and Troughs.—Treatment with silicate of soda is also beneficial for existing floors and troughs which have deteriorated .

The surface should be thoroughly scrubbed with hot water and soap, in order to remove all grease and dirt. Then the whole area is coated over with a mortar made up of one part of cement and three parts of clean, fine sand. When the concrete is firm, and drying out, treat with the silicate of soda solution as for newly laid down concrete.

Surfacing Floors and Troughs in Good Condition.—Old concrete may be treated successfully also, provided the surface is thoroughly prepared as described previously. The method of treatment is the same, but it must be borne in mind that the dry concrete will be more porous than the new, and consequently will require a larger quantity of the silicate of soda solution. Twenty-fours hours after the last application any excess solution should be removed with a mop.

Concrete floors and troughs treated in this manner will give more satisfactory results, as they last longer, are easier to clean, and dry more quickly than the ordinary concrete.

It is advisable to treat the concrete at least once each year to ensure a good water and acid proof floor.

Quartzite silicate of soda may be obtained from James Campbell and Sons, Pty., Ltd., Brisbane.

QUEENSLAND SHOW DATES.

April.

Crow's Nest, 1st and 2nd.
Dalby, 1st and 2nd.
Chinchilla, 7th and 8th.
Tara, 15th and 16th.
Nanango, 16th and 17th.
Miles, 15th.
Kingaroy, 22nd to 24th.
Wallumbilla, 28th and 29th.
Monto, 29th and 30th.
Wondai, 30th April and 1st May.

May.

Goondiwindi, 1st and 2nd.
Longreach, 4th to 7th.
Taroom, 4th to 6th.
Mundubbera, 6th and 7th.
Charleville, 5th to 7th.
Beaudesert Show, 6th and 7th.
Beaudesert Camp Draft, 8th and 9th.
Biloela, 7th, 8th, and 9th.
Wowan, 14th, 15th and 16th (Camp Draft).
Murgon, 7th to 9th.
Goomeri, 13th and 14th.
Mitchell, 13th and 14th.
Ipswich, 19th to 22nd.
Roma, 19th to 21st.
Biggenden, 21st and 22nd.
Gympie, 22nd and 23rd.
Warrill View, 23rd.
Maryborough, 26th to 28th.
Toogoolawah, 29th and 30th.
Kalbar, 30th.

June.

Childers, 1st and 2nd.
Marburg, 6th and 8th.
Bundaberg, 4th to 6th.
Lowood, 5th and 6th.
Boonah, 10th and 11th.
Esk, 12th and 13th.
Rockhampton, 23rd to 27th.
Laidley, 24th and 25th.
Marburg, 27th and 29th.
Mackay, 30th June, 1st and 2nd July.

July.

Bowen, 8th and 9th.
Townsville, 14th to 16th.
Cleveland, 10th and 11th.
Ayr, 10th and 11th.
Rosewood, 10th and 11th.
Nambour, 16th to 18th.
Cairns, 21st to 23rd.
Maleny, 23rd and 24th.
Gatton, 29th and 30th.
Caboolture, 31st July and 1st August.

August.

Pine Rivers, 7th and 8th.
Royal National, 17th to 22nd.
Home Hill, 28th and 29th.

September.

Tully, 11th and 12th.
Innisfail, 18th and 19th.
Southport, 26th.

Mass Production of Pigs.

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

STRANGELY enough, pig-breeding on a mass-production basis has never been attempted in Australia, although there are one or two farms in Queensland on which up to 1,000 head of pigs may be seen at any time, and on which pigs are handled in a big way. It is probable that seasonal conditions are too variable in Australia to permit of keeping pigs on ranches or stations on lines similar to those adopted with sheep. In the Argentine, there are several very extensive hog ranches, one in particular with 1,200 breeding sows, all kept on what Departmental Instructors here term the paddock system, that is, open range country. They are fed early in the morning and late in the evening, spending the balance of the day grazing over lucerne pastures, and in season are turned into the corn crops to hog down the corn, the objective being to "walk the crops to market on the hoof."

Plate 132.
A Pig Paddock Muster in Argentina.

Other crops are grown where possible—notably millets—for green food, sweet potatoes, and artichokes (and sometimes peanuts for use with very young pigs) as root crops, with lucerne as the principal fodder fed in its green form as well as in chaff and hay. Probably the largest pig farm along these lines in Queensland is that owned until recently by Mr. C. B. Peter Bell, of Maroon Homestead, in the Fassifern Valley district, and which has now been taken over by Mr. Appleby, of Brisbane.

It is Mr. Appleby's intention to develop the Maroon property as a specialised pig-raising proposition, a hog ranch, even if on a small scale compared with the Argentine ventures. The principal crops in this instance will be corn and lucerne with as many other fodders and root crops as can be grown and utilised on the property.

EVERY agricultural district in the State benefited greatly from the widespread March rains. The late maturing maize and winter forage crops are now assured. In the dairying districts there should be plenty of grass and water right through the winter.

Wheat.

The bulk of the 1935-36 wheat crops has now been delivered to the State Wheat Board, Toowoomba. It is now estimated that the crop will approximate 2,600,000 bushels. Although the yield is lighter, the quality of grain is stated to be outstanding; in fact, it is considered to be the finest since the inception of the Board.

Although the rainfall was much lighter in the wheat areas, sufficient has been received to enable many farmers to proceed with fallowing. More and heavier rains will be required before the planting season commences.

Tobacco.

In the North the tobacco crop was damaged by excessive rains, which in the Mackay district seriously retarded planting operations. Many of the crops in other areas are suffering from continuous wet weather and are making poor headway. If the weather improves soon and good growing conditions are experienced, the yield may yet be in the vicinity of last year's.

Harvesting has been delayed in the southern areas, but curing operations in these districts should be completed early in April.

The first sales of the season took place on the 26th March, and although the bulk of the offerings were carryover leaf, the prices received may be regarded as satisfactory. New season's leaf comprised some good quality offerings from Miriam Vale and Bowen, and the top price of 48d. was given for three lots. A number of consignments averaged from 2s. 9d. to 3s. per lb.

Cotton.

Early March showed cotton crops rather seriously checked owing to moisture shortage and high temperatures in the latter half of February. Severe shedding occurred, and a heavy proportion of premature opening was caused.

Good rain in early March has induced renewed growth, and if frosts are not too early there is a reasonable chance of a good late crop.

Picking is now general in all districts, and receivals of seed cotton are becoming heavy at both Whinstanes and Glenmore ginneries.

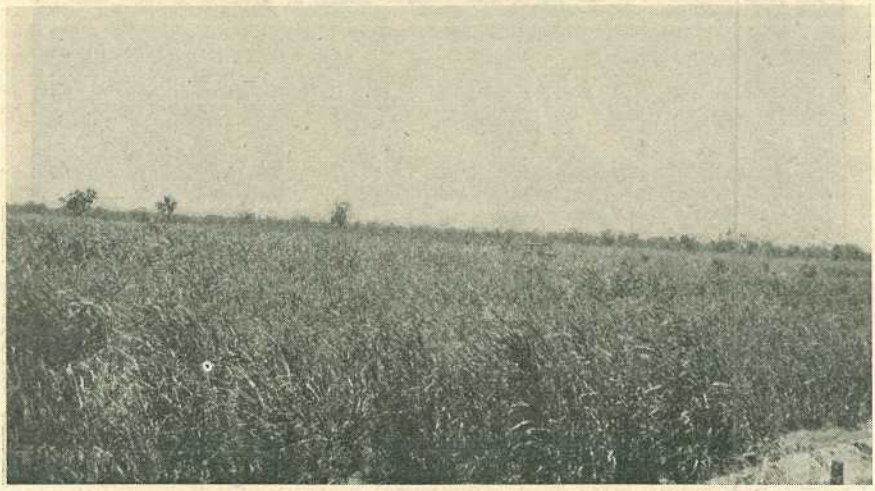


Plate 133.
A field of Sudan grass, Coreena Station.

Sugar.

The breaking of the dry spell in the southern cane areas was delayed until mid-March, and as a consequence much of the valuable growing season was lost. In all other areas extensive and beneficial rains were experienced, and at the present time it would appear that the coming crop will be heavier than the 1935 harvest.

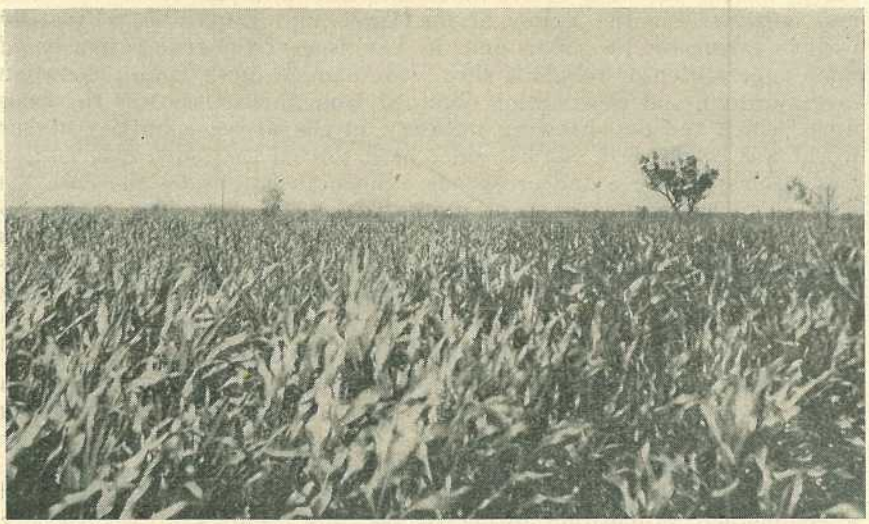


Plate 134.
Sorghum irrigated by bore water, about two months' growth. Coreena Station, Barcaldine District. The bore water on Coreena is almost free from mineral matter; it is soft and very suitable for irrigation.

By H. J. FREEMAN, Senior Instructor in Fruit Culture.*

CONDITIONS in the hot, mid-western districts of Queensland are found to resemble those of other countries throughout the world at present producing dates on a commercial footing, and it is with a view to assisting in establishing the date industry in this State that the following remarks are offered.

History.

In order to comprehend fully the various phases of date-growing in their entirety, it seems advisable that an outline of the history of the date should be related. The native habitat of the date palm is not known with certainty, but its existence in Egypt, Arabia, and Mesopotamia can be traced from the dawn of history. It has been grown in Egypt for the past four or five thousand years, although it was probably first cultivated in the Valley of the Tigris and Euphrates. Practices used in caring for the palms and the handling of the fruit, often based upon superstition or religious rites, were handed down from generation to generation, and information obtained from this source was the basis upon which the date-growing industry in the newer countries of the world was established. It has since been proved that such information was often incomplete and erroneous. Since ancient times the date has been the most important food plant in the desert regions of South-Western Asia and Northern Egypt. In more recent years it has been commercialised to such an extent that its fruit is now known in practically every country of the world. Australia alone imports 8,724,999 lb. weight of this fruit per annum.

Possibilities of the Date in Australia.

The first and only dates worth mentioning to be planted in Queensland were in the Rockhampton and Barcaldine districts. These were of no special variety, and, in the main, were seedlings that were merely the result of chance growth from the discarded seeds of some imported date. The palms planted in coastal regions could never be considered a commercial proposition owing to the unsuitability of the climate, whilst those planted in the Barcaldine district have provided definite

* The writer wishes to acknowledge his indebtedness to Dr. D. W. Albert and Dr. R. H. Hilgeman, of U.S.A., for much of the material used in the compilation of this paper.

proof that dates will grow successfully in that region and will, under normal conditions, return from 200 to 400 lb. of fruit per palm, an excellent return for this fruit. It is to be regretted that the Barcaldine dates are so nondescript that the annual sales from the few palms growing there have not been sufficiently large nor has the quality of the fruit been high enough to create a steady demand, or, what in my opinion is more important, to create any inducement for larger areas to be established.

PLATE 135.
Young date palms on the Date Experiment Plot, Barcaldine.

However, one can safely say that from Barcaldine east to Alpha and south to Blackall would be country of a suitable type, as also would be many thousands of acres of western country possessing similar characteristics to the districts named. These necessary characteristics are—(1) a long, hot growing season, (2) moderate winter temperature, (3) little rainfall and low atmospheric humidity during the late summer and early autumn, (4) abundance of water available for irrigation purposes, and the districts above mentioned could, with the aid of irrigation supplied from artesian sources, fulfil such requirements.

It will thus be seen that if commercial areas could be established, only growing varieties of value on the market, success would not be very difficult to achieve. As a subsidiary to the production of wool the growing of dates would be unsurpassed, and the acreage required for a profitable output would not be so great as to necessitate any large increase in the staff needed for the working of these properties at

PLATE 136.
Water supply for irrigation at the 4-Mile, Alice River, Barcaldine. Date experiment plantation adjoins.

present. It must be realised that a ready market for a suitable date at a price of about 4d. per lb. exists throughout the whole of this continent, and the annual consumption would be about 9,000,000 lb. of dates. There is little doubt that if the fruit were produced locally importations would diminish, and the consumption would in all probability be increased with the sale of fresh local dates.

Plate 137.
Date palms at Barcaldine. A yellow variety showing a good crop.

Botany.

The date palm belongs to the rather large family Palmacæ, genus Phoenix, species dactylifera. It is a typical monocotyledonous plant (having only one seed-lobe), producing a single stem with a single growth bud located inside and near the top of the trunk. It may readily be distinguished from the Canary Island palm (*Phoenix canariensis*), grown in Queensland for ornamental purposes, by the presence of offshoots, a more slender trunk, and by the leaves which are glaucous or bloom-bearing instead of bright green. The date palm is dicœcious, pistillate, and staminate flowers being produced on separate palms. Both the male and female inflorescences are enclosed in a sheath-like case called a spathe, which splits as the flowers reach maturity, allowing the branched inflorescence with its white waxy flowers to emerge.

Pistillate flowers have very little colour or odour to attract insects. They are composed of three scale-like sepals and three petals folded around three carpels, giving the appearance of a newly formed fruit. If the flower is fertilized, only one carpel develops, but if not fertilized, one or all may develop into seedless fruits which do not ripen normally.

The staminate flowers consist of three small scale-like sepals, three larger petals and six stamens. When the spathe bursts the flowers have the appearance of being crowded on the strands. Soon afterwards, they

open and pollen sacs are ruptured releasing the very fine yellowish pollen grains. The pollen has a sweet, musty odour, very attractive to bees.

The feather-like leaves are equally distributed around the main axis in a definite arrangement of thirteen to a whorl. The new leaves develop from the terminal bud, emerging in groups of three. These leaves, referred to as spike leaves, begin to expand when they are 4 to 8 feet in length; attached to the base of each new leaf is a white fibre sheath encircling the growing centre. As the leaf develops, the sheath becomes stretched, torn, and broken by the pressure from the more rapidly growing leaves nearer the central bud. The leaves live for an indefinite period, three to seven years, and young palms retain their leaves in good condition longer than older palms.

PLATE 138.
Date palms with citrus trees interplanted at Barcaldine. The palms are forty years old and are carrying an estimated crop of 400 lb.

Behind each leaf is a single bud which may develop into an offshoot, a fruiting centre, or may die. In a young palm, these buds usually develop into offshoots, but after the palm is five to six years old, they usually form fruiting buds. Bud differentiation probably occurs during March for the following season's crop, and active development of the spathe (inflorescence sheath) begins soon after. The spathes develop slowly in the autumn and early winter. During the late winter and early spring, growth is greatly accelerated and blossoming occurs from August to November, according to the age, variety, and climatic conditions.

The date palm is highly hybridised, therefore no seed is produced which will develop into a plant true to the parent. This has resulted in many varieties exhibiting widely differing characteristics. Many varieties may be identified by their vegetative characteristics alone. Rate of growth is markedly different, varying to such a degree that one variety may grow three times as rapidly as another. The trunks range from slender to stout. The leaves, which are the best index to variety identification, have wide variations; gradations in the midrib range from weak, light, and arched to strong, heavy, and stiff. The area of

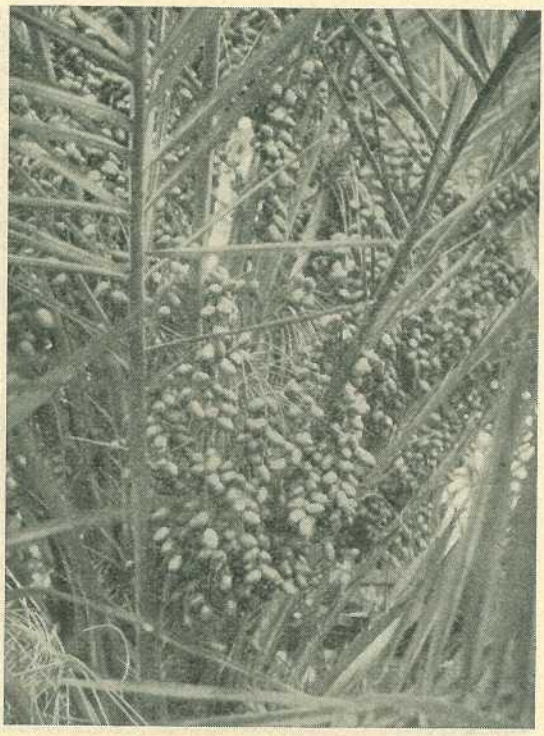


Plate 139.
Date palm, four years old, showing a crop of approximately 200 lb.

the rachis covered by the spines and the angles of the spines and pinnæ present a definite arrangement. Spines may be short or long, thick, or slender, and arranged either singly, in groups of two or three, or in all combinations of the above factors. The pinnæ vary chiefly with respect to colour, angle of attachment, length and diameter. Fruit clusters differ with respect to the total number, length, and arrangement of the strands, and the spacing of fruit on these strands.

The root system of the date palm is fibrous, resembling that of the maize plant. Primary roots radiate from the base of the palm outward and downward at an angle of 25 to 30 degrees. Secondary or feeder roots branch from the primary roots and have a tendency to grow upward. They greatly increase the feeding area of the root system, since the date root does not have root hairs and must obtain water and plant food by direct absorption largely from or near the root tip.

Requirements for Date-growing Areas.

Date culture has succeeded only in the hot, dry, desert regions of the world. The essential factors for commercial date production may be summed up briefly as follows:—(1) A long, hot-growing season; (2) moderate winter temperatures; (3) little rainfall and low atmospheric humidity during the late summer and autumn. As the date requires a large amount of water, planting should be confined to those localities having a cheap and adequate supply of water for irrigation.

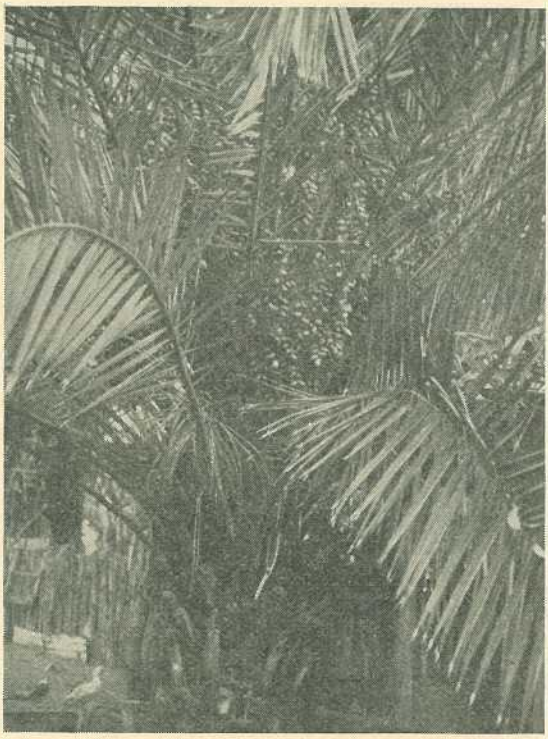


PLATE 140.

Date palm at Barcaldine. Fair type, dark red, four years. Estimated crop 200 lb.

The date palm makes its most rapid growth during the period of high minimum temperatures which occurs during the summer months. It is also found that growth is continuous throughout the year at a rate closely correlated with the mean temperature. Palms growing in the coastal areas where the temperatures are very equable, make luxuriant vegetative growth but do not produce commercial crops.

It has been definitely demonstrated that the date palm requires a climate with excessively hot, dry summers for commercial production. All varieties of dates, however, do not require the same amount of heat units to mature their fruit. It has also been shown that winter temperatures have a direct influence on spathe growth and the subsequent time of blossoming. The temperatures which occur after blossoming apparently have more effect on the time of ripening than does the date of blossoming.

The response of the date palm to temperature conditions may be used in selecting varieties for different localities. Varieties planted in areas which have a relatively mild temperature should be limited to those requiring the lesser heat to mature their fruit. Dates may be grown in such areas provided the winter temperatures are not so low as to cause belated blossoming or undue injury to the foliage. Fortunately, the date palm can endure severe extremes in temperature. There is no record of the date palm being injured by high temperatures, and records show that mature palms have survived temperatures as low as 4 deg. Fahr. There is, however, a noticeable difference in hardiness between the different varieties.

Plate 141.
Date palms at Barcaldine carrying a heavy crop of fruit after recent burning of all foliage.

After temperature requirements have been satisfied, the next most important factor is the relative absence of rainfall and high atmostpheric humidity during the period the dates are ripening. Rain at this time causes serious damage, and high relative air humidity adds to the actual rain damage by creating conditions favourable for bacteria and fungi to attack the ripening fruits. Instances have been observed where rain has also caused damage to immature fruit. However, not only the amount of rain, but the relative humidity and condition of the fruit influence losses. For example, a heavy shower followed by an extended period of cloudy weather and high atmospheric humidity may cause a heavy loss. Furthermore, seasonal temperature variations may so influence the time of ripening that rain occurring during a certain month

may do serious damage in one year but not in another. Thus, the average amount of rainfall serves only as an indicator of the possible damage during that period.

The date palm is not exacting as to the type of soil in which it grows. Climatic conditions are more important than soil texture in selecting the site for a grove. Date palms, like other fruit-bearing trees, grow and produce more abundantly in a good soil than they do if planted in the poorer soil types. Inasmuch as the date palm is deep rooted, a soil at least 6 feet deep is desirable; however, many successful plantings are found on comparatively shallow soils. Soil fertility and proper moisture conditions are more easily maintained in deep soils.

PLATE 142.

Date palm at Barcaldine, 3 years old. Yellow variety. Dates small and light weight.

Observations would indicate that palms planted in light soils mature their fruit earlier and more uniformly than in the heavy soils. Light soils dry out more quickly on the surface after irrigation or heavy rain which is advantageous during the ripening season. Heavy clay-type soils dry out very slowly and thus tend to prolong the period of high atmospheric humidity.

Propagation.

Date palms can be propagated either from seed or from offshoots. New varieties are obtained from seed, but after a variety is once established it can only be increased by means of offshoots. The present "standard" varieties grown commercially throughout the world

originated from seed and, because of their outstanding characteristics, have been propagated in large numbers by means of offshoots.

A large number of seeds of any given variety will produce, theoretically, an equal number of male and female palms. These palms so produced may be unlike the mother palm and unlike each other in

Plate 143.
Mounding soil about the base of the palm will permit root development on those offshoots which originate just above the ground line.

character of growth. The fruit from the female palms will differ in size, shape, colour, and quality. Unfortunately, the chance of obtaining a variety having superior characteristics from seed is very remote. The disadvantage of seedling dates is the inability of the grower to standardise his product and the high cost of handling the many different types and grades in the packing house. The latter objection also applies to the grower who plants a few palms of each of the standard varieties.

Offshoots are produced from auxiliary buds at or near the base of the palm. As they are a vegetative part of the parent palm, offshoots are identical in sex and in vegetative and fruiting characteristics with the parent. Varieties differ as to the number of offshoots produced, but from ten to twenty-five covers the increase in most cases.

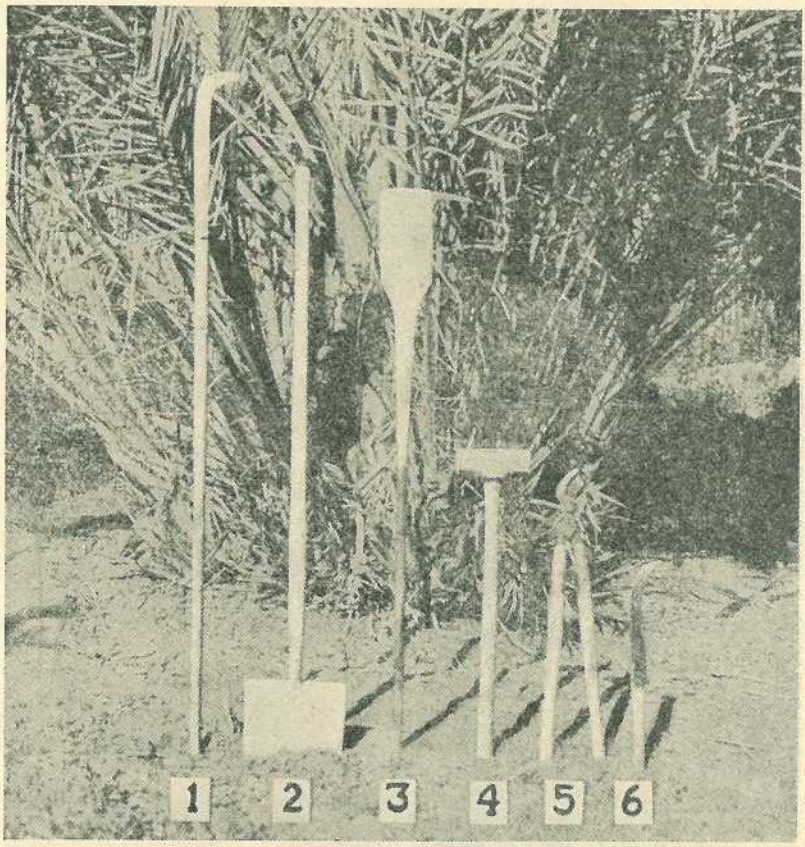


PLATE 144.

Tools used in cutting offshoots. From left to right: Pruning hook for removing leaves, shovel, chisel for severing connection of offshoots to parent palm, sledge hammer, lopping shears for pruning leaves, and knife for removing spines. Each offshoot should have an abundance of soil around its roots.

Young palms producing a large number of offshoots are retarded in growth and in fruit production. Offshoots that have been allowed to remain attached to the parent palm until quite large produce a smaller number of offshoots than those which have been removed at an earlier stage. It is therefore desirable to remove an offshoot as soon as it is sufficiently mature to ensure growth response when planted.

The maturity of an offshoot is indicated by its root development, blossoming, offshoot development, and by a stretched condition of the fibre about the trunk of the offshoot. The age and size which an offshoot must attain before removal will depend on the variety and vigour of the parent. Palms which have been forced into a very rapid growth through irrigation and fertilization will develop large but succulent

offshoots which are very difficult to propagate. Some varieties produce very hardy offshoots which can be successfully propagated when young, whilst others are very delicate and give trouble even though the offshoots are older and larger. As a rule, larger offshoots are more likely to grow than are smaller ones, especially if they have developed a good root system. The present tendency is to remove an offshoot when it is 8 or 10 inches in diameter, weighs as least 30 lb., and shows the other indications of maturity.

Plate 145.
Removing offshoots from the parent palm for transplanting.

Offshoots which have a well-developed root system respond more quickly after planting than do unrooted ones. Root formation can be encouraged on those offshoots which develop at or just above the ground line by moulding soil about their bases. In case the offshoots are at such a height as to make mounding impracticable, a box can be built around the base of the offshoot. This box is filled with a mixture made of equal parts of sand, soil, and well-rotted stable manure. The soil in this box must be kept moist throughout the rooting period. Eight to ten months is required for mounded or boxed offshoots to develop a sufficient number of roots to warrant removal. Rooting offshoots by boxing is expensive and is justified with only the more valuable varieties. The high offshoots of less valuable varieties are removed and planted in a nursery where special care can be given them and where rooting may be accomplished with less expense. Offshoots planted in a nursery, regardless of their condition, should not be transplanted for at least one year, and in many instances two years.

Time of Year to Plant Offshoots.

Early spring is the recognised time to plant offshoots, and commercial field practices in America and other date-producing countries have substantiated this fact. Offshoots planted during this period have full time to become established before growth is retarded by the cold weather in the winter.

Pruning Offshoots.

Many growers are tempted, due to the inconvenience of working around young palms, to remove the outer leaves of offshoots. This practice is not recommended since the amount of growth an offshoot makes, other conditions being equal, will be in proportion to its leaf area. As size is an important factor in propagation, no green leaves should be removed from an offshoot until it is to be removed for planting.

PLATE 146.
After the offshoot is detached some of the outer leaves are removed and the remaining ones are tied tightly together and topped.

The principle that pruning retards growth is sometimes used to advantage on offshoots that have made too rapid and succulent growth. By removing part of the foliage from such offshoots six or eight months in advance of their removal, growth will be checked and the tissues of the offshoot will harden, thus lessening the danger of fermentation occurring in the heart tissue after planting. Pruning is also used on varieties that produce a large number of offshoots to stimulate growth in a few offshoots at the expense of others. In such cases, the leaves on part of the offshoots are pruned back close to the crown which retards their growth. The surplus food thus made available stimulates growth on the unpruned offshoots and on the parent palm.

Removing Offshoots.

Offshoots are attached to the parent palm by a comparatively small stalk-like connection. The length and diameter of this connection differ with each variety. To remove the offshoot, this connection must be severed and, as this is the most exacting part of propagation, only persons who are familiar with the principles involved should undertake the operation.

A special date chisel is used to sever this connection. It has a rectangular cutting blade—9 inches by 4½ inches by 1 inch—with one

side flat and the reverse bevelled towards the sides and toward the end in such a manner as to form three sharp cutting edges. It is made of tool steel and tempered so that a good file will only polish it. This blade is welded to a 48-inch iron handle, 1¼ inch in diameter. The weld should be well reinforced to withstand heavy stress applied to the handle.

Other tools necessary for removing offshoots are an 8 or 10 lb. sledge hammer, from which the temper has been partially withdrawn to prevent battering the chisel handle; a long-handled post-hole shovel; a long-handled pruning hook for removing leaves; a pair of large pruning shears for trimming the top leaves and leaf bases; and heavy twine or light wire to draw the remaining leaves of the plant together.

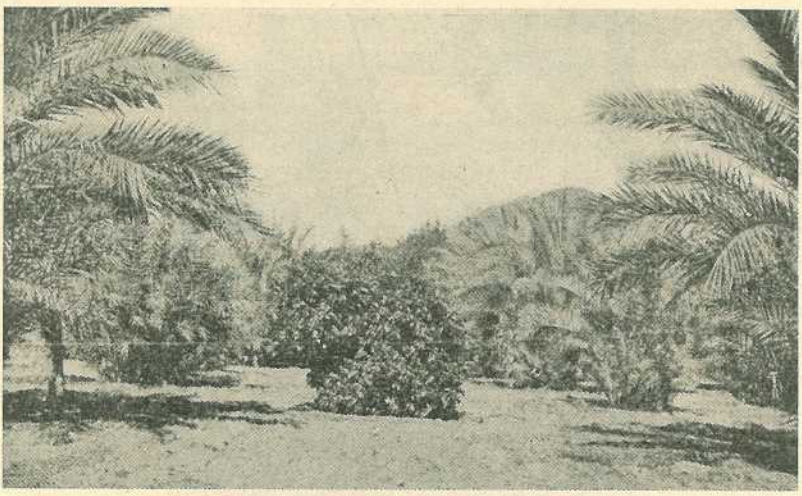


Plate 147.

The partial shade provided by date palms should supply an excellent environment for interplanted citrus.

It is advisable to irrigate the date grove several days before the offshoots are to be removed so that the soil will be moist and easy to work. Each plant should have abundance of soil packed (balled) around its roots. Moist soil can be balled easily as it adheres well to the roots. To facilitate working around the offshoots, all of the lower leaves are pruned off and the remaining ones tied tightly together. The offshoot is then balled, leaving 4 to 6 inches of undisturbed soil about the root area. At this time the connection between the offshoot and the parent palm is exposed and definitely located.

In removing an offshoot, the flat side of the chisel should face the offshoot. The connection is cut from the side, the chisel being set at an angle perpendicular with the plane of the offshoot and the parent palm. This angle is such that the chisel will cut the connection as closely to the parent palm as possible without damaging the permanent tissue. The chisel is driven carefully and, after several blows from the sledge hammer, the handle should be manipulated up and down to avoid wedging of the cutting blade. As the cutting blade is often entirely hidden, progress of the chisel as it is being driven can be estimated by watching the movement of the offshoot. If the chisel is set below the centre of the connection, the top of the offshoot will move toward the

palm; if above, the movement will be away from the palm. To release the chisel after a cut has been completed, the handle is manipulated up and down, parallel to the cutting blade while a steady pull is exerted on it. The cutting blade is so bevelled that, if not driven too deeply, it will cut its way out. In no case should the chisel be used as a pry until the offshoot connection is severed. The first cut is made at the side and just below the centre of the connection, followed by a second and, perhaps, a third cut above the first; if the offshoot has not been freed by these cuts, similar ones are made on the opposite side. Where the offshoot is well rooted it will be necessary to drive the chisel beneath the ball of earth to sever downward growing roots.

PLATE 148.

The offshoot is planted in the centre of a shallow basin so that soil may be filled in against its developing offshoots when necessary to insure root development. The planting depth is at the greatest bulb diameter, and the stubbed leaves are protected with a hessian wrap.

Care must be used that no unnecessary strain or stress is placed upon the offshoot during the cutting operation or in subsequent handling, as the inner tissue near the terminal bud is very succulent and breaks easily. Also, it is important that the offshoot be cut without damaging either the offshoot or the parent palm. The entire operation requires skill, patience, and good judgment, acquired only with experience.

After the offshoot is removed from the palm, all the leaf stubs are pruned back close to the fibre, and all but ten or twelve mature leaves are removed. The remaining leaves are then tied tightly together with heavy twine or wire and cut back even with or slightly below the end of the first spike leaf. The foliage is cut evenly across the top in order to more readily observe subsequent growth.

If the offshoot is to be moved a considerable distance, or if planting is delayed, the balled roots should be covered with hessian and kept

moist by sprinkling with water. Offshoots that are to be shipped considerable distances may be protected in transit by covering the ball with wet sphagnum moss or other material of good water-holding capacity, held in place with a hessian covering.

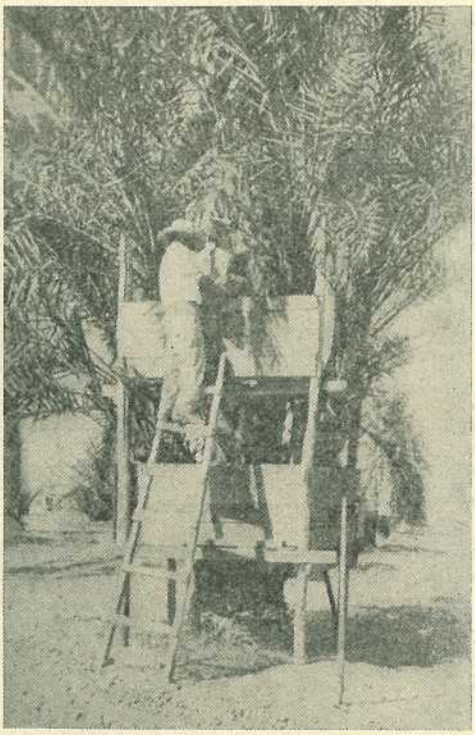


Plate 149.
Root development can be induced on offshoots located high on the mother palm by means of boxing.

Care in handling offshoots cannot be over emphasised. To drop an offshoot or give it a sudden jar may injure the heart tissue, or dislodge the soil about the roots. An offshoot should never be handled by its inner leaves as the leaf bases are very tender and may be broken, thereby exposing or injuring the heart tissue.

Planting Distance.

The planting distance for palms should be governed by the type of soil, the variety, and climatic conditions. Experimental data and general observations in America have shown that plantings of mixed varieties are most successful where they are planted at least 30 feet apart by the square system. This gives approximately forty-eight palms per acre. This spacing allows free circulation of air throughout the date grove, which is an advantage during the periods of frequent rains. Free air current carries off the excess moisture from the fruit and lowers the atmospheric humidity.

I have been advised that, in the Old World, palms are frequently interplanted with many other types of fruit trees, such as citrus, fig,

pomegranate, apricot, and with grapes and vegetables, and this practice is adopted in America. It is possible in the future that interplanting will become an important feature within most date groves. Interplanting with citrus has been adopted by growers at present in Arizona with success, and there are instances where the shade supplied by the tall palms has allowed a variety of tropical and subtropical fruits to be grown which previously were not considered adapted to exposed conditions.

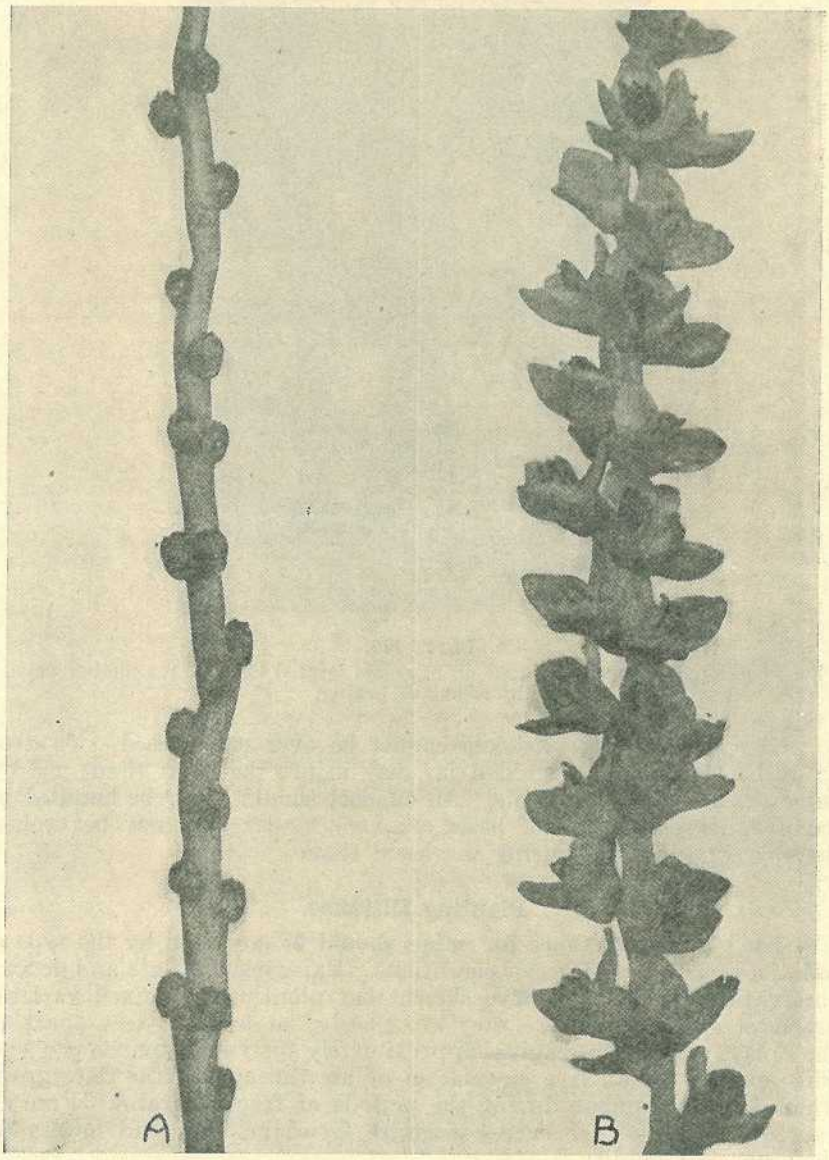


PLATE 150.

A. Female flowers resemble newly developing fruits. A single strand from the female flower cluster is illustrated. B. The male flowers are larger, more open, and more nearly resemble common flowers.

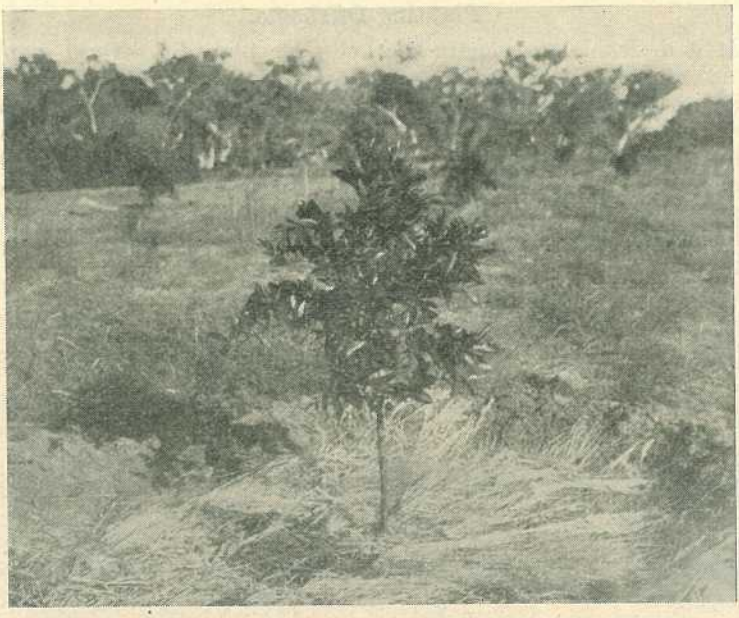


PLATE 151.

Citrus fruits are suitable to interplant with dates. A Valencia orange tree, six months old, on Mr. E. Baker's farm, on Alice River, 8 miles from Barcaldine.

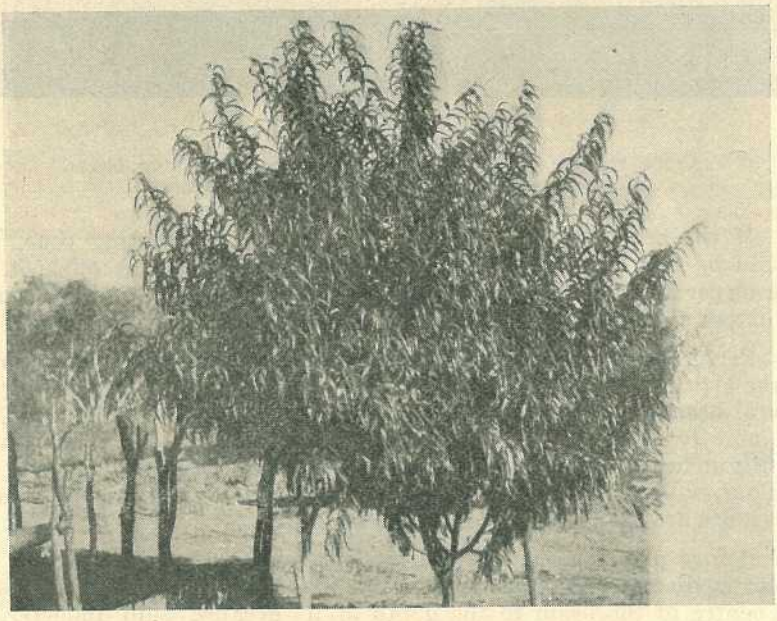


PLATE 152.

Peaches are also suitable as a subsidiary crop to date-growing. A six-months-old tree on Mr. E. Baker's farm, near Barcaldine.

Planting Offshoots.

It is desirable to prepare the holes for planting several months in advance. They should be 3 feet in diameter and 3 feet in depth and filled with a mixture of equal parts of farmyard manure and good top soil. The prepared holes should be irrigated every three or four weeks so that the organic material will be somewhat decomposed and the soil settled before planting time. The composted soil will supply free drainage and an ideal medium for the newly established root system of the young palms. The cost of preparing the holes will be more than offset by the increased growth made during the first few years.

PLATE 153.

Crops suitable for interplanting with dates. "Long beans" growing on Mr. E. Baker's farm, near Barcaldine.

If the holes are not prepared in advance of planting time, they should be dug only of sufficient size to accommodate the offshoot. If dug larger and refilled, the soil will settle and lower the offshoot to such an extent that irrigation water may cause injury or death.

Perfect alignment of offshoots at the time of planting will add much to the attractiveness of the grove. Nearly all fruit-bearing trees develop lateral branches which serve to minimise small errors in alignment, but the mature date palm has a barren trunk and small irregularities are readily detected. To facilitate correct planting, the field is squared and laid out, with a stake driven in at each place an offshoot is to be planted. The holes are then dug around these stakes.

Before planting the offshoot, a depression 4 to 8 inches deep and 6 feet in diameter is made around the hole. The offshoot is planted in the centre of the basin to the depth of its greatest bulb diameter, yet never at a depth to permit irrigation water to come up into the loose fibre near the crown. Loose moist top soil is pressed firmly about the base of the offshoot until the hole is half filled, at which time a small stream

of water is directed into the basin, and the soil worked in carefully to exclude all air pockets. A mulch of dried grass, hay, or manure is then placed in the basin to keep the surface soil from drying out and shrinking away from the sides of the offshoot. New roots will not develop unless moist soil is kept in direct contact with the base of the offshoot. Several inspections during the first few weeks after planting should be made to make certain that this condition is maintained.

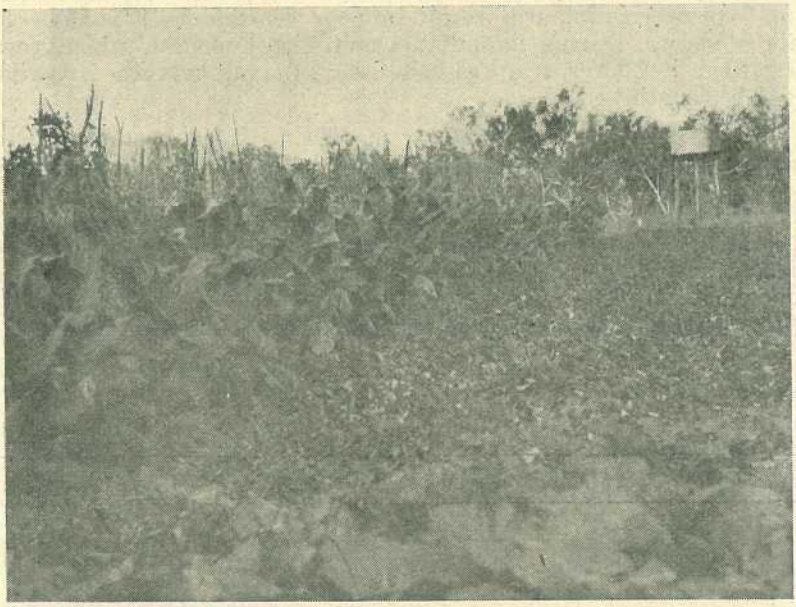


Plate 154.

Other crops suitable for growing in conjunction with dates in Queensland. "Long beans," tobacco, and sweet potatoes, Mr. E. Baker's farm, near Barcaldine.

Care of Offshoots after Planting.

After the offshoots have been planted, the foliage should be protected from the direct rays of the sun. Shading prevents sunburning of the outer leaves and lessens evaporation from the entire leaf area. A simple, inexpensive method of covering is to wrap the leaves with one or two thicknesses of light-weight hessian, leaving the top 2 or 4 inches of the leaves exposed. Allow the hessian to extend towards the base sufficiently to shade the crown of the offshoot, but not far enough to come in contact with the irrigation water. Having the top exposed allows the offshoot to be inspected without disturbing the wrapping material. Such covers are usually allowed to remain on the offshoot until the following spring.

The leaves are kept tightly bound together until active growth begins. After this occurs, the tie is loosened from time to time as new leaves push up through the centre. The tie should be retained until the second growing season, as it serves as a brace for newly-formed leaves, preventing wind breakage. The leaves should be of sufficient size to support themselves before the tie is removed.

It is necessary to keep the soil moist at all times until the offshoot has established a new root system. This requires light but frequent applications of water, the interval between irrigations being determined by the type of soil. During the summer months a light sandy soil may require an irrigation every two or three days, while a heavy soil may remain sufficiently moist with one irrigation a week. No definite rule may be set with regard to this interval, the chief objective being to keep the soil moist. There is some danger of over-irrigation in very heavy soils with poor drainage, particularly if a heavy mulch is used in the basin. Over-irrigating will result in poor aeration with possible loss of the offshoot. During the autumn and winter months, when growth is retarded by lower temperatures, the interval between irrigations should be lengthened.

Irrigation water is applied to the basins from a supply furrow extending along each row of offshoots, 18 to 24 inches from the rim of the basin. The water entering the basin is regulated so that it will not stand more than 2 or 3 inches deep, and is held in the basin until it has penetrated below the depth of the root area. A careful inspection should be made during the first few irrigations to see that the water does not stand high enough to enter the crown of the offshoot. Water in the crown may cause the succulent tissue to ferment and rot, resulting in the death of the young plant.

[TO BE CONTINUED.]

PLATE 155.
On the Russell River, North Queensland.

SOME TROPICAL FRUITS.

No. 8—THE CUCUMBER TREE.

S. E. STEPHENS, Instructor in Fruit Culture.

THIS tree, known botanically as *Averrhoa bilimbi* L., is closely related to the Five Corner, and, like it, is generally regarded as being a native of the Malayan region of tropical Asia.

The tree grows to about the same size as the Five Corner, but may be distinguished from it by the larger compound leaves, which are composed of from five to seventeen pairs of leaflets, and by its flower, which is crimson coloured. The fruit is 2 to 4 inches long, greenish-yellow, and translucent when ripe, obscurely five-angled or almost cylindrical. The flesh is juicy and very acid.

The fruit is used chiefly for pickling.

This tree, with its cogener, the Five Corner, was introduced to the Kamerunga State Nursery at Cairns some thirty to forty years ago, and distributed therefrom.

Cultural requirements are similar to those of the Five Corner. Propagation is usually by seed, although P. J. Wester reports having been successful in shield budding the tree. He advises the use of non-petioled, ripe budwood of brown colour, and to cut the buds 1½ inches to 2 inches long.

Common names for the Cucumber tree in other countries are "Bilimbi," and several slight variations thereof, and "Camia."

GREEN MANURING IN THE ORCHARD.

By R. W. PREST.

THE loss of soil organic matter is a major problem in tropical agriculture the world over. The seriousness of this problem in Queensland is evidenced by the unsatisfactory conditions prevailing in many of our citrus orchards.

This loss is indicated by the unhealthy condition of the trees which shows that, despite every effort to fertilize the soil, it has gradually become poorer and infertile. In citrus trees, a leaf disease known as "Mottle Leaf" frequently makes its appearance. This disorder is intimately associated with a deficiency in soil organic matter. Die back or exanthema may develop and one disease follows another.

Humus, a product of the decay of organic substances, is one of the most important ingredients in any fertile soil and, generally speaking, is present only in inadequate amounts in most of our citrus soils. Except on alluvial land periodically improved in fertility by floodings, the orchardist must consider the maintenance or improvement of the soil fertility if he is to harvest good crops. When the soil has been under cultivation for some time without any addition to the humus supply, it will be noticed that it differs markedly in physical condition from its virgin state. The heavier loam soils are more inclined to run together with rain and bake and crack more readily when drying. This is due to a large extent to the loss of organic matter or humus. This loss takes place more rapidly in warm, moist districts, and where catch crops are intercultivated. In effect, the clay particles have a tendency to break down into a very fine dust which finds its way into the interstices between the soil particles and, with the diminishing supply of humus, tends to cement them, excluding air and water. Sandy soils lose their organic matter even more rapidly than loam soils under cultivation, and trees and plants suffer on such soils. In the absence of adequate supplies of humus, their tendency is to heat up, and soil moisture is lost through evaporation, and particularly by percolation beyond the reach of the feeding roots.

In the absence of bulky organic farmyard manure, the maintenance and improvement of the soil may be carried out by growing and turning under green manure crops. Not only do such crops build up the physical condition of the soil, but their presence reduces soil losses by erosion during periods of heavy rainfall.

The effects of ploughing green plants are both direct and indirect. The bacteria which inhabit the soil, and are necessary for the breaking down and building up of soil materials in the process of releasing plant foods, live on the vegetable matter in the soil, and at the same time convert it into humus. The compounds that result from crop decay increase the absorptive power of the soil and promote aeration, drainage, and granulation, conditions extremely important in plant growth. If the crop turned under is a legume (leguminous plants have a species of nitrogen-fixing bacteria which attach themselves to the roots), and the nodule organisms are active, the store of nitrogen in the soil is markedly increased, a point of extreme importance in fertilizer practice.

Green manures may function as cover crops in as far as they take up extremely soluble plant nutrients and prevent them from being lost

in the drainage water. The nitrates of the soil are of particular importance in this regard, as they are very soluble and are only slightly absorbed by the soil complexes. The added organic matter acting as food for the soil organisms and stimulating biological action, is especially important in the production of carbon dioxide, ammonium nitrates, and organic compounds of various kinds which are essential for plant nutrition.

At best green manuring crops should possess three characteristics —rapid growth, abundant and succulent tops and, with fertilizing, successful growth even in poor soils.

The crops that may be utilised as green manures are usually grouped into two heads—legumes and non-legumes. Some of the common green manures are as follows:—Legumes: Black cowpea, poona pea, crotalaria, beerseem, field pea, lupins, vetches, tick bean. Non-legumes: Mustard, rape, barley.

In the coastal belt, the practice when green manuring has been to utilise the summer rainfall, planting such crops as black cowpeas, poona peas, and crotalaria during November and December and turning under during March. Winter green manuring with crops such as beerseem, vetches, field peas, tick beans, lupins, rape, and mustard could be practised with advantage in many instances, particularly in young orchards, on the lighter sandy soils and where irrigation is practised, planting taking place during April and May and turning under in July.

Citrus trees up to four or five years of age occupy a relatively small proportion of the total area on which they are planted. Their roots do not extend far from the trunk and do not take up the amount of space occupied by the roots of old established trees. Thus, during their early years, an excellent opportunity is afforded for building up a reserve of vegetable matter in the soil.

Cultivation, even early in the season, may be confined to the immediate vicinity of the trees, and by far the greater amount of the space down the centre of the tree rows occupied in growing and turning under summer and winter green manure crops. A strip along each side of the tree is thus being cultivated frequently.

MARKETING ROCK MELONS AND CANTALOUPES.

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

WHEN visiting the markets, one is often impressed with the haphazard manner in which many of the products of the land are still marketed. Bags, loose heaps, and other unhygienic methods are used to bring in and display many of the commodities that will afterwards be used to grace our tables as articles of diet. It has been found possible to discover methods of packing for all fruits, enabling first-rate articles to be obtainable all over the world.

Rock melons are no exception to the general haphazard ways of handling commodities for market. When visiting a grower it was one day suggested, in the course of conversation, that it should be possible to use some method of packing for melons as for apples and other fruit, to assist in placing them on the market in a better condition. A heap

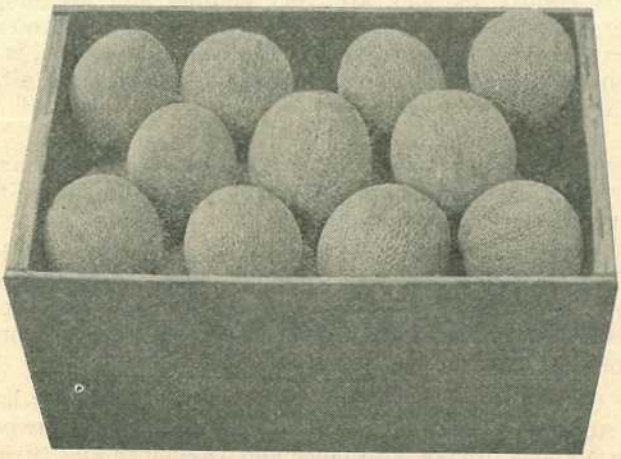


PLATE 156.

Showing the method of packing the 2-1 pack. This pack contains three layers and, as illustrated, would contain the following in each layer:—

1st layer, 11; 2nd layer, 10; 3rd layer, 11—Total, 32.

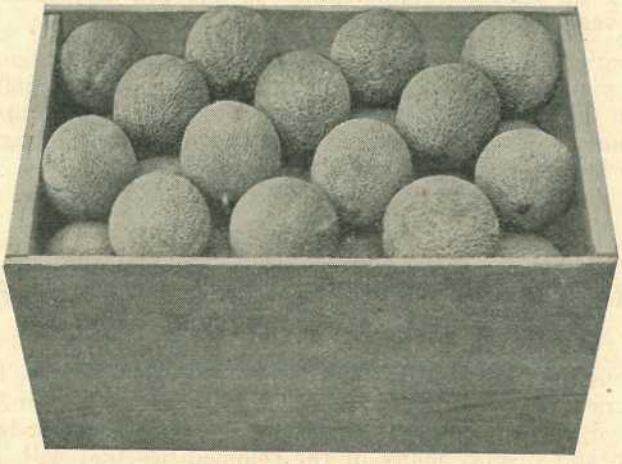


PLATE 157.

Showing the method of packing the 2-2 pack. Each layer contains the same number of melons.

of melons being available, they were approximately sized up and experimental packs made. It was found that the standard bushel case, as made for apples, was the most satisfactory type of container. The internal dimensions of this case are 18 inches long by 11½ inches wide by 10½ inches deep. The illustration will serve to show the packing method used. The same system of diagonal packing as is used for all fruit packing was adopted in this pack. One layer is a replica of another, each melon in every layer except the first fitting into the "pockets" or spaces of the layer beneath. By using this method, it is quite easy, when the pack is finished, to mark the correct number or "count" of the contents of the case. Care in handling is vitally necessary, and no difficulties should be found if common sense is used.

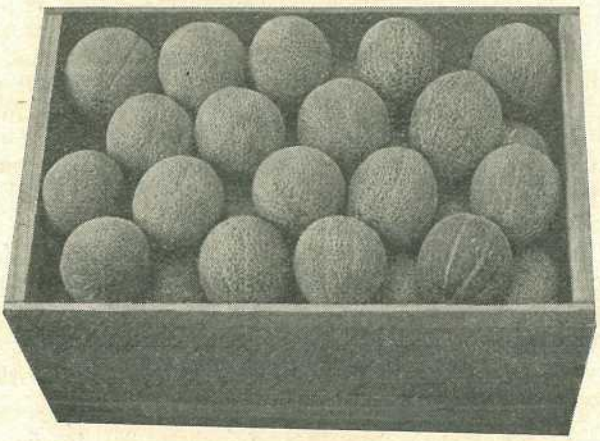


PLATE 158.

Another 2-2 pack illustrated. 2-2 packs can contain either three or four layers according to the size of the melons.

The following are the principal features to be borne in mind:—

1. Grade the melons into approximately the same sizes before beginning to pack.

2. Place the flower or bottom end of the melons in the pockets or spaces for protection, as it is this part of the melon which softens first when ripening.

3. Place the second and successive layers in the pockets of the layers beneath.

4. When counting some of the 2-1 packs, such as that illustrated, it should be noted that the top and bottom layers contain one more than the centre layer—viz., top layer, 11; second layer, 10; bottom layer, 11—total, 32.

5. Pack ¾ to 1 inch above the top of the box and gently ease into position before nailing lid on.

6. Stack the packed cases always on their sides when carting or railing to market.

FRUIT MARKETING NOTES.

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

WITH April, the end of the Queensland fresh apple season draws to a close. The season generally has been a good one, although spoiled partially by hailstorms. Prices for the last month have been steady and satisfactory for most varieties. Papaws reached exceptionally high prices during the month, up to 20s. per case being realised. Banana prices have not shown any marked improvement. Grapes have maintained steady values and vignerons should have a satisfactory season.

Temperate Fruits.

Apples.—Prices were:—Granny Smiths, 6s. to 9s.; Jonathans, 6s. to 9s.; King David, Rome Beauty, Democrats, 6s. to 8s.; Dunns, 5s. to 6s.; Delicious, 6s. to 8s. Southern Jonathans are now arriving on the market and selling 6s. 6d. to 9s. Codling moth has been very prevalent this season, and growers are advised to take all precautions to destroy, as far as possible, all the grubs that can be found in the cracks of the sheds and picking boxes, &c. Scalding the picking boxes for two to four minutes would be of assistance in killing many.

Stone Fruits.—The season is now finished, and growers would do well to clean up their packing sheds and spray them with a 5 per cent. solution of formalin to assist in checking the carrying-over of brown rot. A few late varieties of peaches were sold at 2s. to 4s. 6d. per case.

Grapes.—Prices were:—Muscatels, 6s. to 8s. 6d.; Gros Colman, 4s. to 5s.; Waltham Cross, 5s. to 10s.; other varieties, 4s. to 7s. Values have been very steady, and the quality this season, notwithstanding a sprinkling with hail, has been excellent.

Pears.—Prices were:—Stanthorpe pears, 3s. to 5s. per case; Southern pears, 4s. to 9s. The market price, of course, depends largely on the variety. Growers contemplating planting pears should study this factor closely.

Tropical Fruits.

Papaws.—This fruit has touched very high prices for good quality lines, up to 20s. being obtained for choice Yarwun fruit; 3s. to 8s. per bushel case has been the average price. From next month onwards, closer attention will have to be paid to colour and maturity as the weather becomes cooler.

Custard Apples.—The first of this luscious fruit is now being marketed. Maturity will be the governing factor on early prices. Careful selection of fully developed fruit and good packing will more than pay. Six shillings per case is quoted. Fruit should not be marketed until the interstices of the fruit show a creamy colour if maturity is to be maintained. Sydney prices are 8s. to 10s.

Pineapples.—With factory assistance, the market has maintained a steady price and demand—3s. to 7s. a case for various sizes of smooths, loose 1s. to 4s.; Ripleys, 6s. to 8s. 6d. per case, loose 1s. to 4s. a dozen. Sydney, 7s. to 9s.; Melbourne, 8s. to 11s.; Adelaide, 15s. to 17s.

Bananas.—A slight improvement in price has been made, but it will be a long time yet before really good prices will be obtainable. Sixes, 4s. to 7s.; sevens, 4s. to 9s. 6d.; eights, 5s. to 10s. 6d. Prices in Melbourne and Sydney have remained steady, but need to improve to

make things profitable. Melbourne, nines and eights, 13s. to 14s.; sevens, 11s. to 12s.; sixes, 9s. to 10s.; Sydney, 5s. to 11s. per case; Adelaide, 13s. to 16s. A booklet on marketing bananas should be available in May.

Mangoes.—Mangoes are now off the market after a very unsatisfactory season owing to dry Northern conditions during the summer.

Citrus Fruits.

Grape Fruit.—Melbourne prices for good grape fruit are 14s. to 16s. It must be remembered that only good quality fruit of the Marsh Seedless type is wanted.

Oranges.—The fresh orange season is rapidly approaching. Growers' attention is called to the necessity for marketing matured fruit only. Fruit, the juice of which does not conform to the maturity standards, will be prohibited from sale. Supplies of Valencias are still coming from Southern States to fill the gap between crops.

Lemons.—High prices have been maintained for good lines, Gayndah and Benyenda realising 12s. to 18s. per case; others, 8s. to 12s.

Miscellaneous Fruits.

Tomatoes.—At the latter end of March, the market was oversupplied, possibly owing to the closing of the northern railways through floods; 1s. to 4s. prevailed during this period.

Passion Fruit.—Passions have maintained the high rates of last month, up to 15s. being paid. Prices in the Southern markets have also been maintained at high rates.

In conclusion, one can say that at no time during the month has good, well-packed fruit hung fire on the markets. Every assistance possible that will lead to better marketing will be given by the Department of Agriculture and Stock. Applications should be made to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane.

PIG PRODUCTION RECORDING.

Another good litter of Large White pigs has been recorded by the Department, and the results given below should interest pig-raisers.

The litter which is owned by Hibberd Brothers, Grenier Park Stud, Indooroopilly, is from the sow Highfields Pearl 11th and sired by Norfolk Baron 2nd.

There were twelve pigs born in the litter on the 30th December, one dying on the first day and another being accidentally killed during the second week.

Tattoos or Earmarks	86	87	88	89	90	91	92	93	94	95	96	Total.	Average.
Sexes	B.	B.	B.	B.	B.	B.	B.	S.	S.	S.	S.		
Weight—	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
At Birth	3½	3½	3½	2½	3½	3	3½	2½	3½	3	3	35	3·1
At 1 week ..	5½	7	5	4	7	6	6	6	6½	6	4½	63½	5·8
At 2 weeks ..	8	10	7½	6½	10	9	9	8½	*	8	7	83½	8·3
At 3 weeks ..	11	13	10½	9½	13½	11½	12	11½	..	12	10½	115	11·5
At 4 weeks ..	13½	15	12½	10½	17½	14½	16	14	..	13½	13	140	14·0
At 5 weeks ..	17	20½	17	15	23	19	21	17½	..	17½	17½	185	18·5
At 6 weeks ..	24	27½	23	19	29	24	23½	23	..	22	21½	236½	23·6
At 7 weeks ..	33	37	31	25	39	31	25	29	..	29	25	304	30·4
At 8 weeks ..	42	46	37	30	46	39	29	38	..	35	30	372	37·2

* Killed.

Erosion in the Empire.

Subjoined is an extract from an article by G. C. Watson in the JOURNAL OF THE ROYAL EMPIRE SOCIETY, *October*, 1935. *Dealing with such an important world-wide problem, it has an especial interest for Queensland farmers.*

TO-DAY millions of acres of the Imperial domain all over the world are in danger of destruction by the uncontrolled forces of erosion. In many parts huge areas are losing their original fertility; in others, immense tracts of once valuable land have already reverted to desert, while many more are "on the way." If such basic sources of the Empire's wealth are to be maintained it is evident that more effective anti-erosion schemes must be instituted.

If you speak of erosion nine people out of ten wonder what you are talking about. The other one, if he happens to be a farmer, will probably admit that "something should be done about it," but that it is a subject which mainly concerns the "Government." This, of course, is a fallacy. It is the concern of all. Every patriotic person who has a thought for the Empire's future should be interested in the problem of checking erosion and preserving the land for future generations.

There is no more insidious enemy than erosion. Its work is incessant and often unseen. We are scarcely aware of its far-reaching activities until some serious catastrophe demands public attention.

Not many years ago the Mississippi floods caused widespread damage and distress. "Old Devil River" had overflowed his banks to a far greater extent than usual. Again, quite recently, we hear of townspeople and farmers along the banks of this great waterway having to flee for their lives from the rising flood. About the same time news comes of a dust-storm in Western Kansas, "denser than any yet experienced."

These catastrophes, and other similar ones, it is realised, are almost directly due to erosion. They should be regarded as timely warnings of what may happen if their incidence is not checked by applying control measures.

At one time nearly half the watershed area of the Mississippi consisted of forest land. Now, owing to the enormous demand for wood pulp for newsprint (and for other purposes) this forest area has been reduced by about one-half. President Roosevelt, we hear, is allocating the sum of two hundred millions entirely to the work of combating erosion in the United States; is not this an indication that more might well be spent in many parts of the Empire in checking the same evil?

Let us now glance at some of the "danger spots" of erosion within the Empire. South Africa, of all Empire countries, has perhaps suffered most for want of effective anti-erosion measures. Here, Nature is not so kind as in northern latitudes like Canada where a protective "blanket" of snow is provided during winter months. Moreover, the relentless rays of a sub-tropical sun beat down through the rarified atmosphere of her plateau with withering effect. Floods and droughts alternate at all seasons of the year, taking their toll of life and property, almost as a matter of course. Her gold in some measure may

compensate; but it can never pay for the permanent loss by erosion of huge tracts of her arable land. Here, as with the Mississippi, the wooded catchment areas of many of her big rivers have suffered neglect, and many and extensive have been the resultant evils. Of this the Orange River provides one example. This river alone, within living memory, has carried into the seas sufficient fertile soil to produce crops which would feed the whole of the sub-continent. The same may truly be said of the Zambesi, the Limpopo, and other South African rivers. Owing to the severe losses in the past, vigorous anti-erosion schemes are now on foot, especially for the preservation of forest areas, and particularly of Basutoland, whose wooded mountains give rise to this magnificent river.

In Australia we have many other examples of incalculable loss from erosion—the Murray River affords one. Although its annual flow has remained constant for fifty years, the summer flow has been reduced by nearly one-half (from 49 to 26 per cent.). This, again, is directly due to deforestation of the watershed. In consequence, the enormous expenditure (running into millions) on dams and irrigation works has largely been rendered futile. During the course of eight years the storing capacity of the Burrinjuck Dam, for instance, in New South Wales, has been reduced by 12,000,000 cubic feet—due entirely to the deposit of 500,000 tons of silt during that period.

But the evil does not end here. Forest lands act as purifiers and filters for the water supply of towns. Many cases are on record, not only in Australia, where by deforestation drinking water has become polluted; an excess of injurious bacteria and also of saline contents has resulted—much to the detriment of the consumers. The close connection between forest and city life is thus apparent. The latter cannot afford to disregard the natural value of the former.

Forests in Australia, as in other parts of the Empire, have been ruthlessly destroyed mainly to satisfy increasing demands of wood pulp for newspapers. It is on record that for one Australian "daily" 4 acres of virgin forest were sacrificed for each edition.

In Palestine, where soil is a precious commodity, a cloudburst recently carried away millions of tons of rich earth into the Mediterranean. This soil, which represented the accumulated wealth of hundreds of years, supported the growth of vast fruit and vegetable gardens; now nothing remains but a boulder-strewn waste. This disaster is largely due to Turkish maladministration in the past. The goat and the camel are commonly cited as initial offenders in this respect, but the truth is "man the destroyer" is the real culprit because, in grazing his animals he allows them to destroy the earth's vegetal cover.

From Canada also come tales of distress. Immense tracts of farm lands, from various causes, have been deprived of vegetation; droughts and floods defeat the farmers' efforts to make good. What can be the remedy?

Now there are many remedies for the evils of erosion. The most simple and effective include preservation of the soil's natural cover of trees and herbage; in short, by wise and provident methods of agriculture. When the "vegetational balance" is upset there is literally no limit to the chain of evils that result.

The most expensive and (in some cases) the most ineffectual are those involving the construction of huge dams and weirs with their

highly paid staffs of hydro-technical engineers. This method, at any rate in the Union of South Africa, has been condemned by experts as tackling the problem "at the wrong end." The service of the botanist and the forester, they say, should be called before that of the engineer and the stonemason; in other words, the work of control should commence in watershed areas.

The soundest constructive criticism yet offered advocates the establishment of "geo-botanical" stations. By this means, with efficient organisation, the most suitable kinds of vegetation for "holding the soil" could eventually be selected. The sympathetic co-operation of the stockowner and the herdsman would, of course, be required; for overgrazing has always been the master key for the door of denudation.

Whilst it is true that erosion is the enemy of mankind, it is also the friend. It destroys, but it also creates. Rivers, for instance, often destroy life and property when they overflow, but at the same time they are depositing the detritus (or silt) which is to form the soil for future vegetation. The amount of erosive destruction by rivers, however, is greater at present than their value as soil producers, more especially in the less civilised parts of the Empire. That is the point. What is required therefore is a system of unified control and reckoning whereby a balance could be estimated and maintained; between the loss of arable lands by deforestation of watershed areas, on the one hand, and the formation of new lands, by desert reclamation, irrigation schemes, &c., on the other.

Now a favourable balance between revenue and expenditure is regarded by most Governments as essential to the well-being of any State; yet with regard to erosion, an increasingly adverse balance has accumulated in many countries, almost unheeded until recent times.

Erosion, if uncontrolled, becomes a formidable enemy; and it must be fought on all fronts. While nations sleep, its subtle advance continues unobserved. To arrest its pernicious progress unified control of all available forces must at all costs be established.

It may be asked: How can the ordinary layman help in the scientific control of erosion? The answer is by exercising his right as a voter, and by voting only for those candidates who will undertake to support anti-erosion measures in Parliament.

To deal adequately with so vast a subject as erosion, as it affects the Empire to-day, would demand much study and many volumes. In these remarks I have attempted merely to outline some of the dangers to which the arable lands, and the water supply, of the Empire are exposed at the present time.

True patriotism demands not only a call to arms to fight human aggression, but to stem the tide of the ever-encroaching forces of erosion. The greatest problem of all facing the Empire to-day is not political, nor racial, nor is it essentially defence by armaments; it is geological, for without arable lands and a good water supply the British Empire would soon cease to exist.

MAN THE DESTROYER.

Every traveller in Asia and Northern Africa is familiar with the remains of what were evidently once great cities, requiring vast supplies of food, situated in districts which are now incapable of feeding more

than a few sheep or goats. Mr. Kennedy Shaw has described such finds in his series of articles on "Dead Libya." What is now desert was clearly once fertile country carrying a numerous and highly civilised population. It was thought at one time that the desiccation was the result of climatic charges. . . . The theory is now generally abandoned for the convincing reason that the process can be seen going on to-day as the plain result of man's own ignorance and lack of foresight in his treatment of the soil by which he lives. In America this rake's progress is particularly rapid, but it is not peculiar to America. . . . In South Africa, in parts of Australia and Canada, and in many other countries with seasonal rainfall it is a very serious menace. Owing to faulty land management valuable agricultural land in French and British Nigeria and in the French Sudan is being conquered and absorbed by the Sahara Desert at a rate estimated to exceed a kilometre a year.—"The Times."

According to Professor E. P. Stebbing, the Sahara has advanced 300 kilometres southward in three centuries. On this question of soil erosion much of great interest and value may be gleaned from a report (the Clarendon Press, 6s.) by Dr. MacLagan Gorrie, of the Indian Forestry Service, on his four months' survey in the United States on behalf of the Leverhulme Research Fund. He details the abuses of the land in California and elsewhere, and suggests that the proper agency for holding and developing land and preventing such abuses is a small but representative public body with sound technical advice at its disposal, and sufficient power to enforce its decisions. Private ownership and the common use of "waste" land have almost invariably overworked one use and neglected other possibilities, failing to develop the multiple use principle which can best serve the community as a whole. In the enormous areas of village grazing or common lands in British tropical countries, urgent action is necessary to prevent further misuse and conserve what is left of the soil's natural resources. Such action can obviously not be undertaken by the villagers themselves without some help from Government.

MIGRATION DEPENDS ON MARKETS.

In the course of a recent address to members of the Empire Parliamentary Association, in London, the Premier of Queensland, Hon. W. Forgan Smith, said that it was useless talking of mass migration to Queensland and in the same breath talking of the restriction of sales of Queensland products on overseas markets. Queenslanders' attitude towards migration would be determined by the capacity to sell migrants' products. Difficulties were being created by well-meaning people assuming that migration was a method of coping with unemployment.

"If we have reasonable prospects of selling our produce we will make land available under favourable conditions," said the Premier. He rebutted the question, "Why could not mass migrants live on their own products without depending on exports?"

VETERINARY MEDICINES ACT.

ANNUAL REGISTRATION, 1936.

First supplementary list—to be read in conjunction with list appearing on pages 282 to 285 of March Journal.

Registrations effected from 8th February to 20th March, 1936.

	Reg. No.
Armitstead, J., Warwick—	
Mawson's Horse Blister	230
Sheep Drench	231
Bryce Ltd., Brisbane—	
Pegavo	325
Butler and Co., Ltd., Edward, Brisbane—	
Eczema Ointment	1134
Collins, W. A., Cairns—	
Collins' Alterative Worm and Condition Powders	363
Veterinary Cough Paste	364
Dryden, Victor, Lutwyche—	
Victor Dryden's Blood and Water Powders for Horses and Cattle	28
Victor Dryden's Gripe Drench for Horses and Cattle	30
Finney, L. W., Brisbane—	
Telson Fluke Drench	88
Telson General Purpose Drench	89
Telson Poultry Powder	234
Finney and Ure Ltd., Hubert, Brisbane—	
Karswood Poultry Spice	58
Karswood Dog Condition Powders	317
Ganter Bros., Monto—	
F.G.B. Blood Scour Mixture	418
Hayes Veterinary Co., Brisbane—	
Cutter Blackleg Aggressin (Solid)	235
Hayes' Barbed Wire Liniment	236
Hayes' Cattle Blight Powders	237
Hayes' Condition Powders	238
Hayes' Lampas Lotion	239
Hayes' Mammitis Remedy	240
Hayes' Mange Ointment	241
Hayes' Redwater Cure	242
Hayes' Scour Powders	243
Hayes' Veterinary Ointment	244
Hayes' Udder Ointment	245
Hayes' Wart Lotion	246
Hayes' Worm Powders for Horses	247
Lung Worm Injection	248
Hayes' Cleansing Drench	251
Yohimbin	324
Kelly, R., Ayr—	
XL Powder for Scours in Calves	1110
XL Veterinary Application for Sores	1111
XL Veterinary Blistering Ointment	1112
XL Veterinary Colic Drench for Horses or Cattle	1113
XL Veterinary Embrocation for Horses or Cattle	1114
XL Veterinary Gall Ointment	1115
XL Veterinary Gripe Drench for Horses or Cattle	1116
XL Veterinary Healing Ointment	1117
XL Worm and Condition Powders	1118

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 2nd April, 1936, a ten minutes' talk, commencing at 7.5 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, June, July, and August, 1936:—

SCHEDULE OF LECTURES

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

Thursday, 2nd April, 1936.—"Tobacco Grading," Mr. T. Graham, Instructor in Agriculture.

Tuesday, 7th April, 1936.—"Registration of Stallions," Mr. J. W. Munro, Registrar of Stallions.

Thursday, 9th April, 1936.—"Paspalum Ergot," Mr. R. B. Morwood, M.Sc., Pathologist.

Tuesday, 14th April, 1936.—"The Development of the Poultry Industry," Mr. P. Rumball, Poultry Expert.

Thursday, 16th April, 1936.—"Some Aspects of Malnutrition in Dairy Cattle," Mr. J. C. J. Maunder, B.V.Sc., Government Veterinary Surgeon.

Tuesday, 21st April, 1936.—"Fodder Conservation, Central Queensland," Mr. N. E. Goodchild, Senior Instructor in Agriculture.

Thursday, 23rd April, 1936.—"The Identification of Pigs," Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 28th April, 1936.—"Storage of Seeds and Grain," Mr. F. B. Coleman, Officer in Charge, Seeds and Stock Foods Investigation Branch.

Thursday, 30th April, 1936.—"Winter Care of Market Pigs," Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 5th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 7th May, 1936.—"Pasture Mixtures," Mr. C. W. Winders, B.Sc.Agr., Assistant in Agronomy.

Tuesday, 12th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 14th May, 1936.—"The Economic Use of Licks in the Sheep-grazing Industry," Mr. J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 19th May, 1936.—"Pests of Seed Beds," Mr. J. A. Weddell, Entomologist.

Thursday, 21st May, 1936.—"The Prospects of the Fruitgrowing Industry in Queensland," Mr. H. Barnes, Director of Fruit Culture.

Tuesday, 26th May, 1936.—"The Suitability of Sheep-farming Areas," Mr. J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 28th May, 1936.—"The Value of New Cultivation for Cotton-growing," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 2nd June, 1936.—"Fiji Disease in Southern Queensland," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Thursday, 4th June, 1936.—"Pigs for Pork and Pigs for Bacon," Mr. L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 9th June, 1936.—"Some Peculiar Feeding Habits of Stock and what they Indicate," Mr. W. R. Winks, B.Sc., A.A.C.I., Analyst.

Thursday, 11th June, 1936.—"Cotton Varieties for Alluvial Soils," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 16th June, 1936.—"Cotton Varieties for Hill Slopes," Mr. W. G. Wells, Director of Cotton Culture.

Thursday, 18th June, 1936.—"Artificial Incubation," Mr. J. J. McLachlan, F.B.S.A., Poultry Inspector.

Tuesday, 23rd June, 1936.—"Cane Irrigation," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Thursday, 25th June, 1936.—"Citrus Pruning in Queensland," Mr. R. L. Prest, Instructor in Fruit Culture.

Tuesday, 30th June, 1936.—"Transferring Bees," Mr. H. Hacker, F.R.E.S., Entomologist.

Thursday, 2nd July, 1936.—"Dategrowing in Queensland," Mr. H. J. Freeman, Senior Instructor in Fruit Culture.

Tuesday, 7th July, 1936.—"Interpretation of Labels attached to Stock Foods," Mr. R. A. Taylor, Inspector and Examiner, Fertilizers Branch.

Thursday, 9th July, 1936.—"The Giant Toad," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Tuesday, 14th July, 1936.—"Amended Regulations of the Dairy Produce Acts," Mr. G. B. Gallwey, Inspector of Accounts, Dairy Branch.

Thursday, 16th July, 1936.—"The Breeding of New Cane Varieties," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 21st July, 1936.—"The Use of Drugs in the Treatment of Parasitic Worms," Dr. F. H. S. Roberts, Entomologist and Parasitologist.

Thursday, 23rd July, 1936.—"The Production of Choice Quality Cream," Mr. O. St. J. Kent, Dairy Research Laboratory.

Tuesday, 28th July, 1936.—"Fungi which Assist the Growth of Plants," Mr. H. E. Young, B.Sc.Agr., Assistant Plant Pathologist.

Thursday, 30th July, 1936.—"Herd Recording," Mr. L. Anderson, Dairy Instructor.

Tuesday, 4th August, 1936.—"A Plea for the Tree," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 6th August, 1936.—"Timber Trees on the Farm," Mr. W. D. Francis, Assistant Botanist.

Tuesday, 11th August, 1936.—"Rotation of Crops." Mr. H. W. Ball, Assistant Experimentalist.

Thursday, 13th August, 1936.—"The Problem of Prices," Mr. J. F. F. Reid, Editor of Publications.

Tuesday, 18th August, 1936.—"Some Ways of the Soil," Mr. J. L. Foran, Analyst.

Thursday, 20th August, 1936.—"Some Plants Poisonous to Poultry and Pigs," Mr. C. T. White, Government Botanist.

Tuesday, 25th August, 1936.—"Our Debt to Denmark," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 27th August, 1936.—"The Tick Fever of Cattle in Queensland," Mr. C. R. Mulhearn, B.V.Sc., Government Veterinary Surgeon.

WHAT THE YELLOW WRAPPER MEANS.

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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 Books of the Australian Illawarra Shorthorn Society, and the Jersey Cattle Society, production charts of which were compiled during the month of February, 1936 (273 days 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.				
Model 2nd of Alfavale	W. H. Thompson, Nanango	12,852·6	618·70	Reward of Fairfields
Glengallon Sadie	R. Tweed, Kandanga	10,230·05	431·773	Nobleman of Blacklands
Deb 2nd of Kia Ora	Mrs. J. Weber, Peak Crossing	9,999·95	396·28	Red Knight of Greyleigh
Happy Valley Venture Queen	R. R. Radel, Coalstoun Lakes	10,987·94	376·927	Venture of Happy Valley
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Model 3rd of Alfavale	W. E. Thompson, Nanango	13,758·85	582·707	Reward of Fairfields
Kyabram Rosette	A. H. Black, Kumbia	8,962·7	334·844	Ledger of Greyleigh
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Springlands Duchess	W. G. Marquardt, Wondai	13,768·65	538·507	Boss of Hillview
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Springland Dot	W. G. Marquardt, Wondai	12,726·1	515·082	Boss of Hillview
Headland Perfect III.	J. A. Heading, Cloyna, Murgon	10,502·97	442·232	Jellicoe of Duchesses Fairfield
Home Hill Doris III.	A. E. Althouse, Cloyna	8,875·72	355·757	Waiter of Sunnymeade
Lady Mabbelle of Blacklands	A. Pickels, Wondai	8,202·9	343·02	Limelight of Parkview
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Rhodesview Fairy 12th	W. Gierke and Sons, Helidon	7,211·21	303·326	Red Knight of Rhodesview
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Glenore Cherry	A. M. Johnson, Gracemere	9,717·05	420·796	Sunnyview Union Jack
College Flight	Queensland Agricultural High School and College, Gatton	7,137·43	300·825	Duplex of Greyleigh
College Thorn	Queensland Agricultural High School and College, Gatton	7,729·89	289·893	Premier 2nd of Hillview

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

College Gold 2nd	Queensland Agricultural High School and College, Gatton	11,298·35	439·833	Premier of Hillview
Highfield Caroline II.	J. A. Heading, Cloyna	9,263·62	414·648	Kalunya Bruce
Blacklands Jeannette 12th (245 days)	A. M. Johnson, Gracemere	9,369·3	395·002	Parkview Limelight
Happy Valley Vision Express	R. R. Radel, Biggenden	6,870·79	290·607	Barradale Emperor

JERSEY.

MATURE COW (OVER 5 YEARS), STANDARD 350 LB.

Avonreen of Southport	H. J. Gibson, Kingaroy	6,664·45	384·249	Werribee Twylish Starbright King

SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.

Elden Olga	J. B. Keys, Gowrie Little Plain	7,124·84	402·196	Retford Raleigh Chief

JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.

Monica of Calton	E. Burton and Sons, Wanora	7,632·25	406·599	Prince Clair of Calton

SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.

Choice of Hamilton	J. Wilton, Raceview	5,699·61	322·834	Retford Mays Victor

SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.

Oxford June	W. Spresser and Sons, Redbank	4,225·79	263·577	Oxford Ginger Boy

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

Lermont Belle	J. Schull, Oakey	4,882·76	258·566	Trecarne Fern Lad
Lermont Lynette	J. Schull, Oakey	4,242·46	230·994	Myrtle's Pride of Lermont

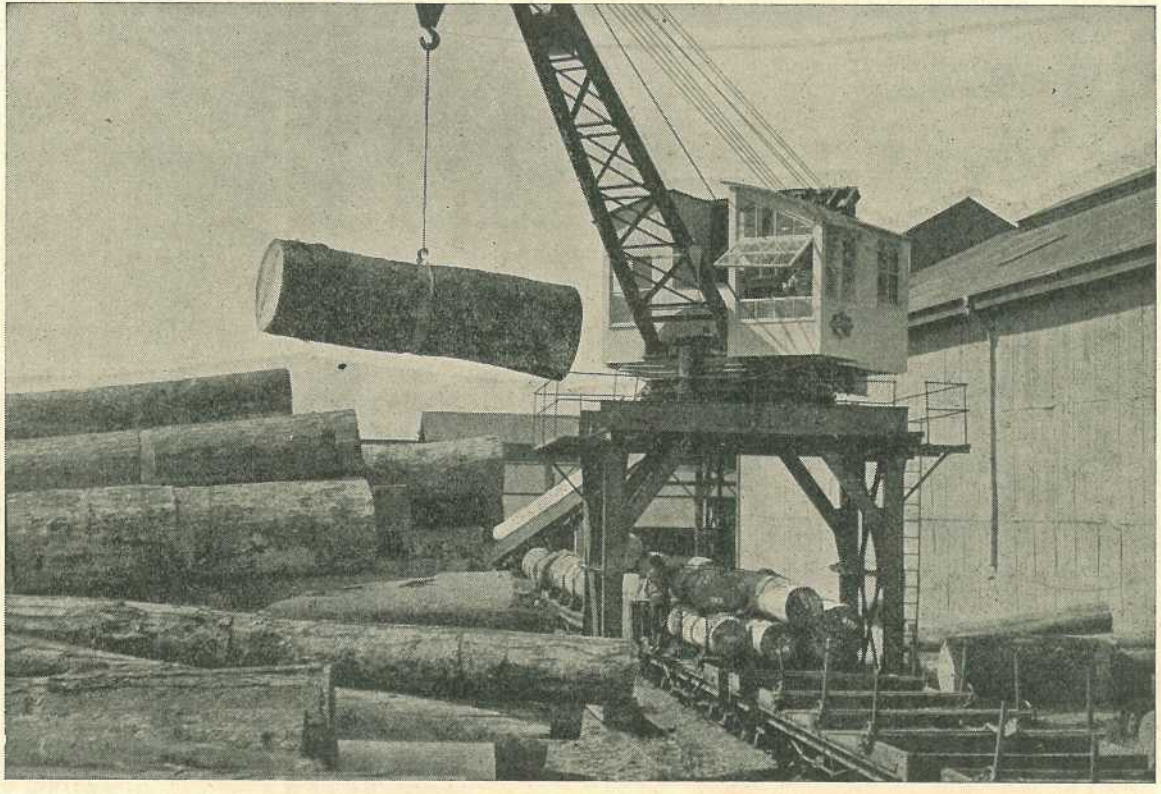

PLATE 159.

CABINETWOOD LOGS AT A NORTH QUEENSLAND DEPOT.

Logs for cutting into decorative veneers and fine timber for furniture are here illustrated. Logging from Crown forests in North Queensland during 1934-35 easily broke all records, approximately 21,000,000 superficial feet being sold, as against 8,500,000 in 1933-34.

[*Photo. by courtesy Telegraph Newspaper Co., Ltd.*

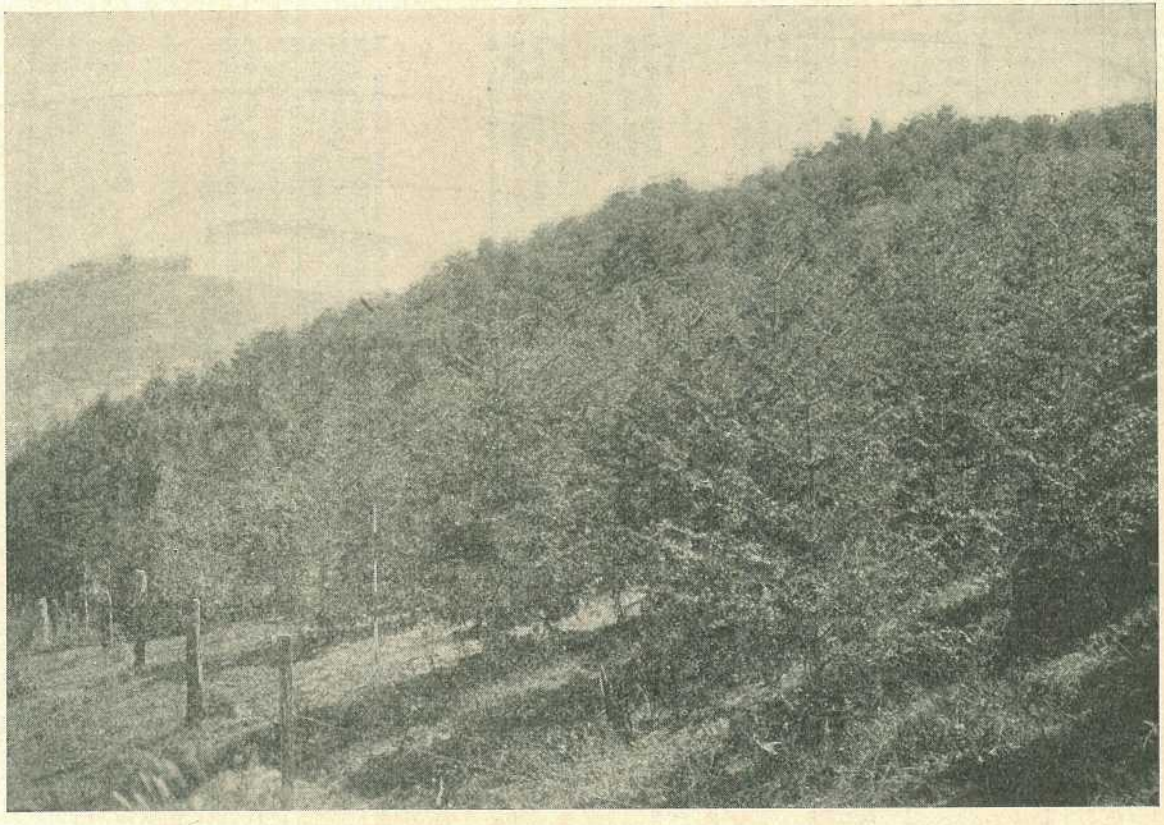

PLATE 160.

A FLOURISHING PLANTATION OF HOOP AND BUNYA PINE (BUNYA IN FOREGROUND).

1,400,000 trees of all species (majority Hoop Pine) were planted out by the Queensland Forest Service during the year 1934-35. [*Photo. by J. A. Lunn.*

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Guinea Grass.

F.A.S. (Mundubbera)—

The specimen represents Guinea grass, *Panicum maximum*. We noted with interest what you say about this grass compared with blue panic grass. We think, like this latter grass, it is well worth having a small paddock of it for periodical eating-off. Cattle seem very fond of it, but if left to grow without eating-off it is liable to become very coarse.

Three-pronged Spear Grass.

H.S.B. (Mundubbera)—

The grass is, we think, *Aristida Leichhardtiana*, a species of three-pronged spear grass which we have not previously received for our collections. We were very pleased to receive this specimen. Half of the material is being sent to Mr. Hubbard, at Kew, England, for check determination.

"Asthma Plant"—Pigweed.

I.B. (Boonmoo, Chillagoe Line)—

The plant like Hervea is *Euphorbia pilulifera*, the asthma plant. This herb is dried and made into tea and is said to give relief in asthma, but we have not heard of its being effective in rheumatism before, and your note has been read with much interest.

The Pigweed is *Portulacca oleracea*, a plant widely spread in one form or another over the warm regions of the world, and it makes quite good "spinach," although we think we have some herbs that are rather better.

We will always be pleased to name and report on any specimens you care to send.

Giant Couch.

A.K.K. (Maleny)—

The specimen represents *Brachiaria mutica*, better known in Queensland as *Panicum muticum*, giant couch. This grass is spread widely over most of the tropical and subtropical countries and in parts of North Queensland, such as on the Daintree River and the wetter parts of Atherton Tableland. There is no doubt it is a very valuable grass. Stock are particularly fond of it. It does remarkably well under cultivation, and a small paddock of it for feeding off has a good carrying capacity. The grass does not seed very readily, but roots put in during the early summer make very rapid growth. It suffers badly from frost during the winter months.

Rattlepods.

V.L.McL. (Colosseum)—

The plants are all species of rattlepods. Members of this genus, *Crotalaria*, both in Australia and abroad, have been proved poisonous to stock. On the other hand, some species are eaten without any ill effects. Of the three you send, No. 1 is the only one definitely proved poisonous by feeding tests, but as suspicion falls on all of them it would be just as well to get rid of the others if possible. Individual determinations:—

1. *Crotalaria striata*, widely spread over the tropics and subtropics of the world, and in India is much grown as green manure for tea. It is very abundant in Queensland and in parts of Northern Territory, and feeding tests show it to be poisonous.
2. *Crotalaria Mitchellii*, which is very common, but nothing is known about its properties.
3. *Crotalaria trifoliastrum*. This has been accussed of poisoning stock, particularly horses, but no definite information is available.

Rag Weed.

S.C. (Crow's Nest)—

The specimen represents *Ambrosia psilostachya*, a species of rag weed. It is a native of Mexico and the Southern and Western United States. In the latter country it is known as Western rag weed, to distinguish it from some of those found in the Eastern States. It is also known as perennial rag weed on account of the perennial root. The plant is said to be rather a bad weed in the United States and to invade all classes of crops. It has not been met with previously in Queensland, but in America it is recommended that newly invaded areas should have prompt treatment with a strong weedicide, caustic soda, or strong brine, the soil being cleared of all plant growth for a season rather than allowing the pest to gain a foothold. Larger areas it is said can be suppressed eventually by cultivation methods, and in most plants with an underground root system, an attempt being made to prevent leaf growth and thus starving underground portions. The plant is not known to possess any poisonous or harmful properties.

Western Plants Identified.

D.F.S. (Cunnamulla)—

1. *Morgania floribunda*, very common in Western Queensland, although we have heard no common name for it. Its properties are unknown; however, it is not known to be poisonous or harmful in any way.
2. *Paspalidium flavidum*, Warrego summer grass. It is generally regarded as a very nutritious and palatable species.
3. *Erigeron longifolius*, commonly known as rag weed, sometimes as cobbler's pegs, but on the coast this latter name is more generally given to another plant of the same family. It is more a coastal weed than a weed of the inland.
4. *Trianthema crystallina*, a plant allied to the pig weeds which is very common in Western Queensland. It is probably quite a good fodder. We have heard no common name applied to it.
5. *Chloris scariosa*, one of the native grasses often called windmill grass. Most of the chlorises are good fodder, making a good bottom, particularly for sheep. This species, however, is not as good as many of the others.
6. *Bassia bicornis*, goat head burr, a plant allied to the galvanised burr.
7. *Abutilon otocarpum*, a plant of the mallow family, for which we have not heard a common name. It is probably quite a good fodder.
8. *Ochinochloa crus-galli*, often called wild millet. It is a good fodder, being related closely to such well-known cultivated crops as Japanese millet and white panicum.
9. *Malvastrum spicatum*, a very common weed of the mallow family in Western Queensland, but for which no common name is known. It has been suggested that it might be associated with staggers or shivers in sheep that occurs spasmodically in the Warrego district, but proof is lacking.
10. *Triraphis mollis*, sometimes called plume grass. It is not generally regarded as a particularly good fodder.
11. *Chloris pectinata*
12. *Chloris acicularis*

    These two chloris grasses are very abundant throughout the West and mid-West. They are regarded as excellent grasses responding well to early rains and making quite a good bottom for sheep.
13. *Tragus racemosus*, small burr grass.
14. *Solanum esuriale*, potato bush.
15. *Sporobolus actinocladus*, a common grass in Western Queensland, but we have heard no common name applied to it.
16. *Epaltes australis*, a common plant of the composite or daisy family; both in Coastal and Western Queensland. It is not known to possess any poisonous or harmful properties.
17. *Aster subulatus*, a North American weed now naturalised in Queensland. It it more common on the coast than inland, and in the Moreton district, Burnett district, &c. It mostly occurs as a weed of wet, damp places, but is not often found in the ordinary pasture.

Near Western Grasses Identified.

L.F.M. (Canaga, via Chinchilla)—

1. *Paspalidium distans, Paspalidium gracile.* These are species of brigalow grass. They are exceptionally good grasses and are fairly common on brigalow country, and usually come in naturally after the brigalow is cleared.
2. *Dactyloctenium radulans,* button grass. A very good natural grass which is a rapid grower, and stock eat it readily when it is dried in somewhat the same way as Flinders grass.
3. *Tragus racemosus,* small burr grass.
4. *Eremochloa bimaculata,* poverty grass. Generally occurs on sandy country, particularly under cabbage gum or rusty gum. It is generally regarded as having poor fodder properties.
5. *Cymbopogon refractus,* barbed-wire grass. A very coarse species, not of much value as a fodder.
6. *Eragrostis* sp. A love grass.
7. *Eragrotis parviflora,* weeping love grass.
8. *Eragrostis leptostachya,* paddock love grass.
9. *Eragrostis concinna,* a love grass.

   The love grasses are of secondary value, but are rather useful in the average mixed native pasture.
10. *Bothriochloa decipiens,* bitter or pitted blue grass, or as it is sometimes called in New South Wales, red leg. This grass has a very bitter flavour. It is of little value as a fodder. It generally comes in in abundance when the palatable grasses are eaten out.
11. *Aristida glumaris,* a three-pronged spear grass. This is not of much value as a fodder.
12. *Aristida* sp.
13. *Setaria surgens,* pigeon grass. Quite a good fodder.
14. *Eleusine Indica,* crowfoot grass. It is readily eaten by stock and mostly occurs round cow yards, old cultivation paddocks, &c., or anywhere where the ground has been disturbed. At times it contains a prussic-acid-yielding glucoside, but losses in Queensland are rare. Occasionally calves are poisoned by it.
15. *Diplachne fusca,* a grass of rather wet places, for which we have not heard a common name. In certain situations it has some value as a fodder.
16. *Sporobolus elongatus,* rat's tail grass. It is not a good fodder.
17. *Cynodon dactylon,* common couch, a valuable fodder.
18. *Chloris ruderalis,* a star grass. Most of the chloris grasses are valuable fodders, particularly on cleared brigalow and belah country, and they are one of the first to respond to early rains.
19. *Panicum effusum,* a native panic grass, very common on the lighter sandy soils, and in such places quite good fodder.
20. *Perotis rara,* comet grass. Not a very good fodder.
21. *Eriachne* sp., not particularly good fodder, but somewhat useful in the mixed pasture.
22. *Digitaria* sp. Quite a good fodder.
23. *Stenophyllus barbatus, Fimbrystylis diphylla.* Two sedges in the bundle. These grow in various situations, but mostly in sandy country overlying clay. Although they have not the fodder value of grasses they probably supply a bit of feed where better fodder is lacking.

Beans.

D.M. (Nanango)—

The specimen represents one of the forms of *Phaseolus lunatus,* but beans and seeds are really necessary to tell the exact variety, as it is the marking on the seeds that distinguishes the varieties. The common lima bean is a variety with pure white seeds, while the Madagascar bean has white seeds splashed with red. Both of these are, of course, edible—either the green seeds fully formed and not hard, or the dried seeds. There is another variety of bean grown in Queensland, known as the pink Mauritius. This has red seeds and is poisonous, but the poisonous component, a prussic-acid-yielding glucoside, is driven off more or less by heating.

Wallaville Specimens Identified.

A.G.S. (Project Club, Perry River, via Wallaville)—

1. *Lespedeza sericea,* Korean clover. This was boomed as a fodder in many countries, particularly in the United States. It is grown here now on a small scale, but our experience with it is that it is rather woody.
2. *Crotalaria juncea,* a species of rattle-pod. It is a native of Queensland, but is found in other tropical countries, and in India is grown for fibre under the name of sun hemp. Stock seem fond of it in spite of the fact that some members of the genus have been accused of poisoning.
3. *Cassia mimisoides,* a small legume very common in the average native mixed pasture in many parts of Queensland.
4. *Euphorbia Macgillivravi,* a native plant; we know very little of its properties.
5. *Eragrostis* sp.
6. *Cenchrus australis,* burr grass. It is frequently known in many parts of Queensland by the absurd name of Scotch Lice. Sometimes flies and other insects get trapped in the burr-like spikelets or seeds.
7. *Cyperus* sp., a sedge.
8. *Eragrostis megalosperma,* a species of love grass rather different from most others of the genus. It most frequently occurs on the edge of scrubs or comes up naturally after the scrub has been felled.
9. *Eragrostis leptostachya,* paddock love grass.
10. *Cymbopogon refractus,* barbed-wire grass.
11. *Setaria surgens,* pigeon grass.
12. *Arundinella hispida,* a very coarse grass.
13. *Tribulus terrestris,* caltrops, also known as cat head, bull head, goat head, names which are indiscriminately applied to many burrs in the West. In South Africa is causes in "big head" a disease of sheep, but we have had no trouble with it here in Queensland, and feeding tests here have given negative results. It is widely spread in many of the warm temperate regions of the world.
14. *Swainsona galegifolia,* Darling pea, or indigo. When eaten to any extent by stock, particularly sheep, this plant causes a peculiar form of poisoning. The active principle of the plant has not been isolated, but it apparently destroys the nerve endings and the animal becomes stupid and may walk into fences, stumps, &c. The symptoms are not manifested until after six to eight weeks of feeding on the plant, but sheep once they start soon become confirmed Indigo eaters.

"The Wheel of Fire."

A.H.B. (Nambour)—

The specimen represents the Wheel of Fire, *Stenocarpus sinuatus,* a native of the scrubs of Coastal Queensland and Northern New South Wales. It is one of the most beautiful of our flowering trees, and is propagated from seed. Although widely distributed it is not very common in scrubs and is not often cut. The Forestry Department has adopted the official name of white oak for the timber.

Coloration of Animals.

J.S. (Gatton)—

The Senior Instructor in Pig Raising, Mr. E. J. Shelton, advises that the progeny of a purebred Large or Middle White (Yorkshire) boar is invariably of white colour when they are produced by a Berkshire sow, and *vice versa*; but where the White breeds are crossed with Tamworths, Wessex Saddlebacks, or Large Black breeds it is not uncommon for some of the progeny to have red, black, or bluish markings, respectively, even if the sire of the pigs is a purebred registered animal. It is difficult to account for this, but the facts are as stated.

In your case it is evident the sow you have carries Large Black and Wessex Saddleback blood, even though she is black in colour herself; hence it is no indication that the boar used is not purebred when some of the progeny show black skin spots. The progeny of a Large or Middle White (Yorkshire) boar when mated to a Large Black sow (or *vice versa*) are almost always bluish-grey in colour, and in the case of a Tamworth sow it is not unusual for some of the young pigs to have red markings.

The subject is an interesting one, and if you desire to make a further study of the coloration of animals we refer you to the textbook, "Animal Breeding," by Shaw, which can be obtained at approximately 15s. from booksellers in the city.

General Notes

Staff Changes and Appointments.

Messrs. M. R. Irving and P. F. A. Hardman, Government Veterinary Surgeons, Department of Agriculture and Stock, Brisbane, have been transferred to Rockhampton and Gympie, respectively.

Constable W. T. Hibbett, Jandowae, has been appointed also an Inspector under the Slaughtering Act.

Mr. B. N. Choice, Goondiwindi, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. R. E. Churchward, B.V.Sc., Veterinary Surgeon, Department of Agriculture and Stock, Townsville, has been transferred to Cloncurry.

Constable Wm. Neil, Ravenswood, has been appointed an Inspector of Slaughterhouses.

Messrs. R. E. Churchward, B.V.Sc., P. F. A. Hardman, B.V.Sc., and M. R. Irving, B.V.Sc., veterinary surgeons on probation, Department of Agriculture and Stock, have been appointed also inspectors under the Diseases in Stock Acts, the Dairy Produce Acts, and the Slaughtering Act, as from the 21st March, 1936.

Constable J. S. Harper, of St. George, and Acting Sergeant R. V. Carter, of Roma, have been appointed also Inspectors of Brands as from the 21st March, 1936.

The resignation of Mr. K. V. Doherty as Acting Inspector of Stock at Maryvale has been accepted.

Mr. A. H. W. Cunningham, Strathmore Holding, Collinsville, has been appointed an honorary ranger under the Animals and Birds Acts, as from the 21st March, 1936.

Mr. M. T. Keating, Superintendent of Green Island, via Cairns, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act, as from the 21st March, 1936.

Mr. J. Bishop, Inspector of Stock, Dairies, and Slaughterhouses at Kingaroy, has been transferred to Proston.

Messrs. L. A. Jacobsen (North Kolan, via Avondale) and C. C. A. Herman (Kolan River South, via Bucca) have been appointed Honorary Rangers under the Animals and Birds Acts, as from the 7th March, 1936.

Applications under the Farmers' Assistance (Debts Adjustment) Act of 1935.

A Proclamation has been issued under "*The Farmers' Assistance (Debts Adjustment) Act of* 1935" fixing the 30th June, 1936, as the date within which any farmer who proposes to effect a composition or scheme of arrangement with creditors in satisfaction of whole or part of his debts and/or liabilities, whether secured or unsecured, may make application to the Rural Assistance Board for assistance to give effect to such composition or scheme.

Queensland Cane Growers' Council.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts, providing that at the election in March, 1936, each mill suppliers' committee, district cane growers' council, and the Queensland Cane Growers' Council shall be elected for three years, that is, until the 31st March, 1939.

Plywood and Veneer Board.

An Order in Council has been issued in pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1935," extending the operations of the Plywood and Veneer Board from 3rd May, 1936, to 2nd May, 1939.

A petition was invited for a poll on the question of the continuance or otherwise of the pool, but as none was received within the specified time the above order has been issued formally.

Animals and Birds Sanctuary near Collinsville.

An Order in Council has been issued under the Animals and Birds Acts, declaring portion of Strathmore Holding, Collinsville, which embraces Campbell's Camp and Callaghan's Swamp, to be a sanctuary for the protection of native animals and birds. Mr. A. H. W. Cunningham, of Strathmore, is an honorary ranger under the Acts.

Federal Fertilizer Subsidy.

Forms of application for subsidy on artificial manure used during the year ending 30th June, 1936, have been distributed throughout the Commonwealth, and supplies may be obtained at all Post Offices.

Provision is made in *The Primary Producers Relief Act*, 1935, for the payment by the Commonwealth of a subsidy at the rate of 15s. per ton on artificial manure used during the period 1st July, 1935, to 30th June, 1936, in the production of primary products other than wheat. Payment of the subsidy is made in respect of complete ton or half-ton lots only, other fractions of a ton being excluded.

Many primary producers in previous years have been under the impression that the subsidy is payable on quantities purchased. This impression is erroneous, and has led to much confusion and delay in dealing with claims. It should be noted that the subsidy is payable only on artificial manure used—that is, applied to the soil—during the period 1st July, 1935, to 30th June, 1936.

The Primary Producers Relief Act, 1935, defines artificial manure as—

> "Any substance which contains nitrogen, phosphoric acid, or potash, which has been manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants."

It does not include any animal or vegetable matter which has not been subjected to process or manufacture; or agricultural lime or other soil amendment or any product prepared primarily for supplying lime to the soil.

If producers are unable to obtain the forms at their local post office, they may procure same on application to the Officer in Charge of the Fertilizer Section, Department of Commerce, Box 778L, G.P.O., Brisbane.

After completing all the particulars required on the form, the applicant should send it to the supplier of the fertilizer for completion of the Supplier's Certificate and transmission of the claim to the department at the address previously mentioned for payment.

The Act provides that applications must be lodged with the Secretary, Department of Commerce, on or before 31st October, 1936. Any applications lodged after that date will be ineligible for participation in the subsidy.

Fruit Marketing Organisation Acts.

An Order in Council has been issued under the Fruit Marketing Organisation Acts extending the operations of the Fruit Marketing Organisation Acts until the 31st December, 1939. Notice of intention to make the above Order was published on the 19th December last, and a requisition for a ballot on the question of the continuance of the Acts was invited, to be lodged by the 31st January. No such requisition was received, and the Acts have now been extended formally.

Canary Seed Board.

An Order in Council has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the operations of the Canary Seed Board for a further period of three years from 1st June, 1936, to 31st May, 1939. A petition for a ballot on the question of whether or not the Pool should be continued for such period may be lodged, by not less than ten per cent. of the growers of canary seed, on or before the 27th April next.

Sugar Cane Assignment.

Executive approval has been given to the issue of Orders in Council in pursuance of the provisions of the Regulation of Sugar Cane Prices Acts declaring the assignments of lands of canegrowers to sugar mills throughout Queensland.

Open Season for Duck and Quail throughout Queensland.

An Order in Council has been issued under the Animals and Birds Acts fixing the open seasons for duck and quail throughout Queensland during the present year.

The effect of this Order in Council is to fix the open season for duck in Southern Queensland from the 1st April to the 31st August next, and for quail in the same area, from the 1st May to the 30th September next.

The open season for duck and quail in Central Queensland has been fixed from the 1st July to the 30th November next, and in Northern Queensland, from the 1st June to the 31st October next.

Conditions Governing the Making of Wine for Sale.

A grower of fruit, i.e., oranges, pines, mulberries, and plums, is permitted by law to make wine from these fruits, with the addition of sugar, and sell same to the public. Such wine must not contain more than 40 per centum of proof spirit by volume.

A license to sell or to manufacture wine from the abovementioned fruits is not required. It is illegal, however, to make wine from the juice of the grape, containing added sugar, honey, glucose or other sweetening matter, without first obtaining the necessary manufacturer's license, which costs £20 per annum, from the Customs Department. Wine made from the juice of the grape, with the addition of the ingredients mentioned, is subject to 20s. per gallon duty.

A grower and maker of wine is permitted to sell wine made by him in any quantity at the premises where it is grown or made, but the sale of such wine in quantities of less than two gallons at one time elsewhere than on the premises where it is grown or made is prohibited.

There is not any restriction as regards the hours of sale during the six business days of the week by a grower and maker of wine, but the sale of any such wine on Christmas Day, Good Friday, Sunday, or Anzac Day is prohibited.

The use of fortifying liquor, such as brandy, whisky, rum, or grape wine, is permitted, but, as already mentioned, "wine" must not contain more than 40 per centum of proof spirit by volume.

It is not necessary to guarantee home-made wine under "The Pure Foods Regulations" of "*The Health Acts, 1900 to 1931.*" Inquiries made at the Health Department elicited the information that there is not any standard as regards the purity of foodstuffs. "Food" is either fit or unfit for human consumption. If impure, and therefore unfit for consumption, a prosecution would, of course, be launched by the Health Department. It would be advisable for fruitgrowers making wine to forward a sample to the Health Department, South Brisbane, for analysis.

Local Cane Prices Boards.

His Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Regulation of Sugar Cane Prices Acts, 1915 to 1935,*" doth, by this notice, appoint the following persons as representatives of the owner or owners of the mill, and as representatives of the canegrowers, to be members of the respective Local Boards hereinafter specified, and has been pleased to appoint the persons so designated as Chairman therof respectively:—

Babinda Local Board.—Millowners' Representatives: F. A. Lamont and W. J. Ryan. Canegrowers' Representatives: S. H. Warner and D. O. James. Chairman: A. Anderson.

Bingera Local Board.—Millowners' Representatives: B. A. Bourke and Dr. A. J. Gibson. Canegrowers' Representatives: F. J. Wheeler and C. W. Thiele. Chairman: A. E. Aitkin.

Cattle Creek Local Board.—Millowners' Representatives: P. H. McLean and G. W. Shaw. Canegrowers' Representatives: W. G. Merrill and F. W. Valentine. Chairman: A. V. C. Smith.

Fairymead Local Board.—Millowners' Representatives: T. W. Pulsford and E. W. Scott. Canegrowers' Representatives: P. E. Scotney and F. J. Wheeler. Chairman: A. E. Aitkin.

Farleigh Local Board.—Millowners' Representatives: W. B. Fordyce and John Smith. Canegrowers' Representatives: P. Kirwan and T. G. Mulherin. Chairman: T. R. Kennedy.

Gin Gin Local Board.—Millowners' Representatives: W. C. Cunningham and H. G. Mittelheuser. Canegrowers' Representatives: J. Laurison and G. Powell. Chairman: A. E. Aitkin.

Goondi Local Board.—Millowners' Representatives: J. R. Kerr and D. A. Williams. Canegrowers' Representatives: W. D. Davies and H. T. Stone. Chairman: W. Rillie.

Hambledon Local Board.—Millowners' Representatives: A. H. Edwards and L. M. Smith. Canegrowers' Representatives: A. W. Browne and J. Moore. Chairman: A. Anderson.

Inkerman Local Board.—Millowners' Representatives: W. Gibson and D. Watt. Canegrowers' Representatives: S. W. Gibson and W. F. Klaka. Chairman: A. M. Taylor.

Invicta Local Board.—Millowners' Representatives: H. B. Burstall and J. L. Mullins. Canegrowers' Representatives: H. F. Hecht and W. E. G. Smith. Chairman: A. M. Taylor.

Isis Local Board.—Millowners' Representatives: A. Adie and J. Alison. Canegrowers' Representatives: B. Foley and A. W. Macpherson. Chairman: J. G. Fitzsimon.

Kalamia Local Board.—Millowners' Representatives: R. K. Calcutt and J. W. Inverarity. Canegrowers' Representatives: J. Breen and M. A. Coyne. Chairman: A. M. Taylor.

Macknade Local Board.—Millowners' Representatives: N. S. Beatty and A. J. West. Canegrowers' Representatives: G. Cantamessa and T. J. McMillan. Chairman: C. B. Buxton.

Marian Local Board.—Millowners' Representatives: A. J. Coyne and J. O'Neill. Canegrowers' Representatives: G. Ollett and E. C. Walz. Chairman: T. R. Kennedy.

Maryborough Local Board.—Millowners' Representatives: T. Braddock and O. C. Kinne. Canegrowers' Representatives: J. J. Leather and H. Doss. Chairman: J. A. Murray.

Millaquin Local Board.—Millowners' Representatives: G. S. Moore and E. P. Wyllie. Canegrowers' Representatives: F. Courtice and F. J. Wheeler. Chairman: A. E. Aitkin.

Moreton Local Board.—Millowners' Representatives: G. F. Scott and W. M. Whalley. Canegrowers' Representatives: Wm. Kittle and A. E. Williams. Chairman: T. P. Shanahan.

Mossman Local Board.—Millowners' Representatives: W. H. Crawford and E. J. O'Brien. Canegrowers' Representatives: R. D. Rex and N. H. Wellard. Chairman: T. W. Foran.

Mount Bauple Local Board.—Millowners' Representatives: T. Beattie and G. Greathead. Canegrowers' Representatives: W. J. Douglas and H. Jeppesen. Chairman: J. A. Murray.

Mourilyan Local Board.—Millowners' Representatives: G. R. Blair and H. G. Selby. Canegrowers' Representatives: E. S. Edgerton and B. B. Ross. Chairman: W. Rillie.

North Eton Local Board.—Millowners' Representatives: N. F. Lever and S. H. Scougall. Canegrowers' Representatives: P. E. Neilsen and T. P. Ross. Chairman: A. V. C. Smith.

Pioneer Local Board.—Millowners' Representatives: B. C. J. Martin and C. S. Wynter. Canegrowers' Representatives: B. S. Donovan and L. W. J. Hoey. Chairman: A. M. Taylor.

Plane Creek Local Board.—Millowners' Representatives: D. Greetham and A. Innes. Canegrowers' Representatives: C. W. Davidson and J. Lawrie. Chairman: T. R. Kennedy.

Pleystowe Local Board.—Millowners' Representatives: W. F. Clarke and G. M. Smith. Canegrowers' Representatives: M. W. R. Bowman and C. McKinley. Chairman: T. R. Kennedy.

Proserpine Local Board.—Millowners' Representatives: M. R. Gibson and R. Shepherd. Canegrowers' Representatives: H. W. Holmes and C. C. Robinson. Chairman: C. A. K. Morrison.

Qunaba Local Board.—Millowners' Representatives: G. S. Moore and W. A. Shield. Canegrowers' Representatives: G. E. Maughan and E. C. Rickert. Chairman: A. E. Aitkin.

Racecourse Local Board.—Millowners' Representatives: N. Bennett and A. S. Hamilton. Canegrowers' Representatives: R. S. Stevens and A. Turner. Chairman: A. V. C. Smith.

Rocky Point Local Board.—Millowners' Representatives: W. H. Heck and F. W. Heck. Canegrowers' Representatives: B. A. Ernst and H. W. Koppen. Chairman: J. J. Leahy.

South Johnstone Local Board.—Millowners' Representatives: F. Gillan and F. H. Gilmore. Canegrowers' Representatives: W. J. Henderson and R. J. Wright. Chairman: W. Rillie.

Tully Local Board.—Millowners' Representatives: C. P. Kemmis and F. N. King. Canegrowers' Representatives: P. Byrne and J. A. Winter. Chairman: W. Rillie.

Victoria Local Board.—Millowners' Representatives: R. T. Challinor and N. R. Dowling. Canegrowers' Representatives: E. L. Burke and G. G. Venables. Chairman: C. B. Buxton.

Rural Topics

Beef, Milk, and Butter in a Single Breed.

From the Secretary of the Red Poll Cattle Society:—

At the last show of the Smithfield Club, at Islington, the breed champion, which was also reserve champion at Norwich, not only proved an ideal butcher's carcass, but this animal, a two years nine months old heifer weighing 17 lb. in excess of 13 cwt., was the daughter of a 1,000-gallon cow, with a butter fat of 4.1 per cent. This champion heifer was the granddaughter of a cow that yielded over 37½ tons of milk, having averaged over 9,000 lb. a year with her nine calves.

The reserve champion, which was the second prize heifer and the Norwich champion, scaled 13¼ cwt. for her two years seven months. This heifer was the heaviest in her class, and was out of a good milk dam. She had as her granddam a cow that averaged a 1,000 gallons with nine calves.

The winner under two-years-old steer scaled nearly 12¼ cwt. for his twenty months. He was out of a 930-gallon cow, while his sire was the grandson of the 2,000-gallon cow Hardwick Ashberry. The winning baby steer, a fourteen-months beast scaling over 9¼ cwt. has milk in abundance up to 1,500 and 1,150 gallons on either side of his pedigree.

How well milk and beef were combined in the breeding of these and other of the Red Poll exhibits, which, with a total entry of thirty, exceeded those of nearly all other breeds, is seen in the fact that they averaged 63 per cent. carcass weight as against live weight. The subsequent reports of the butchers substantiate the great asset of the Red Poll for beef production, owing to the low percentage of waste, which finds ample testimony in such remarks as, "nearly a model carcass; no waste whatever, other cattle bought did not equal the Red Polls for the low percentage of waste."

Respecting two commended heifers exhibited from the Sandringham herd of His Majesty the King the buyers report that the killing percentages were 70 lb. and 69.5 lb. per cwt.

Lead Poisoning of Calves and Pigs.

A case came under notice recently in which a farmer reported the death of three well-grown bacon pigs and some calves. Several months ago, when his house and outbuildings were being painted and renovated, the painters, when finishing up the job, carted away a number of old paint tins and bagging bespattered with paint, and deposited them in a corner of a paddock to which the pigs and calves later had free access. Wet weather followed, and some of the tins filled with water. It was this water that the calves and pigs drank with the result stated. This is not the first case, the Senior Instructor in Pig Raising reports, in which fatalities have occurred from paint pot water poisoning. A similar case occurred several years ago from the drinking of water from tins in which rabbit poison had been stored. The losses emphasise the necessity for immediately burying deeply any containers of this description in order to avoid the risk which inevitably exists if they are left lying about the yards or paddocks.

No Snobbery.

One of the most priceless stories I know is the one told about Charles Lamb. He was rather a timid man, but could be withering at times, and there was nothing that he hated like snobbery. One day he was talking with a snob who did his best to prove that no man could be worth anything or count for anything unless he had received a Public school education—that is, an English Public school, which might be compared with our Great Public Schools here. Lamb listened as patiently and as respectfully as he could.

"And in support of this contention," said the snob heavily, "take Byron, for example. He was a Harrow boy."

"Yes," replied Lamb dryly, "and take Burns. He was a ploughboy."—C.G.C.C., Strathfield, in "The Sydney Morning Herald."

The Cow and the Car—Stock Route Wisdom.

"A man who does not stop his car when a herd of cattle is on the road is a menace and a fool." That was the view expressed by a magistrate at Truro, Nova Scotia, when delivering judgment regarding the circumstances of the decease of a wandering bovine. The magistrate also said that no driver can determine what a cow is going to do, and that the onus is therefore upon the driver.

The "Montreal Gazette," in an editorial, treats the subject with serious humour: "Nothing could be more true than the facts set forth in his Worship's final sentence. Nobody knows what a cow is going to do—not even the cow. The motorist finds himself upon the horns of a dilemma. He wishes to pass the cow but he has no means of knowing where the cow will be when he arrives. He has little stomach for it, whereas the cow has four. The driver has no preconceived antipathy towards the cow; indeed, the milk of kindness may be in him. His ordinary sentiment in the matter of cows is one of goodwill and esteem. He has no desire to injure either hair or hide of the ruminant ruminating in the highway; but the cow, preoccupied with gustatory problems peculiar to its field of activity, has a tendency to gyrate. The cow, in moments of abstraction common to all deliberative mammals, college professors, etc., is subject to unpremeditated and therefore unforseeable vagaries of locomotion. These are distinctly embarrassing to the automobile driver, whose only safe course, particularly in view of this recent judgment, is to go back a few miles and detour. It is difficult, in the light of personal experience, to completely stifle all sense of sympathy for the Truro offender who is thus left to chew upon the cud of his melancholy reflections. But there is a point of great importance involved. A way out has been found for the ordinary human biped, who has no right of way. All that he has to do now is to look like a cow."—From "Things We Talk About," by "Himi," in the current "New Zealand Farmer."

Milking Machines—Importance of Proper Care.

Discussions as to the practical success of milking machines have continued since they were first introduced. Milk and cream from herds milked by the aid of machines have, on occasions, been inferior to that produced by hand milking. Investigations into the cause of the inferiority have frequently shown that the dairyman possessed insufficient knowledge of the proper operation of the machine, or possibly the type of machine used did not lend itself to speedy and convenient dismantling, cleansing, and sterilising. When proper care is taken and the machines are of reputable make (writes a departmental dairy instructor) the milk produced by machine milking should be equally as good as, if not superior to, that produced by hand milking.

A good machine should preferably have the joints coupled with metal unions to prevent the milk line sagging after it has been in use for a few months. The line running from the vacuum tank to the vacuum pump should have joints similar to those in the milk line, in order to allow for simple dismantling and to ensure air-tight joints whenever it is necessary to disconnect and re-erect the plant. Some older types of machines have this line constructed of ordinary galvanised iron piping and sockets. This renders cleansing difficult, due to the uneven interior surfaces, dismantling unsatisfactory, and the development of air leaks unless particular care is taken.

Milking machines must not be regarded as complete milkers, but only as a method of removing the flush milk from the cow. Stripping by hand is usually necessary. A satisfactory method of determining how long the machine should be allowed to remain on a cow is by grasping the milk line running from the claw to the main line. If this is still warm, the flush of the milk has not been removed, but should it show signs of cooling off, then the machine should be removed.

Care should be taken to see that the cups are not left on too long, also to see that too high a vacuum is not maintained, as these practices may injure the udder of the cow. The vacuum on most plants should not exceed 15 inches.

The cleansing of machines is simple, but must be carried out in a regular and thorough manner. Once neglected, it becomes a difficult matter to restore them to their original sanitary condition.—A. and P. Notes, N.S.W. Dept. Agric.

A Heavy-weight Pig.

Mr. R. G. Watson reports having sold recently a very heavy-weight Large White sow pig which on slaughter dressed 465 lb., from which it was estimated that her live weight was approximately 700 lb. It is not often that pigs attain such weights.

The High Cost of Doing Nothing.

Following are extracts from a recent talk broadcast by the Editor from the National Station, 4QG, Brisbane, by courtesy of the Australian Broadcasting Commission:—

In Queensland moisture is predominantly the limiting factor in pastoral production, and consequently the natural water supply affects the economic structure of the State. To anyone with a knowledge of our Western country, how pleasant it was to read recently of widespread rainfall over a large extent of our sheep and cattle lands of, for instance, the Bulloo running a banker at Tambo, and 5 miles wide in places. Except for a few overshot dams here and there on station property what have we done to conserve at least a proportion of that enormous volume of water for seasons in which the monsoonal downpours may not be so generous? There is scope there, surely, for a really national policy. The cost would be tremendous, of course, but the cost of doing nothing, as expressed in the loss of stock in dry times, may be very much greater.

Queensland is remarkably rich in the number and nutritive value of our native grasses, and a strong characteristic of many of them is drought resistance. Nearly 80 per cent. of the State's income is derived from our grasslands. Grass is, therefore, the most important crop in the whole range of the State's production. In our grasslands we have obviously a wonderful asset and a great inheritance. What have we done, or are we doing, to prevent that asset from vanishing, and to preserve that inheritance? Happly a "grass consciousness" is growing, presumably because the high cost of doing nothing is now included in our reckoning.

Queensland possesses a delightful climate for most of the year. A winter in our Western country is superb. Our bore waters have all the virtues of much advertised European spas. What have we done to develop a tourist trade for the interior? Every district has some natural feature or some charm of climate and landscape that would attract "paying guests" in their hundreds if they knew anything about it. In Canada, the tourist trade ranks with paper and wheat in revenue importance. Have we seriously calculated the high cost of doing nothing in this connection? We mean that, of course, in respect of district or local effort which could well be co-ordinated with the central directive tourist services, the efficiency and value of which are not questioned for a moment.

Queensland has immense areas of fertile country, and every type of soil from the lighter loams to heavy black alluvia and volcanic deposits of extraordinary depth and richness is represented. Is it not time that we calculated the cost of doing nothing—in a national way, of course—to preserve our soils from wind and water erosion? Erosion takes twenty times as much plant food from the soil as the hungriest crop. In the ten years between 1923 and 1933 30,000,000 acres of agricultural land were destroyed by soil erosion and ultimately abandoned in the United States. Within forty years 90 per cent. of cultivable soil has been washed away in parts of British East Africa. This is what a Commission appointed by the Union Parliament reported recently:—There was very little evidence of change of climate, but that since the beginning of European settlement enormous tracts of country had been more or less denuded of the original vegetation, with the result that rivers and waterholes had dried up. The consequent prospect was stated in this alarming way:—"The simple unadorned truth is sufficiently terrifying without the assistance of rhetoric. The logical outcome of it all is the great South African desert, uninhabitable by man." The report goes on to say:—"The quantity of rainfall shows little variation; its utility has certainly diminished, for the quantity absorbed by the soil is continuously decreasing, and for this man is responsible."

The tremendous losses of soil by erosion in every country in historic times is known to every student. China furnishes a particularly sad example. In his book "Travels and Men," published last year, the renowned traveller and author, Mr. J. H. Curle, writing of the Yunnan Province, calls it an ugly barren country, a portion of only too much of China. "There is hardly anywhere a tree. Hardly anywhere a shrub—and often not even Nature's covering of grass. At daybreak, far up, far up the mountain sides you see coolies tearing the grass out by the roots; in the afternoon staggering under their loads they carry it down to the villages. China has long ago been stripped, wherever there is population, of her timber and low-lying scrub. When the rain comes there is nothing to prevent erosion, and the face of the land, certainly of each mountain and hillside, has become deeply scarred with a thousand water channels, which widen as the years go by.

"It is a ghastly sight. The result of centuries of misgovernment and greed; of the steady diversion of public money from afforestation. . . ." Against that he quotes Japan. "Consider," he says, "the face of Japan. It is a mosaic on all

its uplands of splendid forests and groves and glades and endless undergrowth. When a great tree is cut down for its timber it is replaced. When a grove of bamboos is taken for its many utilitarian purposes, another is planted. Nothing is let to run down. No area is wasted. And if it be Government property, no money is misapplied. Japan's timber, and all her greenery, are to her a mighty asset; they are perhaps the truest measure of her civilisation—and of China's.''

There is a lesson in that comparison for every Queenslander interested in the wellbeing of our primary industries; in fact, every Queenslander who is interested in the whole future of this country.

The causes of erosion are various, but the primary and most important cause is the widespread destruction of forests and other soil-binding and soil-retaining vegetation. Every farmer on our coastal river catchment areas, as well as every producer in our back country, can see in his own neighbourhood what damage to both agricultural and grazing country unchecked soil erosion can do—damage quite unnoticed until, in many cases, the land has been robbed of its natural fertility by sheet erosion, or become so broken as to be useless not only for cultivation but for grazing also. It is no exaggeration to say that in Australia almost every acre of sloping farm land, and much that is out of cultivation, in the higher rainfall zones is being affected by soil erosion. Only in recent years has any notice been taken of it, and only then by those to whom the plain facts have become apparent. Through the action of wind and water, depreciation and destruction of land have become definitely a serious national problem demanding immediate and adequate attention.

In regard to such a problem, China provides a classic example of the high cost of doing nothing—a cost that is paid annually in famine, death, and economic servitude.

Coming back home, it is only fair to say that in Queensland—or should we say Australia—neglect and improvidence, although considerable, are not the most important factors in creating the menace of erosion of farm lands. The hand of man is more evident in the destruction of forests, the natural consequence of which is water erosion and increasing severity of floods. The worst floods ever known in Victoria occurred last year. There a part of the continent, once covered by dense forests, and with a comparatively heavy rainfall, has been stripped of its natural protection. Forests are natural reservoirs, retarding the flow of rain water from the hills, and facilitating evaporation. There it has been found that as timber reserves and catchment areas the hill country is a valuable asset; denuded of trees and shrubs it becomes a dangerous liability and a menace to productive farmlands miles away. Fortunately, it may be said in this regard that the high cost of doing nothing has been recognised by Commonwealth and State Governments who are alive to the urgency of the problem.

That leads us to a concluding suggestion that in all these questions of definite national importance, while we are calculating the high cost of doing an essential job, we might well consider just as keenly the high cost—possibly the ruinously high cost of doing nothing.

The Agricultural Show.

Since the dawn of civilisation, the agricultural fair has been regarded as a great social asset, a factor quite apart from the facilities for trade and barter and the enlarged educational outlook consequent on new things seen and heard. In the early ages, religious festivals offered outlets for trade, and in the Code of Khammurabi, the Babylonian Emperor, B.C. 2250, the law is laid down for proper conduct of trade, based on the experience of the previous 1,000 years since the reign of Sargon of Sumeria in B.C. 3800. In China, the Emperor Fu-hi in B.C. 2852 issued orders regarding agricultural fairs which were comprehensively dealt with by his successor, the great agriculturist, Shunnung. The festival at Delos and the Olympic games in ancient Greece were merely the opening days of gigantic fairs, and in ancient Italy the vast annual assembly at Voltumna merged itself into a famous mass meeting for social intercourse and trade. India with its great annual fair at Hurdwar on the upper Ganges, Russia with Nijni Novgorod, Germany with Leipsic and Frankfort, England with Stowe, Barnet, and Nottingham, all in turn have passed the torch westward to Canada, where at Toronto, the Canadian National Exhibition or fair, for that is what it really is, and the Royal Winter Fair stand at the present day in the direct line as among the greatest annual agricultural fairs. Modern invention may claim to have displaced many methods of an older generation, but the radio, the telegraph, the motor car, and every other modern invention seem merely to have conspired to solidify the wisdom of the ancients in providing the thrill of an ever-widening social circle and the opportunity for a generous education through personal experience in the agricultural fairs of to-day.—''The Journal of Agriculture,'' Quebec (Canada).

DURABLE WHITEWASHES.

The following formulæ for making whitewash have been taken from U.S.D.A. Farmers' Bulletin 1452, *based on formulæ in National Lime Association Bulletin* 304-*B*:—

Whitewash No. 1 (for sheds, &c.).—Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, and add it to a solution made by dissolving 15 lb. of common salt in 7½ gallons of water, mixing thoroughly. Thin with more water.

Whitewash No. 2 (for sheds, &c.).—Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, and add about 4 gallons of hot water. While stirring vigorously pour into the lime mixture a solution made by first dissolving 12 lb. of salt and 6 oz. of alum in about 4 gallons of hot water and then adding 1 quart of molasses. Thin with water.

Whitewash No. 3 (for high-grade work).—(*a*) Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, add about 4 gallons of water, allow to cool. (*b*) Dissolve 3 lb. of borax (better, trisodium phosphate) in about 3 gallons of skimmed milk (better, in 1 gallon of water, which is afterwards added to 5 lb. of casein previously softened for two hours in 2 gallons of hot water). (*c*) Dissolve 3 pints of formaldehyde in about 3 gallons of water.

When the paste (*a*) and the milk (or casein solution) (*b*) are thoroughly cool, slowly add the milk (or casein solution) (*b*) to the lime (*a*) stirring constantly. Just before using slowly add the formaldehyde solution (*c*) to the batch, stirring constantly and vigorously. Adding the formaldehyde too rapidly may cause the casein to jell, thus spoiling the mixture.

Caution.—If all of this mixture cannot be used in one day, use only a half or third, or other fractional part of each of the three parts (*a*), (*b*), and (*c*), and mix the rest as desired, since a fresh solution each day gives better results.

In all of these directions, one sack (50 lb. of hydrated lime, which has been well protected from the air, can be used in the place of freshly slaked lime. In No. 1 the hydrated lime can be added directly to the salt solution; in Nos. 2 and 3 it should first be made into a paste by mixing it thoroughly with about 7 gallons of water.

Whitewash No. 4 (disinfectant whitewash).—For a mild disinfectant or insecticidal whitewash, add a quart of crude carbolic acid to the whitewash obtained by slaking half a bushel (38 lb.) of quicklime, or by mixing a sack (50 lb.) of good hydrated lime with water.

For strong germicidal whitewash, add 2 quarts of crude carbolic acid to the whitewash.

Whitewash No. 5 (disinfectant whitewash, small quantity).—Dilute 1½ quarts of commercial lime-sulphur with about 3 gallons of water and add 3 teaspoonfuls of common salt, previously dissolved in a pint of water. To this solution add, while stirring constantly, a lime cream made by mixing a heaping quart of good hydrated lime with water (or by slaking about 2½ lb. of fresh quicklime and straining through wire fly screen).

GENERAL SUGGESTIONS.

In using quick or burnt limestone care must be exercised in adding the water if good results are to be attained. Add the water a little at a time to the lime in a clean wooden pail, keg, or barrel. When slaking is well started add more water gradually to replace that lost in the slaking process. If not enough water is added the lime will become "sorched," and part of it will be granular. On the other hand, if too much water is added at one time it may retard or "quench" the slaking process. After the lime is completely slaked add enough water to make a thick paste, cover the container, and allow to stand for several hours or overnight.

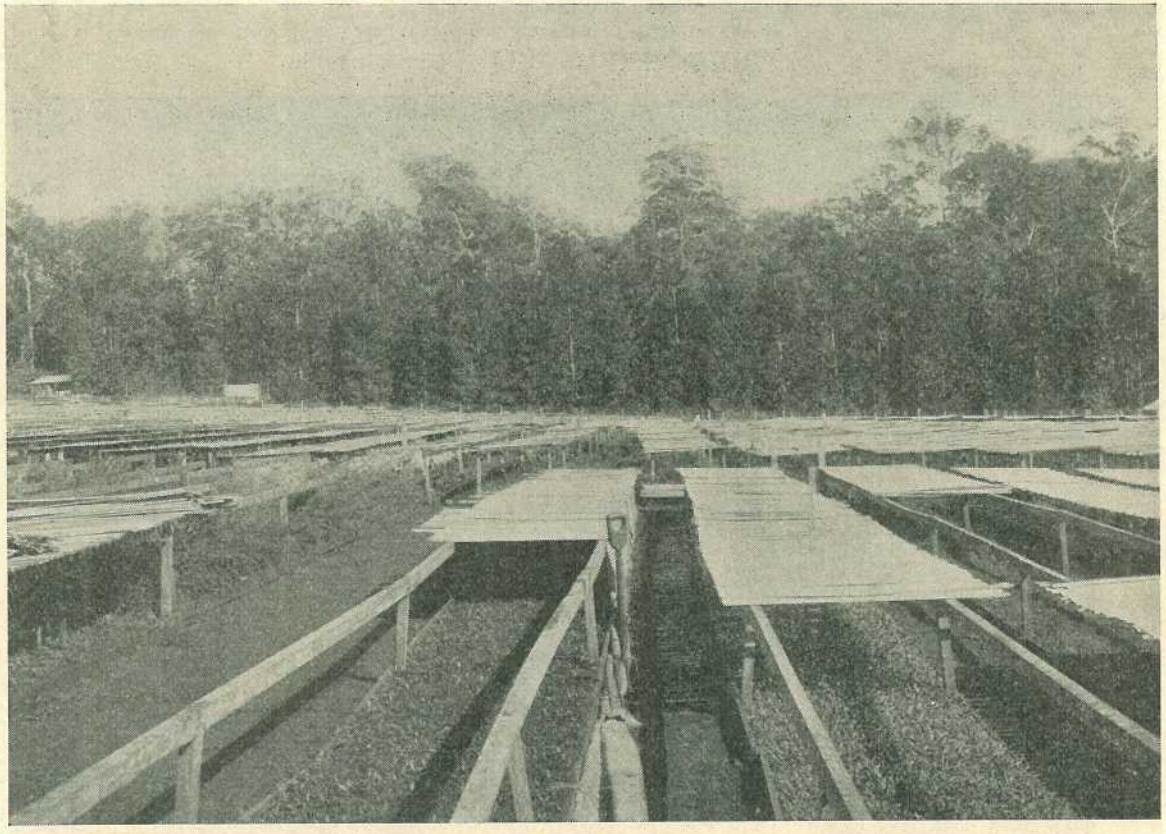

PLATE 161.
SECTION OF A FOREST SERVICE NURSERY (SHOWING KAURI PINE SEEDLINGS IN FOREGROUND).
Seventeen forest nurseries have been established in Queensland, in which, at 30th June, 1935, 4,000,000 trees were in stock. [*Photo. by J. A. Lunn.*

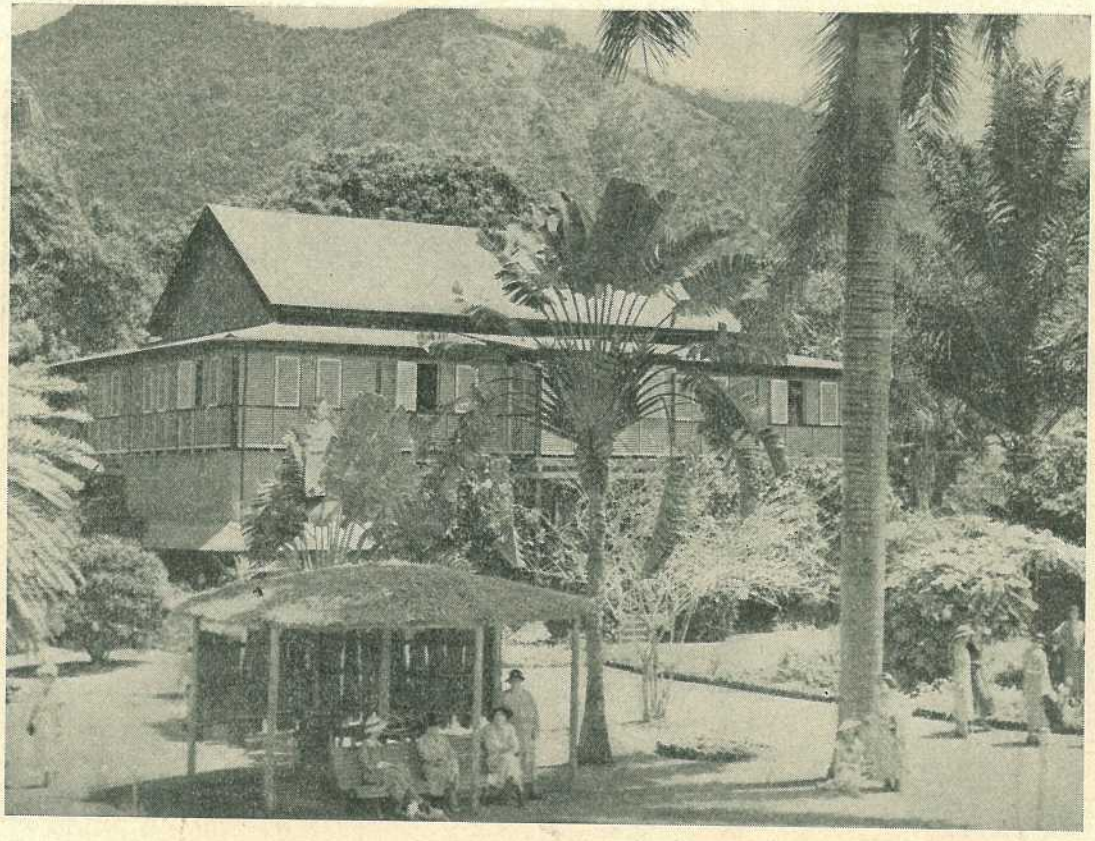

PLATE 162.—MORNING IN A GARDEN NEAR CAIRNS.
North Queensland is noted for home gardens of infinite charm and gorgeous colouring of tropical shrubs and flowers.

[*Photo. by courtesy of "The Telegraph," Brisbane.*

PLATE 163.
NEAR THE END OF THE DAY.
A coconut palm grove on a sugar cane plantation near Mackay.

[*Photo. by courtesy of "The Telegraph," Brisbane.*

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.

SLEEP AND REST.

EVERYONE knows that bad feeding ruins many babies, but few people realise the damage done by not ensuring a full and regular allowance of uninterrupted sleep and rest every day throughout infancy and early childhood. During sleep Nature repairs the worn-out parts and attends to the growth of the whole organism; hence it is that when rapid growth is taking place Nature demands a maximum amount of sleep.

How Much Sleep is Needed?

In the first month of life a baby should sleep nine-tenths of his time.

At first all the time not needed for feeding, bathing, &c., is devoted to sleep; but after the first month or so a baby wants more and more waking hours for crowing and kicking, and, indeed, for practising and enjoying the use of all the growing senses, faculties, and powers of body and mind. At six months of age a healthy baby can enjoy himself for six or eight hours a day. By the time he is a year old (allowing a night of twelve hours' sound sleep) a baby should still have as much as three hours of day sleep—say, two hours in the morning and one in the afternoon, given at the same time every day.

Baby's Rights with Regard to Sleep.

How many modern babies are sure of their rights in these most important matters—the "night sleep" and the "day sleep"? Many town babies accompany their mothers to the pictures from the time

they are a year old, and there are few infants whose periods for day sleep are kept sacred and inviolate. Of course, one fully recognises that the modern mother is beset with difficulties arising out of the fact of her not being able in most cases to get any helper or understudy to look after the home while she takes necessary outings, does her shopping, &c. However, the first thing is to recognise what the baby ought to have—and indeed must have—if the most perfect development of manhood or womanhood is to be attained, proper growth of body, mind, and character, all inseparably bound up and dependent on one another.

One notices, too, that even where there is no excuse of over-work or lack of help for the mother babies are often no better off, simply because people have no idea that it does a small child any serious harm to be trapsed about all over the country on Sundays or holidays, or, indeed, on any occasion where the parents may have the opportunity of getting off the chain themselves. Again, one sees weary, fretful, or precociously lively babies, or small urchins kept up every evening for an hour or so "because father likes having them about after he comes home."

Insufficiency of Sleep and Over-stimulation.

Our main purpose to-day is to draw attention to the fact that stunting of growth and development, nervousness, and all-round instability and precocity may result from robbing a child of its proper sleep, and from stimulating it when it ought to be at rest and growing.

Any kind of over-stimulation or over-exertion is injurious to children. One frequently sees small children made nervous, high-strung, irritable, and capricious by being habitually dragged about in the evening long after bedtime to the point of weariness and fatigue—this being done by parents devoted to their offspring, but without any idea as to what a child needs in the way of regularity, early hours, and unbroken sleep and rest.

IN THE FARM KITCHEN.

MAKE MORE USE OF TREACLE.

Some of the ways in which treacle can be used in cooking are:—

1. Add a tablespoon to a rich fruit cake mixture to darken it. One tablespoon is enough for ¾-lb. flour.

2. Use for darkening a plum pudding in the same proportion as given in No. 1.

3. Mix with equal quantity of castor sugar and rub into the scored fat of a boiled ham. Prick with cloves and bake ham till crisp.

Forfar Crisps.

Take 3 oz. treacle, 2 oz. castor sugar, 3 teaspoons baking powder, ¼ gill milk, ¼ lb. rolled oats, ½ teaspoon salt, 1½ tablespoons melted butter.

Grease a baking sheet or tin. Put rolled oats through a mincer into a basin. Mix with baking powder, salt, and sugar. Stir in butter, milk, and treacle. Mix well. Flour the pastry board with 2 tablespoons of rolled oats. Turn dough on to board. Roll out and cut into narrow strips, 3 to 4 inches by 1½ inches. Place on baking sheet or in baking tins. Bake for twenty minutes in a moderate oven, then turn out and cool on a cake rack.

Treacle Toffee.

Take 1 lb. treacle, 4 oz. fresh butter, 6 oz. sugar, 2 oz. almonds.

Put the treacle, sugar, and butter in a saucepan. Place over heat. Bring to the boil. Boil for about twenty minutes, stirring constantly. Remove from heat. Add minced almonds, or any other nuts preferred. Pour into a greased tin. Leave till set, then break roughly.

Ginger Wafers.

Take 2 oz. treacle, 1 oz. butter, ½ teaspoon ground ginger, 1 oz. flour, ½ teaspoon allspice, 1 oz. sugar.

Grease a baking sheet or tin. Heat butter, treacle, and sugar till butter is melted. Turn into a basin. Stir in flour sifted with the spices. Place teaspoonfuls of the batter on baking sheets or tins, in rounds, leaving them plenty of room to spread. Bake till brown. Cool a little. Remove with a palette knife. Roll loosely round a buttered handle. The top of wafers should be on the outside. When set, cool and fill with whipped sweetened cream.

Treacle Spiced Pudding.

Take 1 tablespoon treacle, 4 oz. breadcrumbs, 1 egg, ½ oz. candied orange peel, 1 tablespoon castor sugar, 3 oz. cleaned currants, 1 pint milk, pinch salt, ½ teaspoon ground cinnamon.

Butter a pie-dish. Measure the crumbs into a basin. Heat milk to boiling point in a saucepan and pour over breadcrumbs. Stir in all the other ingredients, mincing the peel and adding the treacle last of all. Stir well. Bake in a moderate oven for forty-five minutes. Enough for four persons.

Treacle Parkin.

Take 1¾ lb. treacle, 1¼ lb. flour, 1 lb. butter, ½ oz. ground mace, ½ oz. grated nutmeg, 1 lb. medium oatmeal, 1 lb. moist sugar, 1 oz. ground ginger, 3 oz. candied peel, ½ teaspoon bicarbonate of soda.

Sift the flour into a basin. Rub in butter with tips of fingers. Mix in oatmeal, sugar, spices, and soda. Heat the treacle until it will run easily, then stir into other ingredients, mixing all well together. Divide mixture between two buttered baking tins. Bake in a moderate oven for 1½ hours. Leave parkin in tin until almost cold, then turn out and cut into squares.

Treacle Duff.

Take 2 tablespoons treacle, ¼ lb. flour, ¼ lb. cleaned currants, pinch salt, ¼ lb. breadcrumbs, ¼ lb. shredded suet, ¼ lb. raisins, 1¾ gills milk, 1 teaspoon baking powder.

Mix the flour, sifted with baking powder and salt, with suet and breadcrumbs. Add prepared fruit. Stir in treacle and enough milk to make a stiff batter. Beat batter well, then pour into a greased basin. Cover with buttered paper and steam for about 2½ hours.

STANTHORPE APPLES FOR DESSERT.

Granny's Nightcaps.

Take 6 or 8 apples, 1 teaspoonful apricot jam for each apple, 1 tablespoonful brown sugar for each apple, pastry as required.

Roll out the pastry and cut it into as many squares as there are apples. Peel and core the apples without breaking them. Spread each square of pastry with apricot jam. Stand the apple on it. Fill the hole in the apple with sugar. Close up the pastry round the fruit. Press the edges well. Bake the apples on a greased tin in a brisk oven till the pastry is nicely browned. This will take about twenty-five minutes, according to the size of the apple.

Apple Glace.

Take two large, firm, red apples, cold water, sugar, angelica, cream to serve.

Wash apples and core them. Beginning at the stalk end, peel them about a third of the way down and place in a saucepan. Make a thin syrup with a third of a cup of sugar and half a cup of water boiled together for about six minutes. Pour over the apples, cover the pan closely, and cook very slowly over a small gas-burner until tender, basting occasionally. Remove cover, place 1 teaspoonful castor sugar in the hollowed out part of each apple, and put beneath a grill or in a hot oven until sugar is melted. This should coat the apples and give them a transparent, shiny look. Decorate with leaves of angelica, and serve with cream or custard.

Apple Shape.

Take 1 lb. apples, 1 lemon, 3 oz. sugar, ¾ oz. gelatine, water.

Peel and core apples. Cut into small pieces and put into a saucepan. Add sugar, half a pint of water, and the grated rind and strained juice of the lemon. Cook until tender. Dissolve gelatine in half a gill of hot water. Rub apples through

a sieve, then stir in dissolved gelatine. Pour into mould rinsed out with cold water, and leave to set. Serve if liked with custard. A very pretty effect can be obtained by colouring half the apple puree with a little cochineal.

Apple and Quince Mousse.

Take 5 oz. peeled apples, 1 quince, 2½ oz. sugar, ½ pint lemon jelly, 1 egg-white, strip lemon rind.

Dissolve jelly crystals in boiling water, making half a pint of liquid in all, and leave to cool. Cover the bottom of a saucepan with a little water, put in the peeled and cored apples, quince, lemon rind, and sugar, and simmer until quite soft, then put through a sieve. When the jelly is beginning to set, beat it up together with the apple puree, mixing thoroughly. Beat the egg-white to a stiff froth and fold in the mixture. Pour into a mould and leave to set. Serve as cold as possible.

Grated Apple Pudding (Iced).

Take 1 lb. sweet apples, 1 lemon, castor sugar to taste, ¼ pint cream, a few drops cochineal.

Take the apples, peel and quarter them, and grate them on a coarse grater. Take the lemon and grate part of the rind, adding a few drops of the juice. Unless this pudding is served at once it is apt to turn brown; therefore, it is wise to add a few drops of cochineal. Place the mixture in custard cups or any other glass cups, ice thoroughly, and serve with slightly sweetened, whipped cream on the top of each cup. Garnish with chopped nuts.

Apple Jam.

Take 4 lb. apples (peeled and cored), rind and juice 1 lemon, 1½ oz. lump ginger, few cloves, 1 pint water, allow ¾ lb. sugar to every pint of pulp.

Wipe the apples, peel them very thinly, cut into quarters, and take out the core. Cut the lemon rind thinly and tie in a piece of muslin with a few cloves and the bruised ginger. Put the apples into a preserving pan with the water and flavourings and cook gently till soft. Take out the muslin and rub the apples through a sieve. Measure the pulp and allow the sugar in proportion. Return to the pan with the flavouring bag. Add the lemon juice and sugar, cook slowly till the sugar is dissolved, then boil until it will jelly when cold. Take out the flavouring bag before potting the jam.

Apple and Onion Ketchup.

Take 12 tart apples, 2 minced onions, 1 level teaspoonful mustard, 1 level teaspoonful ground cloves, 2 level teaspoonfuls ground cinnamon, 1 small level tablespoonful salt, 1 pint pure malt vinegar, 6 oz. castor sugar.

Pare, quarter, and core the apples. Place them in a saucepan with water to cover. Simmer them till soft, when all the water should be evaporated. Rub the apple pulp through a sieve. Add to each quart the other ingredients given. Should the apples not be large enough to yield a quart, it is better to cook a few more than to alter the quantities of the other ingredients. Simmer the ketchup for one hour and bottle.

Apple Chutney.

Take 6 lb. apples (after being peeled and cored), 2½ pints vinegar, ¾ lb. onions, 1 lb. raisins, 1 lb, brown sugar, 3 tablespoonfuls salt, 2 teaspoonfuls ground ginger, 6 chillies.

Peel and core the apples and weigh them. Chop them up or grate finely. Wash, dry, and stone the raisins. Crop them. Peel and grate the onions. Put all the prepared ingredients into a pan, add the sugar, vinegar, chillies, ginger, and salt. Stir them all together. Bring to the boil and boil the chutney gently for about twenty minutes. Choose sour apples for this chutney.

A Tasty Ham Dish.

Ham and eggs are always popular for breakfast, but to vary the menu in serving them plain make these delicious little ham cakes, and when serving place a fried egg on the top of each garnished with a sprig of parsley:—

Mince ¼ lb. of cooked ham with a small onion. Mix with ½ lb. cold boiled potatoes and mash well together. Then add a little chopped parsley and salt and pepper to taste, also a little tomato sauce if liked. Divide into three portions and make each into a flat, round cake. Fry carefully in a little hot fat, and then place the egg on the top and serve hot with crisp toast and a nice cup of tea or coffee or cocoa.

Orchard Notes

MAY.

THE COASTAL DISTRICTS.

IN these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of blue-mould infected or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month, and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

CLEAN up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place, as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweeetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manures—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland, and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

Farm Notes

MAY.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland. Prairie grass seed should be treated with formalin or a reliable mercury dust before sowing.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

A HOME-MADE VYCE.

This vyce will hold a piece of wood as tightly as an iron vyce will. One would need a piece of 8 inches by 1½ inch as high as the table, and another piece of 5 inches by ⅞ inch two-thirds the height of the table. A block 4 inches by 1 inch by 4 inches is nailed on to the big piece half the way up, and a hinge is put on to this and the smallest piece of board. The big piece is then let in at the top, as in the diagram,

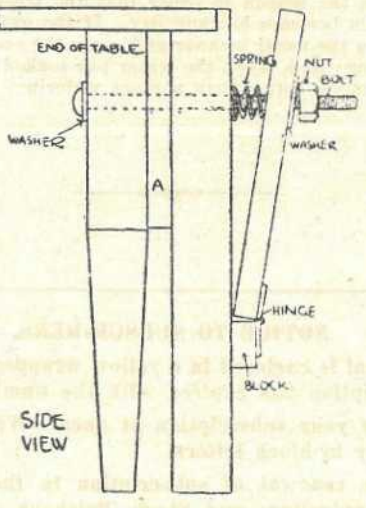

PLATE 164.

and is nailed on to A. A hole is then bored through all these, and a bolt is put through with a washer on both ends. A spring is put between the two boards with a nut on the end. With a spanner it is an easy matter to tighten the nut. This bolt needs a thread from the outside of the moving jaws when shut to the end.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1936.	Feb., 1935.		Feb.	No. of Years' Records.	Feb., 1936.	Feb., 1935.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	10·52	35	15·18	7·63	Clermont	4·22	65	2·42	1·08
Cairns	15·70	54	29·57	14·94	Gindie	2·76	37	..	0·77
Cardwell	16·63	64	51·31	10·72	Springsure	3·87	67	0·93	1·09
Cooktown	13·65	60	22·61	6·49					
Herberton	7·90	50	10·43	4·64					
Ingham	15·85	44	41·74	7·95					
Innisfail	22·36	55	53·89	16·21					
Mossman Mill ..	17·91	23	29·15	11·48	*Darling Downs.*				
Townsville	10·99	65	28·70	0·60					
Central Coast.					Dalby	2·86	66	0·61	1·47
					Emu Vale	2·59	40	0·28	3·86
					Hermitage	2·48	30	..	1·25
Ayr	8·81	49	28·61	2·51	Jimbour	2·67	48	0·45	2·49
Bowen	8·66	65	16·67	4·98	Miles	2·71	51	1·64	0·36
Charters Towers ..	4·40	54	7·66	2·15	Stanthorpe	3·20	63	0·48	3·15
Mackay	11·47	65	27·99	16·59	Toowoomba ..	4·58	64	1·47	3·67
Proserpine	12·16	33	29·98	17·41	Warwick	3·08	71	0·91	2·84
St. Lawrence ..	7·78	65	5·30	3·19					
South Coast.									
					Maranoa.				
Biggenden	4·48	37	1·59	3·09					
Bundaberg	6·64	53	1·27	6·32	Roma	2·91	62	1·72	0·97
Brisbane	6·28	85	1·27	5·59					
Caboolture	7·92	49	1·61	7·28					
Childers	6·86	41	1·92	4·22					
Crohamhurst	13·14	43	2·09	16·03					
Esk	5·55	49	2·05	3·91					
Gayndah	4·29	65	0·87	5·15					
Gympie	6·87	66	2·00	8·35	*State Farms, &c.*				
Kilkivan	4·99	57	1·67	3·04					
Maryborough ..	6·88	65	2·46	7·04	Bungeworgorai ..	2·15	22	..	0·75
Nambour	9·90	40	3·30	15·64	Gatton College ..	3·60	37	2·03	5·98
Nanango	4·13	54	1·64	3·49	Kairi	9·89	22	..	7·79
Rockhampton ..	7·75	65	4·69	3·79	Mackay Sugar Experiment Station	10·49	39	27·21	15·44
Woodford	8·61	49	0·85	9·28					

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure, Means 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	29·74	88	72	99	2	69	23, 24	2,261	19
Herberton	..	81	67	89	1, 2	57	25	1,043	15
Rockhampton	29·89	87	72	96	24	66	3	469	10
Brisbane	29·97	84	68	92	22	63	1, 20, 27	127	15
Darling Downs.									
Dalby	29·83	90	64	103	23	57	1	61	6
Stanthorpe	..	83	59	96	23	50	1	185	3
Toowoomba	..	82	60	97	23	56	1	147	10
Mid-Interior.									
Georgetown	29·77	93	75	102	3	73	1, 20, 23	500	17
Longreach	29·81	97	75	105	8	71	19	57	6
Mitchell	29·90	91	68	101	22, 23	63	3	285	6
Western									
Burketown	29·73	92	78	107	3	73	1, 22	459	12
Boulia	29·77	99	76	108	8	68	12	249	6
Thargomindah	29·83	95	75	104	5, 9	67	12, 13	136	3

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1936.		May, 1936.		April, 1936.	May., 1936.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					p.m.	p.m.
1	6·2	5·50	6·18	5·20	2·29	2·4
2	6·3	5·49	6·18	5·19	3·2	2·34
3	6·3	5·48	6·19	5·18	3·33	3·5
4	6·4	5·46	6·20	5·17	4·3	3·35
5	6·4	5·45	6·20	5·17	4·33	4·9
6	6·5	5·44	6·21	5·16	5·3	4·47
7	6·5	5·43	6·21	5·15	5·35	5·25
8	6·6	5·42	6·22	5·14	6·10	6·13
9	6·6	5·41	6·23	5·14	6·45	7·4
10	6·7	5·40	6·23	5·13	7·27	7·58
11	6·7	5·39	6·24	5·12	8·14	8·57
12	6·8	5·38	6·24	5·11	9·7	9·57
13	6·8	5·37	6·25	5·11	10·2	10·59
14	6·9	5·36	6·26	5·10	11·1	12·0
15	6·9	5·35	6·26	5·10	..	..
					a.m.	a.m.
16	6·10	5·34	6·27	5·9	12·5	1·2
17	6·10	5·34	6·27	5·9	1·7	2·6
18	6·11	5·33	6·28	5·8	2·11	3·12
19	6·11	5·32	6·29	5·8	3·16	4·19
20	6·12	5·31	6·29	5·7	4·23	5·28
21	6·12	5·30	6·30	5·7	5·30	6·37
22	6·13	5·29	6·31	5·6	6·42	7·42
23	6·13	5·28	6·31	5·6	7·53	8·44
24	6·14	5·26	6·32	5·5	9·0	9·37
25	6·14	5·25	6·32	5·5	10·2	10·20
26	6·15	5·24	6·33	5·4	10·58	10·59
27	6·15	5·24	6·34	5·4	11·48	11·35
					p.m.	p.m.
28	6·16	5·23	6·34	5·3	12·28	12·5
29	6·16	5·22	6·35	5·3	1·2	12·35
30	6·17	5·21	6·35	5·2	1·35	1·5
31			6·36	5·2		1·35

Phases of the Moon, Occultations, &c.

7 April,	○	Full Moon	8 46 a.m.
15 ,,	☽	Last Quarter	7 21 a m.
24 ,,	●	New Moon	10 32 p.m.
28 ,,	☾	First Quarter	9 16 p.m.

Apogee, 6th April, at 3.36 p.m.
Perigee, 21st April, at 6.12 a.m.

On the 10th Mercury will be in the part of its orbit beyond the Sun and, technically, in superior conjunction with it; but Earth, Sun, and Mercury will not be exactly on the same straight line. The distance of Mercury from the Earth varies considerably. On this occasion it will be more than 128 millions of miles distant.

Jupiter, after moving slowly eastward amongst the stars of Orphincus, will apparently come to a standstill on the 10th of April and instead of getting into Sagittarius will appear to be moving slowly westward and continue amongst the stars of Orphincus until at the end of October it will reach Sagittarius.

On the 17th Mercury, still on the far side of its orbit, will be technically in conjunction with Uranus though the actual distance between the small and the large planet will amount to more than 1,700 million miles.

On the 19th at 7 a.m. Saturn will be 7 degrees south of the Moon, 4 hours after rising, but as the Sun will rise about an hour earlier a popular spectacle will be obviated.

A day later Saturn will be replaced by Venus at 8 p.m., four hours after setting.

On the 23rd at 2 a.m. Mercury and Mars will be about a degree apart when far below the horizon.

On the 25th the Sun will pass between Uranus and the Earth, the bigger planet then being more than 1,780 million miles beyond the Sun.

Mercury sets at 5.29 p.m. 21 minutes before the Sun on the 1st, and at 5.51 p.m., 16 minutes after it on the 15th.

Venus rises at 4.15 a.m., 1 hour 47 minutes before the Sun on the 1st; on the 15th it sets at 5.42 p.m., 7 minutes after the Sun.

Mars rises at 7.24 a.m., 1 hour 22 minutes after the Sun, and sets at 6.44 p.m., 54 minutes after it, on the 1st; on the 15th it rises at 7.17 a.m., 1 hour 8 minutes after the Sun, and sets at 6.21 p.m., 46 minutes after it.

Jupiter rises at 9.56 p.m. and sets at 11.44 a.m. on the 1st; on the 15th it rises at 9.5 p.m. and sets at 10.48 a.m.

Saturn rises at 4.8 a.m. and sets at 4.46 p.m. on the 1st; on the 15th it rises at 3.20 a.m. and sets at 3.56 p.m.

6 May,	○	Full Moon	1 1 a.m.
14 ,,	☽	Last Quarter	4 12 p.m.
21 ,,	●	New Moon	6 34 a.m.
28 ,,	☾	First Quarter	12 46 p.m.

Apogee, 3rd May, at 10.24 p.m.
Perigee, 19th May, at 12.36 p.m.
Apogee, 31st May, at 12.54 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.