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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The routine work of the dairy is reviewed in this issue by Mr. Graham, and his observations and practical advice are sure to receive the attention of all engaged in one of our most progressive industries. Mr. Graham's paper is also available in pamphlet form. In this issue the sugar-growers' interests are well served with first-hand information, particularly on the scientific side. Mr. Pollock has an interesting note on *Acacia arabica* as a fodder plant. The Queensland citrus industry is the subject of practical comment by Mr. Benson. Mr. Coleman contributes an informative note, to which is added something in the nature of a warning, on Wild White Clover. Poultrymen are well served by two articles, illustrated excellently, by Mr. Rumball, in which he discusses poultry rearing as a side line for orchardists and veterinary practice in caponizing. Mr. Shelton, too, has a practical illustrated note on stye and paddock accommodation for pigs. Fruit fly in the Stanthorpe district is the subject of a valuable report by Mr. Hubert Jarvis. Among selected matter is an extract from a memorandum prepared by the Sub-Committee of Civil Research (England) on the mineral content of natural pastures, and which was referred to by Mr. Brünnich in his valuable note on the same subject in our last issue. Readers generally will be pleased with the contents of the April number.

Queensland's Progress—A Visitor Profoundly Impressed.

At a civic reception in his honour at Brisbane recently, Dr. John R. Mott, chairman of the World Conference of the Y.M.C.A., made some striking references to Queensland's evident progress and prosperity. He had, he said, been impressed by the social legislation of Australia; by the way the youth of the nation had been safeguarded; by the way justice had been done to womanhood and old age; and by

the general comfort of the masses of the people. The sanity and effectiveness of the economic legislation made a profound appeal. Queensland, he added, had made unbelievable progress since he first visited Australia. It was a State that had the courage of its convictions, and ability to take the initiative and try experiments that were of profound interest and concern to the world. Increasingly it was becoming the gateway State of Australia. He had been impressed with the growth in the population of Australia; with the great material development; with the uncovering of apparently limitless resources, and the linking up by most modern means of communication of great sections of the Commonwealth. Politically, the unity achieved by the Commonwealth itself had appealed to him. After remarking that it would be wise for each of the Australian States to spend vastly more money on higher education, Dr. Mott added, in conclusion, that he knew of no mandate which had been administered with finer conscientiousness or better judgment than the one administered by Australia.

White Australia—Queensland's Part.

In the course of a previous Press interview, Dr. Mott observed that Queensland had the most important single part to play in the solution of the White Australia problem, because while she was trying to deal with the race problem, she had to find out whether Anglo-Saxons could thrive in the tropics. However, if the Portuguese and Spaniards were able to establish and maintain Republics for generations in the tropics, it did not strike him as an impossible proposition for Anglo-Saxons to do the same. Dr. Mott remarked that he had travelled over the world for thirty-seven years, and had visited fifty-eight different nations. His work had necessitated his calling more than once at different places, consequently he was in a position to observe progress or disintegration. He had no hesitation in saying that the spiritual tide in the world was rising rapidly. He meant spiritual in the large sense as contrasted with material.

Australia's New Rival in Wool Production.

The Divisional Officer of Economics, Markets, and Co-operation in South Africa claims that the fine wool of that country now takes pride of place in the world's market. He says: "As a result of the depreciation in the quality of the Australian wool clips overseas manufacturers have more and more come to look upon South Africa as a producer of fine-quality wool. Although South African wool has in the past been known for its good qualities, it has never attracted such universal attention as during the past few years, and especially during this season. This is also evident from the fact that Bradford is for the first time this year officially quoting our 80's wool. That the demand for wool of a fine quality is strong, and that Australia is no longer capable of meeting this demand alone, is also evident from the fact that South African wool markets have advanced from 5 to 10 per cent. above the Australian for wool of this class. South Africa has, therefore, become a formidable rival of Australia, and whether she is to retain this position, and even to strengthen it, depends on the enterprising spirit of the wool farmers of the Union. The difference between the prices of the fine and coarse wool will annually increase, and the farmer who adapts himself to the requirements of the market will find the undertaking a profitable one. It must also be remembered that Australia and other countries supply the world with wool of a coarser quality, and thus provide keener competition, while South Africa has the advantage of having a climate which is specially suitable for the production of fine wool, and thus easily able to adapt herself to this requirement." It is coldly comforting to know, in view of the foregoing, that South Africa, in building up her wool industry, has drawn without limit on the best of Australian fine-woolled stud flocks.

The Nation's First Need.

At a recent river excursion to mark the inauguration of the new phase of agricultural organisation under the Council of Agriculture, as authorised by legislation last session, the Deputy Premier and President of the Queensland Producers' Association (Hon. W. Forgan Smith) made a noteworthy speech, in the course of which he said that Queensland had made an earnest effort to organise the great producing interests of the State, with a view to placing those engaged in them on a sound footing, and to supply the needs of the people. Queensland was a country of great resources, dependent very largely on agricultural production. No nation could become great unless it was based on a sound system of agricultural production. That was particularly true of Queensland, which had a vast area of country with a small population, but the capacity to absorb a very large population. But, in order to establish her industries on a sound footing, organisation was necessary. It was of no use to ask men and women to go on the land and engage in the various activities associated therewith unless it were possible to assure them that, with a reasonable amount of industry, they would be able to enjoy a decent standard of living. These were days of high organisation of business of every kind, yet the most important industry of all in the past was the least organised. Products were grown without any knowledge of the market conditions. Men sowed and harvested without knowing what their return would be. The Queensland Producers' Association and its subsidiary bodies were formed to remedy that unsatisfactory state of things. The L.P.A. was doing a great service, not only for the producers, but also for the State as a whole. (A voice: And for the Commonwealth.) That was so, for Queensland led the Commonwealth in agricultural organisation. Naturally, there were considerable organising difficulties in the early stages. It was only to be expected that there would be some opposition. Under the old system very many persons found it a most lucrative business to speculate in the products of the soil. Now, however, the producers themselves had the organising of their own industry. One great essential was loyalty to one another and loyalty to their organisation. They must see to it that they elected to the various organisations men with a due sense of responsibility and trust—reliable men and capable men. If that were done there would be no doubt in his mind of the success of the scheme; they would be able to stabilise prices and eliminate waste. It was a good thing to meet socially as they were that day; it helped to bring them closer together, and to remove misunderstandings. The Government would continue to assist the L.P.A. and its subsidiaries in every way possible, and he wished the scheme increased and permanent success.

Council of Agriculture Justified by Results.

On the same occasion the Director of the Council of Agriculture (Mr. L. R. Macgregor) claimed that the results of the agricultural organisation scheme had amply justified the efforts and expenditure. That the policy was successful was demonstrated by the fact that 26,000 out of 30,000 farmers might be numbered within its ranks. While financial institutions demanded collateral securities such as freehold, it was impossible for a grower to obtain advances upon crops unless those freeholds were held by the grower. All but three of the marketing boards now in existence were organised under the present scheme. It would have been impossible for those boards to have carried out the important work of financing the producers unless the State Government had stood behind them with guarantees, and it was pleasing to be able to say that not a single loss had been incurred. On conservative lines he estimated that the direct benefits already reaped by the primary producers under the scheme was £500,000. There, however, still was a great deal more to be done in the way of organisation of agriculture. Mr. Macgregor concluded by paying a strong tribute to the Deputy Premier (Hon. Forgan Smith), whose assistance to the farming industry he acknowledged gratefully. Mr. Smith, he said, was something more than a capable administrator—he was an able statesman.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from Mr. W. Cottrell-Dormer, who is investigating cane pests and diseases, the following report (25th February, 1926) on the districts of Proserpine and Mackay:—

INSECT PESTS.

The So-Called Proserpine Wire Worm, *Rhyparida limbatipennis* Jacoby.

This heading is adopted in order to catch the eyes of Proserpine growers. Strictly speaking, the larva of this beetle is not a wire worm at all, it is a small, squat, creamy-coloured grub, measuring about ½ inch in length, including a rather small, light brown head; it also has six little legs placed fairly close together a short distance from the head.

This little grub attacks the sets, shoots, and roots of very young cane planted in June-August, during the month of July and until the end of November, and in some places, such as Proserpine, causes very heavy losses.

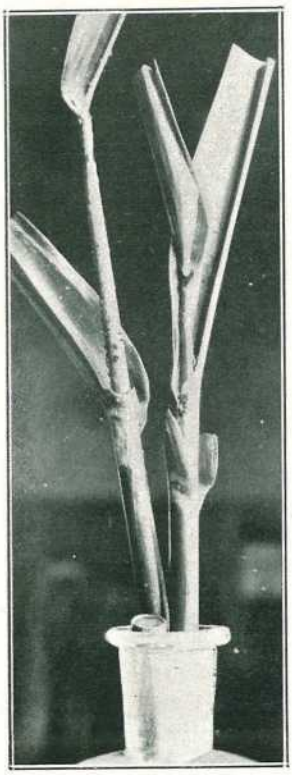


PLATE 80 (Fig. 1).

After going through a short pupal stake the grubs (larvæ) become beetles at the end of October and until the end of December. This beetle, *Rhyparida limbatipennis* Jacoby., which was kindly identified for me by Mr. H. Hacker, Entomologist

to the National Museum, is a small pale-brown insect, measuring about ¼ inch by ⅛ inch. Its chief distinguishing mark is the presence of two short thin dark lines, running longitudinally through the middle of each wing case (elytron). The feeding habits of the beetle are entirely different from those of the grub—the beetle feeds on the leaves of Shea Oak trees (*Casuarina*), and in places where the grub has done severe damage great numbers of this little insect can be found at the bases of the leaves, *i.e.*, close to where they join the stem, during the summer months.

Exactly what happens to the beetle during summer and autumn remains yet to be worked out. The spring brood of beetles may now lay their eggs in the soil and the larvæ, assisted by warm weather, go through a quick metamorphosis and form an autumn brood about April, or there may even be several overlapping broods during this time. At all events, the eggs are certainly not laid in the canefields, as damage does not occur during the summer months. On the other hand, the spring brood of beetles may live through until the winter. Mr. Hacker informs the writer

Plate 81 (Fig. 2).

that the beetle is very common under the bark of Eucalypts during the winter months, so that one brood of beetles evidently hibernates. Now many Chrysomelid beetles lay their eggs during autumn. In some cases these eggs hatch, and after feeding a short time the grubs go well down into the soil to spend the winter, as do the larvæ of the Frenchi beetle (*Lepidiota frenchi*), and then come up again in spring to complete their feeding, while in other cases the eggs do not hatch until the spring. It appears that our grub is by nature a feeder on grass roots, so that either of the above cases, but especially the former, would explain why it is that the grubs suddenly appear in the soil and play havoc with the young cane plants, since previous to planting the cane much grass is usually present during the autumn, unless green-manuring or crop rotation is practised.

PLATE 82 (Fig 3).

PLATE 83 (Fig. 4).

Control.

The above discussion immediately suggests three possible methods of controlling this insect:—

1. It has been stated above that the beetles feed on the leaves of Shea Oaks. Now, the writer has spared no efforts to discover some other feeding plant, but all in vain. *Rhyparida limbatipennis* has been responsible for more or less damage at Kelsey Creek, Up River, Waterson, and other parts of the Proserpine area, and at Netherdale, Sunnyside, West Plane Creek, and possibly other parts of the Mackay area. In all of these places the beetle was found in great or small numbers on the Shea Oak trees, which are common on almost every creek in both districts, but in spite of assiduous searching no beetles could be found on other plants. Again, it was observed that where no damage had occurred no beetles could be found. These observations do not prove anything, but they are very suggestive. The control measure they suggest is that Shea Oak trees be all cut down wherever the insect is troublesome. This method of control is to be tried by the Proserpine growers, some of whom are going to cut and keep down for at least one year all the Shea Oak trees over a length of 2 miles of the Proserpine River, where Rhyparida does its worst damage. This effort will, of course, be purely in the nature of an experiment.

Plate 84 (Fig. 5).

2. Instead of cutting down all Shea Oak trees a few suitable ones could be left standing and sprayed from time to time, during the spring and perhaps the summer months, with arsenate of lead, mixed, if necessary, with a spreader.

3. Since various factors seem to indicate that one brood of grubs or eggs may hibernate while the land is being prepared and the June-July planting done, clean fallowing or rotation with some crop likely to be distasteful to *Rhyparida limbatipennis*, such as cowpea, could be tried during the autumn months; corn and sorghum would probably be too closely related to the grasses to act as deterrents.

The Pale Brown Field Ant (*Iridomyrmex* sp. ?).

In the writer's report on the Tully district, mention was made of a severe damage done to cane at Euramo by a small pale-brown field ant. This ant was found to be very common in the Plane Creek area, at Alligator Creek, West Plane Creek, and in parts of Koumala. In all cases their presence was perceived by the occurrence of small mounds of loose granulated earth amongst the blady grass which grew thinly in such places. In no case was the infestation as severe as at Euramo, and in no case had more than inappreciable damage been sustained by cane. However, in one case at West Plane Creek a certain grower was unable to form a couch grass lawn tennis court owing to the activities of this field ant; but when the grass was all removed and a hard earth court formed, no further trouble was experienced.

The Soldier Fly Pest of Sugar-cane (*Metoponia rubriceps* Macq.).

This insect, which is fully described by Mr. E. Jarvis in a recent Agricultural Journal, has, it would appear, been responsible for very serious damage on 70 per cent. of one farm near Cattle Creek Mill. On this farm the larvæ, which are tough, greyish maggots, measuring about ½ inch in length, were very plentiful indeed in the soil at or about the base of cane stools, though no pupæ or adults could be found. The grower in question states that the adults are plentiful during April. One 4-acre field of first ratoon D.1135 last year only cut 15 tons of cane—*i.e.*, under 4 tons per acre. Most of the field has not been ploughed up and will be planted with potatoes next March, the unploughed quarter-acre or so being kept for horse feed. During the growth of the potatoes the farmer will make every effort to keep the land free from grass and weeds. In June the tubers will be dug out and the whole of the block, including the quarter-acre of cane stubble, will be planted up afresh with cane. The effects of this crop rotation on the activities of *Metoponia rubriceps* should be closely watched by visiting officers of the Bureau.

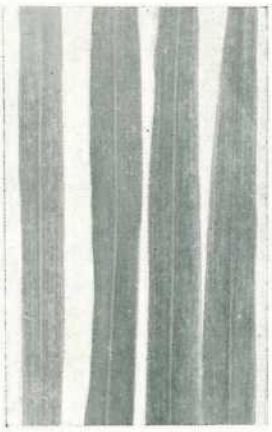


PLATE 85 (Fig. 6).

Mosaic Disease.

It would probably be a very conservative estimate to say that Mosaic disease had increased at least 300 per cent. in the Mackay areas during the last two years. Not only is this rapid spread an absolute fact, in the writer's opinion, but the probability of the disease spreading even more rapidly in the future unless active steps are soon taken is a factor to be borne in mind by all suppliers to Mackay mills from Farleigh to Plane Creek.

As one travels from farm to farm in the Mackay areas one cannot help noticing many fields of corn or sorghum adjoining fields of cane; in fact, in many cases, the corn or sorghum is even growing amongst the cane. If these two cereals are not present, their place is taken by a native sorghum or by some closely related grass. The vital and intimate connection between the spread of Mosaic and the presence of the above mentioned plants in or about a field has been so often reiterated that one is at a loss to know why cane farmers, who, taken as a whole, are a very intelligent class of men, persist in doing just the wrong thing, as though out of perversity. If corn or any of the sorghums must be grown, well, let this be done at least 1 chain

away from the cane if Mosaic disease is present on the farm. The reason for this discretion is, as has already been explained times out of number, that corn and the sorghums are the favourite food-plants of the Corn Aphis, which is by far the most important carrier of Mosaic disease. Let any grower who has corn or sorghum on his farm in the Mackay areas pull away the young leaves near the growing point of the stem and he will, in many cases, sometimes nine occasions out of ten, find very small, wingless, light-bluish insects, with thin dark legs, sucking the sap. When disturbed by the pulling away of the sheltering leaves most of them will move away in search of protection from the bright light; these are the larvæ, nymphs, and adult wingless viviparous females of the Corn Aphis; the winged adult, a small black insect with comparatively long wings, is also often seen amongst the larvæ. We need not for the present go deeply into the life history of *Aphis maidis;* what concerns us just now is that this insect carries Mosaic disease. An indication of the presence of *Aphis maidis* on the stem is often given by the occurrence of empty skins on some of the outer leaves, where the larvæ have moulted, when the leaves were younger. Fig. 1 shows these old empty white skins and many Corn Aphids on two young stems of native sorghum.

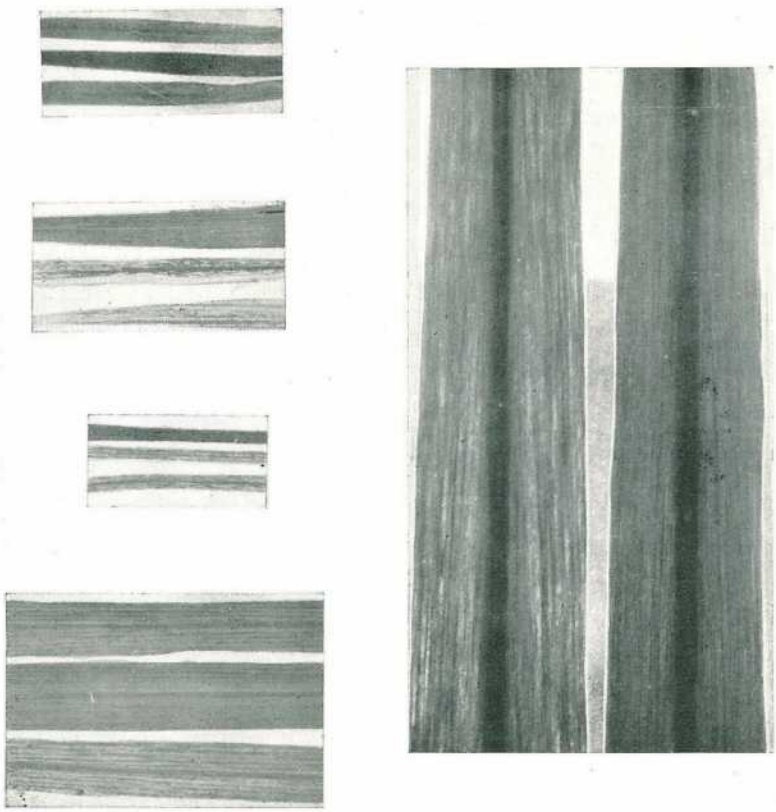


Plate 86 (Figs. 7, 8, 9, 10, 11).

An insect which might sometimes be mistaken for the Corn Aphis is the Corn Leaf Hopper (*Peregrinus maidis*), but the larvæ of the latter are of a pink colour.

The Corn Aphis also attacks certain smaller grasses, some of which have been found to be susceptible to sugar-cane mosaic disease in other countries. Appearances strongly suggestive of cane mosaic were commonly seen in grasses on this visit, on several farms where Mosaic occurs. The following grasses were found to be affected in this way:—

Panicum colonum or Wild Millet,
Panicum sanguinale or Summer Grass,
Sorghum sp. or Native Sorghum,
Seteria aurea or Rat Tailed Grass;

and at West Plane Creek a grass, known there as cane grass, which, owing to the

writer's inability to obtain flowering or seeding specimens, he was unable to have identified. Figs. 2, 3, 4, and 5, should enable farmers to identify the first four grasses mentioned, though Wild Millet is usually smaller than depicted when it occurs in cane fields. These grasses were kindly identified for the writer by the Government Botanist, Mr. C. T. White.

Now, it is very noticeable on these farms where grasses appeared to be infected that in all cases the affected grasses were growing very close to, or even adjoining, infected canestools, and that although comparatively few grass plants were infected, yet the cane was invariably far more heavily infected in the immediate vicinity of the diseased grasses than in the other portions of the field; for instance, on the field where Mosaic symptoms were found in Wild Millet, 100 per cent. of those cane plants immediately surrounding the affected grass were diseased, while 60 per cent. of the cane stools growing within half a chain of the above grass showed Mosaic; the remainder of this field showed an average infection of from 5 per cent. to 10 per cent. The cane in this case was first ratoon Clark's Seedling. The Corn Aphis was very plentiful on the Wild Millet and also on the sorghum growing near by. Again, in this same field, it was observed that where the field adjoined another cane paddock the percentage of Mosaic was only ½ per cent. The opposite end of the field was separated by a dirty headland from a field of sorghum, and as this end was approached the infection of Mosaic considerably increased.

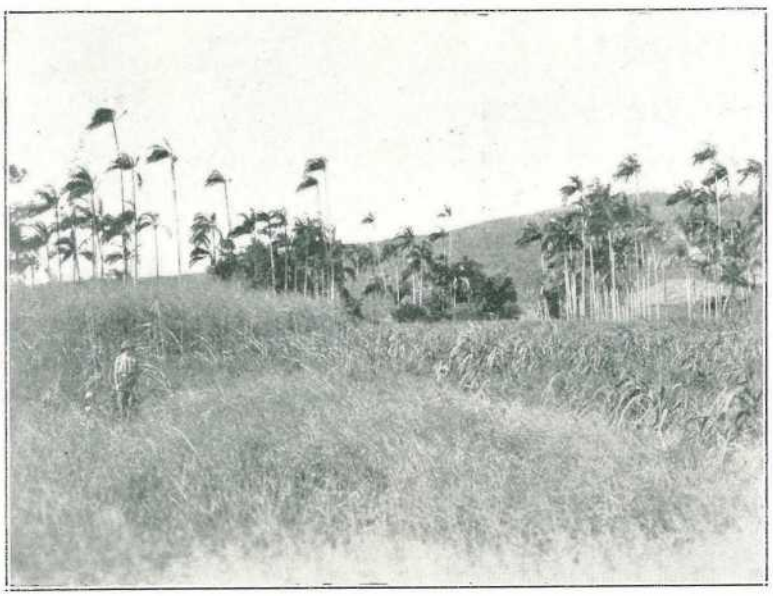


PLATE 87 (Fig. 12).

Control.

The above remarks speak for themselves in so far as control measures are concerned—growers must try to keep their farms cleaner, and to treat corn, sorghum, and grasses with the greatest distrust. Especially is this the case with the sorghums, which, if allowed to take a hold of a farm, become a very serious pest, as may be seen by Figs. 4 and 12, and especially the latter. In one area of the Mackay district Native Sorghum has been allowed to take complete possession of land which could have been fenced in and used for running stock. These fields of Native Sorghum are not only the home of *Aphis maidis*, but also, in some cases, of Mosaic disease, rats, and moth borers. They are sometimes the home of Mosaic disease, since they often contain many old ratoon stools of Mosaic infected cane, and in the Mackay district at least, it is a very simple matter to find very strong suggestions of Mosaic in the grasses. Figs. 6, 7, 8, 9, and 10, show what is probably sugar-cane Mosaic disease in leaves of Wild Millet, Summer Grass, Native Sorghum, Rat Tailed Grass, and Cane Grass. Thus it is not to be wondered at that Mosaic disease has increased at least 300 per cent. in the last two years.

However careful the growers be there will always be a little grass about the farm, so that the transmission vector of the disease cannot be entirely eliminated, but the latter is kept down to such a minimum as to render the usual seed selection and digging out of stools where a crop is not too heavily infected sufficiently effective to practically eliminate the disease in the course of two or three years. As some growers are not too sure of the symptoms of Mosaic disease in cane, Fig. 11 is submitted for their careful consideration.

Illustrations.

(1) *Aphis maidis* on young stems of Native Sorghum, x ½.
(2) Wild Millet (*Panicum colonum*). Florin shows scale.
(3) Summer Grass (*Panicum sanguinale*). Stool about 3 feet high.
(4) Native Sorghum amongst cane at Mackay.
(5) Red Tailed Grass (*Setaria aurea*).
(6) A Mosaic in leaves of Wild Millet. One leaf healthy, x ½.
(7) A Mosaic in Summer Grass. Centre leaf healthy, x ½.
(8) A Mosaic in leaves of Native Sorghum. One leaf healthy. A severe case, x ½.
(9) A Mosaic in leaves of Rat Tailed Grass. Darker leaf is healthy, x ½.
(10) A Mosaic in leaves of "cane" grass. Central leaf healthy, x ½.
(11) Sugar-cane Mosaic in leaf of cane. One leaf healthy, x ½.
(12) A field of Native Sorghum adjoining a field of plant cane. Mosaic-infected cane was plentiful amongst the grass.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (23rd March, 1926) from Mr. N. L. Kelly, Assistant to Pathologist, who is investigating cane diseases:—

Since five major cane diseases have now been discovered in Queensland it is desirable here to give a summary of their main features and methods of control. These diseases are Gumming, Leaf Scald, Leaf Stripe, Mosaic, and Fiji disease.

They have three main points in common—(1) An infected stool will never recover from the disease; (2) a diseased set will always produce a diseased plant, a stool becoming diseased soon after one of its stalks is infected; (3) the diseases are highly infectious.

Gumming.

Gumming disease is present in all districts south of Mackay. It is present also in the Cairns and Herbert River areas. It is probably the most dangerous disease of all, for, besides reducing the tonnage per acre, and the c.c.s. in infected fields, it renders the mill juices refractory to boiling when the cane crushed is moderately infected.

Symptoms.—The leaf symptoms enable a quick and reliable diagnosis, but they do not appear at certain seasons. The "gum streak" bears a superficial resemblance to streaks due to other causes. Typically, it is a yellow streak from ⅛ inch to ¼ inch in width, of varying length, running along the veins to the leaf margin. It is almost invariably dotted with dull red, and, as it matures, becomes converted into dead tissue at that portion of the leaf where the streak originated. The streak usually begins at the margin, and works down towards the leaf sheath, but sometimes originates further down the leaf, and then elongates in both directions. The dead tissue at the point of origin spreads, and is delineated from the living by a dark red or brown margin. The gum streak is best observed between a fortnight and eight weeks after good rain has fallen; for during the warm rainy season the growing conditions of the cane are often such that the streaks do not appear. Again, after prolonged drought, the older leaves having withered, the young leaves formed no longer develop streaks. At this time the cane which is badly infected will wilt, and perhaps die. The critical symptom—the oozing of gum from the vascular bundles—should then be sought. The stalk is always pulled out, to avoid knife infection, and a portion with freshly-cut ends is placed in an enclosed space (a billycan) to prevent premature drying. The globules of gum which are "sweated" out constitute the critical symptoms of gumming. A stalk will not "sweat" gum unless it shows reddening of some of the fibres at the nodes, in a longitudinal section of the stem.

A stool dying from gumming will always "sweat" gum; but in other cases if gum does not ooze the stool may be recently or lightly infected, or the growing conditions may be too moist for the gum to be evident.

(*a*) Cause.—The organism is *Bacterium vascularum*.

(*b*) Spread.—The disease has been, and is still, distributed by the careless selection of seed.

(*c*) Infection is carried—(1) By knives, hands, clothing, &c., and (2) very probably by insect bite. It is not known which insects are responsible. Bad drainage or prolonged rains appear to expedite its spread; and bad growing conditions generally, as with most other diseases, increases its harmfulness.

Control.—(1) Careful seed selection. However, since no cane growing within 1 mile or more of a diseased stool can be guaranteed clean, where the disease is widespread, only seed which is obtained from a clean isolated nursery can be guaranteed.

(2) When the leaf streaks are showing up well, "rogueing" fields less than 5 per cent. infected might be useful. Any field heavily infected should be ploughed out on harvesting, especialy if clean seed can be obtained.

(3) When the disease is very prevalent the abandonment of all susceptible and the widespread use of resistant varieties has proved of great value as an adjunct to seed selection and rogueing.

Leaf Scald.

Leaf Scald occurs in all districts north of the Herbert River, in the Proserpine area, and has lately been found on the Maroochy River. Like gumming it is a bacterial disease of the vascular bundles; it reduces the tonnage per acre and the c.c.s., and often entirely destroys infected cane of susceptible varieties.

Symptoms.—The leaf symptoms sometimes resemble those of gumming, but in such cases the critical symptom—the pencil line—is to be sought. This is a long narrow streak, quite white, running from the midrib, or from the junction of leaf and stem, to the leaf margin. It is so narrow that throughout most of its length it includes but one vascular bundle. In other parts the white tissue is broader. Very frequently, adjoining some portion or portions of the streak, there is evidence of the dying of the tissues. These become a bluish-green, then die, and have, usually, no definite red or brown border defining them from the healthy tissues. The dead portions increase, and become grey, with blotches of darker grey, and they are very brittle. Thus, both to the eye and to the touch, the leaf in this state (the beginning of the acute stage) is very characteristic.

The stalk, when in the chronic stage of the disease, usually develops shoots along one or both sides of the stem, or from the base. The top inner leaves are often quite white and have a bunched appearance. In this stage the pencil-line can usually be seen, especially on the side shoots.

Very often cane in a field will, in a few days, wilt and die without leaving much indication of the cause of their death. This often occurs after a period of dry weather in mature cane of susceptible varieties—*e.g.*, Clark's Seedling or Mahona. The first sign of this stage is the presence of streaks very similar to gum streaks. The young leaves often twist in towards one another so that their tips, now withered, meet or cross, giving the appearance of a pair of callipers. The plant then dies, and few if any pencil-lines can be found in the vicinity.

Spread.—The disease is distributed in sets; some varieties, during favourable conditions, showing no signs of the disease for perhaps one year after infection. Infection, as with gumming, may be brought about—

(1) By hands, knives, clothing, &c., and

(2) Very probably by insect bite.

Control.—The first step in a newly-infected locality should be the eradication of the susceptible varieties—H.Q.426 and Mahona—on the infected and adjoining farms. As with gumming we have—

(1) Seed Selection.—Do not obtain seed from infected areas, even if only one stool in the field was noticeably infected.

(2) Rogue in lightly-infected fields. Plough out infected fields as soon as possible. These measures, together with

(3) The use of resistant varieties,

has quite eradicated the disease from the Clarence River.

The remaining diseases will be dealt with later.

CANE PEST COMBAT AND CONTROL.

The Acting Entomologist at Meringa, Mr. A. N. Burns, reports (24th March, 1926):—

Effect of Control on Army Worms (*Prodenia exempta* Walk.) at Edmonton.

Control measures, as mentioned in last report (January to February, 1926), embodying the use of an arsenate of lead solution spray, were carried out at the farm which suffered most severely at Edmonton. Before attacking the cane, the caterpillars had in three days eaten to ground level over 20 acres of young corn. At the time of treatment the larvæ had entered the cane, and the first seven rows were almost completely defoliated. A few clean rows in front of their advance were sprayed with the above-mentioned solution (1 lb. lead arsenate to 25 gallons of water), and the results obtained were most satisfactory; very few of the caterpillars remaining alive that same evening.

Leaf Stripe (*Sclerospora sacchari*) at Sawmill Pocket.

The Northern Field Assistant, Mr. Gibson, whilst visiting this Laboratory a few days ago, brought under our notice a field of cane at Sawmill Pocket which was attacked by some pathological disease. Two days later, in company with Mr. Gibson, the farm was visited, and on examination it was found that the cane (Pompey, plant crop) was suffering badly from Leaf Stripe (*Sclerospora sacchari*). All through the field stools bearing the characteristic brown appearance could be noticed, also in many places plants that had "jumped up"—*i.e.*, grown up higher than the surrounding cane; this latter is a very noticeable character in Leaf Stripe disease. Leaves on attached plants bore a whitish mildew on the under surface, which also is very characteristic of Leaf Stripe.

The ratoons from which the plants of the affected cane were cut did not show any indication of the disease, but one plant of D.1135, in an adjoining block of cane, was found to be affected.

FIELD EXPERIMENTS.

Calcium Cyanide (Flakes).

Six rows of cane (D.1135, second ratoon), each 50 feet long, were treated on the 2nd of February with ½ oz. doses of calcium cyanide, doses being applied at the rate of four to a stool. A check plot of equal size was marked out adjoining the fumigated area. Before fumigating, six stools in each plot were dug to ascertain the average number of grubs per stool. The plot gave 4.6 and the check 3.5 grubs per stool. Forty-eight hours later six stools in the fumigated plots were examined, a total of twenty-two grubs being found, thirteen alive and nine dead, which represents a mortality of approximately 40 per cent. A further examination was carried out twenty-one days after injection. Six stools were found to harbour thirty-two grubs, all of which were alive. Nineteen of these were first stage greybacks (*Lepidoderma albohirtum* Waterh.), and probably did not hatch till some days after injection, in which case the calcium cyanide would not have any effect on them, most of the hydrocyanic gas being by that time dissipated, leaving a residue composed chiefly of slaked lime and carbon.

Another, and much larger plot, has since been injected with the same material, and results will be given in later reports.

Benzine and Naphthalene.

A plot of grub-infested cane (D.1135, second ratoon), one-twentieth acre in extent, was injected with 2 drachm doses of benzine and naphthalene (saturated solution). Injections were placed on each side of cane rows, 1 foot apart, 5 inches from centres of stools, and 4 inches deep. A control block of equal area was marked out adjacent to the treated plot. Three days later four stools were examined; ten grubs altogether were found, nine alive and one dead. Sixteen days later two stools were dug, seventeen living grubs being found.

A similar experiment was carried out with 4 drachm doses of the same material. After three days four stools were examined, five living grubs and four dead ones being found. After another sixteen days two more stools were dug up, and only three live grubs were unearthed.

Shell Benzine.

An area of grub-infested cane (D.1135, second ratoon), one-fortieth acre in extent, was fumigated with 4 drachm doses of shell benzine, placed on each side of cane rows, 1 foot apart, 4 inches deep, and 5 inches from centres of stools. A control

plot was marked out adjoining the fumigated block. After three days, four stools were examined, giving a total of eight grubs, of which four were dead and one very sickly. Sixteen days later two stools were examined, producing two live grubs.

See-Kay.

The two blocks (each 130 by 45 feet) injected with See-Kay on 11th February last, have been inspected at frequent intervals since that date, and on the last visit (11th March) the cane in each treated plot appeared to be darker green and of slightly more vigorous growth than that in the respective control plots.

In the plot injected with ½ oz. doses the odour of See-Kay was very faint; the other plot, which received ¼ oz. doses, still emitted a strong odour of the fumigant when digging amongst the stools, and even on walking through the treated cane the odour could be distinguished.

Two stools in each plot were examined on the 24th February—thirteen days from the date of injection. In the case of the smaller dose, four live grubs and one dead one were found, and in the other case one live grub only was disclosed. On the 11th March, twenty-eight days after injection, two stools in each plot and control were examined. Plot No. 1 (1 drachm dose) gave eight live grubs—its control, twelve live grubs. In Plot No. 2 (2 drachm dose), no grubs were found; its control gave ten living grubs.

Chlorocide "A."

The plots put down on 15th February last were examined on the 3rd of March—sixteen days after fumigation. The chlorocide in each case was still intact, and the characteristic pungent odour very strong.

In the plot with 1 cwt. per acre dosage, three stools were dug, revealing the presence of eleven living and one dead grub. We cannot be sure that death in this one instance was not due to some previous mechanical injury, especially as one live grub was found intermingled with the chlorocide itself.

In the case of the 1½ cwt. per acre dosage, four stools were examined, sixteen live grubs being found, some of which were right in the centres of the stools, whilst others were only a few inches away from the fumigant and feeding on the outer cane roots.

Dehydrated Tar.

The "sets" having their ends dipped in dehydrated tar before planting, also the single row of wholly immersed "sets," which were planted on the 4th February last, were inspected on the 10th March—thirty-four days after planting. In the case of the plot which had only the ends of the sets dipped, a good many plants were well above ground, and appeared healthy, which condition also prevailed in the control plot.

No signs of shooting were apparent in the case of the wholly dipped sets, though on examination they were still green, and had not rotted or decayed. No roots were growing from the nodes, nor was there any sign of growth from the buds. There are considerable numbers of grubs in both the plots and control.

ENTOMOLOGICAL HINTS.

By A. N. BURNS, F.E.S., Acting Entomologist.

Fumigation against grubs of the grey-back (*Lepidoderma albohirtum* Waterh.) and frenchi (*Lepidiota frenchi* Blackb.) cane beetles may be still carried out to advantage whenever a few days of fine weather occur, and the soil has a chance to dry. Of the former pest, grubs will still be found to be in all stages, a few still remaining in the first instar, the remainder fairly evenly divided in the second and third stages. Cane plants will not yet show signs of "wilting," except in bad cases of attack; plants already wilted will be found to be attacked by frenchi grubs, which have been feeding since October or November in the third stage.

Army worms still continue to do considerable damage to cane in certain areas. Where observed in any appreciable numbers control measures should be applied. To prevent the spread of these caterpillars from one field to another, a trench about 6 inches deep, or a deep plough furrow, should be run all round the infested area. Care should be taken to have the vertical face of the furrow opposite the advance of the larvæ. Poison bait, made up of Paris green 1 lb., bran 2 lb., and molasses 2 quarts, should be made as follows:—Add water enough to bring the ingredients

to a thick mass which will break up easily, and sprinkle this mixture thinly in the bottom of the furrow. If the army worms have reached a clean area a very good control method is to spray, with an arsenate of lead solution, several uninfested rows of cane just in front of the attacked cane. Two pounds of lead arsenate, mixed with 50 gallons of water, will make an effective spray, which can be quickly and easily applied by means of a hand spray pump.

When scarifying between cane rows many young cane grubs are often exposed; when practicable it is advisable to collect and destroy, for later these grubs, on reaching second and third stage, will go deeper in to the soil and add to the attack on cane roots. Collecting these will, therefore, help to keep down the injury done by grubs. In several canefields in the Gordonvale district dozens of young grey-back grubs were exposed during scarifying operations, as many as twenty grubs being turned up every few yards.

Where Termites (white ants) are giving trouble to cane growers, very helpful control measures may be carried out by removing and burning all timber lying in and adjacent to the cane. Clearing completely a strip of land from 1 to 2 chains wide outside canefields that are infested will also help to keep this pest away from the cane. Where fence posts are affected, poison baits, composed of arsenic, caustic soda, and molasses, will be found effective. Take four parts (by weight) of arsenic to one part of caustic soda. Mix these dry, then add water till all dissolved. To each pound of arsenic used, add 2 gallons of molasses. About three tablespoonfuls of this mixture is sufficient to treat a fence post.

Large Moth Borer (*Phragmatiphila truncata* Walk.) will soon be in evidence again in young plants and ratoons. Keeping headlands and canefields clean aids very considerably in helping to keep down this pest. Indications of its presence in canefields may be seen by "dead hearts" distributed throughout the cane stools.

MACKAY SUGAR EXPERIMENT STATION.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) writes that his attention has been called to a report of a recent meeting of the United Cane Growers' Association at Mackay, at which one of the members is reported to have said that the soil on the Mackay Experiment Station was "rotten with manure."

The Director wishes to point out that this statement is absolutely incorrect. The Experiment Station, in its fertilising trials, does not manure the land, but manures the cane. By this is meant that in the application of fertilisers consideration is given as to what should suffice the crop for the season. Practically no fertiliser is left in the soil after the crop has been removed.

The cost of the bulk of the fertilisers used on the Station, with their application, does not run to more than £4 per acre, and from this expenditure the Station has maintained an average increase for many years of some 8 tons per acre more than the yield of cane which is not manured, and which, at £2 per ton for cane, would give a profit per acre of £12. It must be evident that this increase could not possibly take place if the land were "rotten with manure," or over-charged with manure, because in that case there would be no difference secured between manured and unmanured plots. Further, analyses of the soil at the Sugar Experiment Station do not show this soil to be superior in plant foods to the average cane farms of the Mackay district. As a matter of fact, upon a great part of the Station land, the clay is very near or is actually on the surface of the soil.

The reason that the Experiment Station is successful in the use of manures is that the manures are applied at the right time, and the cultivation of the cane is good. It is frequently objected that the Experiment Station does not pay, but a sharp line of demarcation must be drawn between the growing of cane on the Station for the mill, and the other expenses incurred in the scientific work of the Sugar Bureau, such as testing of varieties, free distributions to farmers, analyses of sugar-canes and soils performed for farmers, the maintenance of laboratories for entomological and pathological work, &c. As a matter of fact, all the experiments carried out with cane do pay, and more than pay, for themselves.

It has also been objected that the plots at Mackay are too small to give reliable results, but the same results with fertilisers have been obtained on very much larger plots, running up to 4 or 5 acres, on the other two Experiment Stations, which are larger than the one at Mackay.

Misconceptions of the nature outlined could be easily overcome by approaching the officers of the Sugar Bureau for information.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (18*th March*, 1926) :—

Nambour.

There is a certain resemblance in regard to the soil conditions here, as to that which prevailed in the tropical areas after the cyclones and heavy rains some years ago. Last season was an abnormally wet one in the Nambour district, and this year the effect is apparent in tightly packed soil of poor texture that is noticeable on many of the farms. Farmers have had trouble in obtaining good strikes, and there is very frequently poor subsequent growth. Examination of the cane on land of this description showed no special incidence of disease, and the cause of lack of growth is no doubt due to the factor mentioned above—poor texture. There is probably a deficiency of nitrogen and excessive acidity. Samples were taken of soils showing unsatisfactory growth and forwarded for analyses. The farmers on the low-lying soils are advised to try liming experiments. Those growers who have tried lime have had decidedly useful results. The use of lime should, if possible, be followed by a crop of cowpea or some other leguminous crop useful as a green manure. Two tons of pulverised limestone per acre and 25 cwt. of burnt lime make a good application.

Hand planting versus the cane planter causes a good deal of discussion in these districts. Under the average soil conditions that prevail in Queensland, the cane planter is the most economical method of doing the work, but there are certain soils and certain weather conditions wherein the planter could profitably be laid aside, and the cane planted by hand, at least as far as small farmers are concerned. The reason for this is that it is difficult to govern the amount of covering given to a set in using the planter, whereas this difficulty does not arise by the slower method of hand planting. A minimum of covering should be given in soils that are dense and do not drain freely. Bedding up, or bringing the land into high beds each having two rows, is also to be recommended as conducive to soil ventilation and drainage in wet districts and low-lying soils. The age of the small grower is being ushered in, and it will be by concentration on the finer points of cane cultivation that he will be able to carry on and make a good living.

Paspalum grass is a decided nuisance in districts within the influence of the Nambour mill.

There is abundant evidence of Mosaic, and gumming to a certain degree, although it is unlikely the latter will become epidemic.

A form of Mosaic was noticed affecting E.K.1. This form is common in Southern Queensland, and when it occurs almost an entire destruction of normal green tissue in the leaf follows. The cane is stunted and of very low sugar value when so attacked. Ordinary forms of Mosaic show about an equal distribution of pale and normal green in the leaf, and the cane affected usually grows as high as the unaffected, but thinner.

Q.813 is now the most favoured. H.Q.285 is also a cane showing well at the present time. H.227 is being gradually extended and is looking promising. There are a great many varieties other than these in the district, but the three mentioned are the most promising from the growers' point of view.

Regarding incidental crops, farmers are advised to keep maize well away from their cane. Cane adjoining maize appears almost invariably to become rapidly affected with Mosaic.

Mount Bauple.

Growers here do not expect a large crop this season. The cane has had a serious check owing to the dry weather, and it is improbable that anything like last season's crop will result, unless a very open winter follows good rainfalls. However, the bulk of the cane is quite in a fit state to respond to good weather conditions, particularly the Q.813, Q.822, H.Q.285, and M.1900 Seedling. The cane is carrying a very small percentage of disease, although farmers are confronted with a weed growth.

Some damage is being caused by white ants. The variety most seriously affected is H.Q.77. Growers confronted with trouble by insect pests are recommended to communicate with the entomologists through the Director of Sugar Experiment Stations.

Farmers appear to be getting satisfactory results through use of fertilisers high in phosphoric acid and potash. Samples of typical soils were taken for analyses. The planting of green manures is a question that is receiving more attention from the growers here than hitherto. A difficulty in this respect appears to be a scarcity of seed.

Growers are hoping to give more attention to the question of crop rotation and fallowing in the near future, it being generally considered, and rightly too, that this aspect of sugar farming has been too long neglected.

The Northern Field Assistant, Mr. A. P. Gibson, reports (*20th March*, 1926) :—

The Hambledon and Mulgrave mill sugar areas were inspected last month.

Seasonal.

February rainfall was some 9 inches below the average, only 378 points were recorded; this fell by way of showers. These frequent showers following on the late splendid rains of January, and coupled with warm sunshiny days, had greatly benefited the outlook from a canegrowing point of view.

The 1926 crop prospects are promising. The cane is at a stage when it demands abundance of moisture and heat. On the whole it has not made the rapid growth generally expected after a dry spell, and with the exception of isolated parts, is fully five weeks behind its usual appearance at this time of year. With the continuance of favourable conditions, it may yet overtake much of its present backwardness; even so it is obvious that grinding operations will be delayed until June.

Cultivation.

The dry period early in January was a blessing in disguise. It permitted the factories fully completing the 1925 crop, enabled the soil to sweeten up, and assisted the agriculturist to forward the necessary cane husbandry under perfect conditions before the heavy rain fell. Unfortunately, the exceptionally heavy rain that fell late in January made the soil very refractory. A good tiller of the soil endeavours to scarify the exposed crop interspaces at his earliest convenience after heavy rain, thereby destroying new weed growth, and at the same time forming a protective soil layer which arrests the upward movement of the water and is highly efficient in retaining soil moisture in a dry period. The crop has reached the stage when further cultural operations are not required, other than freeing the headlands of weeds, &c. Preparatory field work prior to planting is being hurried along; the weather continues favourable for this class of work. Motor tractors are playing an important part in this particular operation, and in conjunction with intelligent cultivation, judicious plant selection will greatly assist in making profitable cane culture possible.

Manuring.

The principal manures being applied at present are sulphate of ammonia and nitrate of soda. Better results would probably be obtained had this been applied earlier in the season. The use of overmuch of this is costly and harmful to the soil. It is not advisable to apply more than 2 cwt. per acre. Molasses was pumped to an adjacent Mulgrave mill farm, and broadcasted by gravity; unfortunately, too much was concentrated in the depressions, and in consequence has temporarily ruined the ground for cane growing. Where the application was less the soil had greatly benefited. A little mill compo was also being applied. Fair leguminous crops were being ploughed in the soil.

Soil Samples.

Twenty soil samples were taken this month from the Cairns area. Farmers are rather slow in grasping the immense importance of soil analysis. Buying and applying manures without first knowing the soil requirements seems waste of capital. The soil may be suffering from want of some material indispensable to the crop growth; it may contain something harmful; or the fertility may be impaired through other causes. Analysis helps us in pronouncing what is necessary, and with this knowledge it is possible to restore it to its original fertility.

Pests and Diseases.

Grubs, rats, bandicoots, wild turkeys, and army worms have been mainly responsible for crop destruction. At present grubs and rats are not doing much damage. Bandicoots excavate holes around the cane stubble, thus severing the root system to such a degree that often the whole stool of cane tumbles over and fails to ratoon when cut. Wild turkeys occasionally visit the cane paddocks from adjacent scrubs, more especially during the winter months, and destroy much cane.

Army worms are widely distributed over these sugar areas and the damage done is usually temporary, nevertheless farmers must co-operate and keep them under control when it is possible.

Leaf Scald, Leaf Stripe, Brown Rot, Red Leaf, Top Rot, and Peg Leg noted.

Leaf Scald is very prevalent throughout this district, more especially in N.G.15 (Badila) and H.Q.426 (Clark's Seedling); in isolated parts whole stools of plant cane were dying out from the effects.

Leaf Stripe observed in a Sawmill Pocket farm; the variety affected was 7 R 428 (Pompey). Seed planted from this area carried on the disease.

Mosaic.—A little of this disease was located in H.109 at Aloomba.

Brown Rot was found in N.G.15 (Badila) plant growing on virgin scrub land at the top end of the Upper Mulgrave River.

Top Rot.—N.G.15 (Badila) was slightly affected on a farm in the Gap.

Peg Leg.—A disease known as Peg Leg was seen at Sawmill Pocket in H.Q.426. The few canes growing run to a pencil point in the ground and are practically stoolless—they have little support and lodge. Very pronounced red streaky leaves were noted in the N.G.15 (Badila), plant and ratoon alike, in the Freshwater areas; sometimes all the sprouts in a stool possess the streaky red leaf markings.

Leaf Scald and Leaf Stripe are serious diseases, and may be controlled by judicious plant selection. When the area is badly infected it should be ploughed out at the farmer's earliest convenience and be fallowed until such time as the old stubble has been completely destroyed, otherwise the sprouting stools may carry on the disease. Every day the signs are becoming more apparent that knowledge and understanding in things pertaining to sugar culture are being more sought after.

The Upper Mulgrave.

The wonderfully rich and very picturesque narrow Upper Mulgrave River Valley was visited. It was surprising to note the extraordinary progress made the last year or so. The drawback in the past was the lengthy carting distance to the mill's nearest tramway. Recently this line has been extended, and the very progressive group of farmers in this valley are privately lengthening this 40-lb. mill track another 3 miles, costing them £10,000. The principal variety grown is N.G.15 (Badila), and some remarkably healthy and well-advanced paddocks of this variety were seen. The estimated tonnage to cut for the coming season is some 14,000 tons. A promising lime deposit has been located at the top end of this valley. The Russo-Ugo Lime Company are rapidly developing this. A modern brick kiln is under construction, and it is hoped that the much required lime will be available in about six weeks. In this valley may be seen fine rich silt in very valuable material, being deposits of successive inundations. Here soil and climate combine, resulting in heavy crops.

Green Hills.

This fertile, volcanic, brick-red area lies horseshoe shape at the foot of the hills from whence it receives its name. Some 350 acres of the total holding are under cultivation, the remainder resting. Much of the land used for cane is carpeted by a prolific crop of Mauritius beans (black variety). As a rule such crops are planted by the seed drilling machine, with rows 8 feet apart, and requiring some 20 lb. of seed per acre to plant. A splendid fence-high volunteer crop was being satisfactorily ploughed under by a D.I. disc plough drawn by four horses. The disc of the plough is of the tinkum bearing type, and was ploughing to a depth of 12 inches, the upturned soil was in excellent order, but not free from grubs.

The principal varieties grown here are N.G.15, D.1135, a little H.Q.426, and the present star cane of Hawaii—H.109—all of which then looked well and free from grub destruction.

Mulgrave Mill Improvements.

This progressive company are always doing things. The tramways almost annually continue to creep further out. At present a big staff is employed in the mill. Five new boilers, 8 feet by 7 feet 6 inches, are being installed for the coming season. These have a greater heating surface than the old ones.

Varieties grown are as follows:—N.G.15, H.Q.426, 7 R 428, D.1135, and B.147. Badila is grown on the deeper and more fertile soils, H.Q.426, 7 R 428 (Pompey), and D.1135 are grown on the less fertile soils.

Several farmers propose securing small parcels of Tableland Badila by way of a change; the idea is a good one providing the area is disease free. Cane raised on elevated land and under cooler conditions is less subject to disease. We must not overlook the fact that there is always the tendency of introducing new pests and diseases when the foregoing is carried out. Nevertheless, planting continuously from the very old plant, and that grown in the same old soil without change, must cause variety degeneration.

Railways.

The C.S.R. Company is improving its tramway system. Big cuttings and embankments are being constructed with the object of reducing the grades. It is also contemplating extending the line round to Stratford, which, if done, would place the entire crop transportation under its control. Steel tramway sleepers are being used in the firmer and less corrosive soils.

The Southern Assistant Entomologist, Mr. R. W. Mungomery, reports (16*th March*, 1926) *for February*:—

Bundaberg and Gin Gin.

From an entomological viewpoint, "white grubs" were found to be accounting for most of the losses in the canefields in these districts, although Mosaic is very prevalent on some farms along the river flats. Much more rigid measures might well be adopted by individual growers in an attempt to eradicate this disease.

Notwithstanding that other species of grubs are to be found in these districts, there are three species of grubs, namely *Pseudoholophylla furfuracea, Lepidiota frenchi,* and *Lepidiota grata,* which are the main culprits, and these can be readily distinguished from one another by the arrangement of the setæ (hairs) which go to make up the anal path. However, judging from their occurrence and the relative predominance of the various stages that were in evidence, it would appear most likely that they all have a life cycle similar to that of *L. frenchi*—namely, two years. Therefore, growers should look for the first signs of grub injury in September and October, and not expect damage to show up in April, as is the case with the "greyback" cockchafer of the Northern canefields.

The distribution and characteristics of these grubs are as follow:—

P. furfuracea was found almost solely in the red volcanics, and in one case in the yellowish-red sedementaries of North Bucca. It occurs at Goodwood, Watawa, North Bucca, Bingera, and the Woongarra, but is only occasioning major injury in the three former places this year. The sight of a canefield invaded by grubs of *P. furfuracea* is very typical, and there is an abrupt line of demarcation between the affected and the unaffected parts, the cane remaining small and stunted, with a weak yellowish appearance, on the one hand, while on the other the cane is high, green, and shows normal growth.

L. frenchi.—The occurrence of this species remains very much the same as in North Queensland, and it is to be encountered in the poorer whitish forest soils chiefly. This, though not appearing so often as *P. furfuracea,* is probably doing just as much damage in these parts, and a block of 15 acres in one farm has fallen a victim to their inroads, besides other smaller areas at the Elliott Heads and Gin Gin which have suffered damage. Growers at the Elliott Heads have until now been unfamiliar with grub attack, and so sudden has it been, that they have been taken unawares and the whole root system has been destroyed before the real cause of the trouble was ascertained, and whole blocks of cane have had to be ploughed out, being beyond recovery. The patchy nature of the occurrence of this grub has often been referred to, but in the south its distribution is certainly more regular than either *P. furfuracea* or *L. grata.*

L. grata appears to be intermediate in its occurrence between *P. furfuracea* and *L. frenchi,* and cases have been found where it was associated with *P. furfuracea* in one class of soil and with *L. frenchi* in another, but the writer has never taken the three species together. The red forest type of soil is usually the one preferred by this beetle, and its distribution is very wide in these areas, stretching from Goodwood, Elliott Heads, Burnett Heads, and South Kalkie, to Gooburrum, Givelda, and Gin Gin.

The following insects are responsible for severe injury only in odd cases, and otherwise remain of minor importance:—

Mole Crickets (*Gryllotalpa* sp.).—Accounts of these insects damaging cane come from Hawaii and other sugar-producing countries, and also from the Lower Burdekin in our own State, and in nearly all cases they are found in low-lying, damp situations, or around irrigation channels, so that it is not surprising when we meet with similar examples in our Southern districts, and a few farms in the Barolin area have recently suffered, particularly those bordering a swamp or having a distinct soakage through them.

The method of injury is for these insects to eat the "eyes" of the sets and so prevent a successful "strike," sometimes as many as six being found around a single set. After planting up "supplies," and investigating after a lapse of three days, these were found to have suffered a similar fate. They usually make burrows in the soil from 6-8 inches deep, and when wet weather supervenes after planting, their burrows can readily be seen near the surface of the soil where they have moved up from the water-logged subsoil and gone from one set to another.

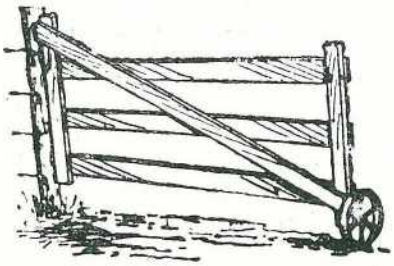
Control measures suggest deep ploughing when the crickets are active during the spring months previous to planting, thus disturbing or killing them in their underground retreats, and should there be any further trouble after planting, a small ½ oz. dose of paradichlor. or crude naphthalene might be applied to the soil near to the "supplies" when these are being planted, to act either as a killing agent or as a deterrent.

Rhyparada morosa.—Though this little black beetle may be found on grasses and cane widely distributed in Queensland, occasionally they are found in great numbers in a limited locality, and in this State do damage to young plant and very small ratoon cane; farms near Bingera particularly suffering this year. Small circular holes may often be found on cane leaves where the beetles have been feeding, but it is in their larval existence that the worst damage occurs. The grub, on hatching, enters the central heart of the cane at about ground level, sometimes making numerous galleries at this level, and at other times continuing its passage down towards the parent set, and in all cases producing "dead hearts." Fresh "eyes" as they form may be eaten, and in this manner, when dry weather continues, the vitality of the plant may be so undermined that the plant is unable to cope with the successive destruction of the new shoots, and it ultimately succumbs. However, in favourable weather the plant stools out, and no great injury results.

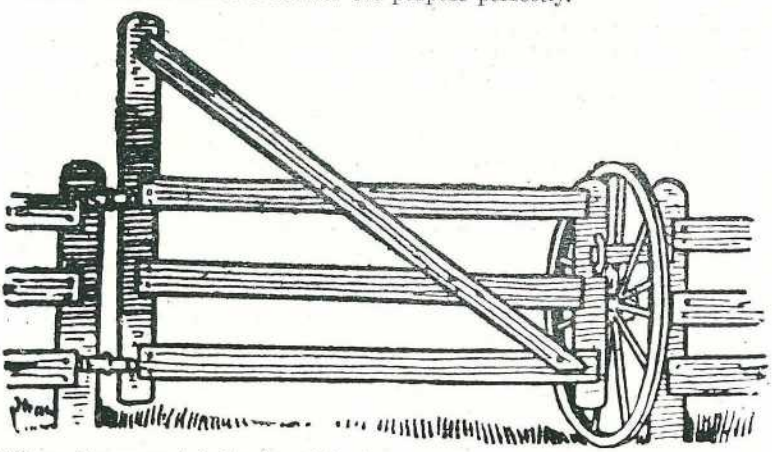
Farmers are advised to keep their cane free from wild sorghum, Johnston, and other grasses that are attractive to these pests, and as far as possible to keep the grass in surrounding stock paddocks low; also, in parts where this beetle makes its appearance, to plant up where practicable in the months of January to March, so that the cane is well established when infestation from these pests comes about.

PUT THE GATE ON WHEELS.

For a real back breaker, and one that's especially hard on children, is a gate that doesn't swing right. Lots of times it is almost impossible to keep some gates swinging right for a day, and the only solution seems to be to put a wheel on them. The accompanying illustrations show two possibilities. The larger wheel



is more adapted to a place where the ground is rough, soft, or stony. A buggy wheel is just the thing. It will roll through a rut or through soft soil, where a little wheel will sink into the mire. It is easy to attach a wheel of this type. A wooden axle may be made out of a well-seasoned piece of hardwood. As long as it is thoroughly greased it will function as well as an iron axle. Sometimes an old broom handle will be found to answer the purpose perfectly.



Where the ground is hard and level, a small wheel is just as practical and a great deal less cumbersome. A wheel from an old cultivator or plough will suffice. In this case the axle may be a large bolt, stapled to the lower corner.—"American Agriculturist."

WILD WHITE CLOVER.

A CAUTION TO SEED BUYERS.

By F. F. COLEMAN, Officer in Charge Seeds, Fertilisers, Pest Destroyers, and Stock Foods Investigation Branch.

The urgent necessity for the improvement of our grass lands has directed particular attention to the possibility of introducing suitable perennial clovers in order to increase the pastures carrying capacity. Recently Mr. J. Alan Murray, of Reading University College, pointed out that it is idle to combat the notion that "the presence of clover in pastures is a good sign." This idea is based on the practical experience of many generations of farmers and may be accepted as a fact; but it is necessary to beware of confusing cause and effect. It does not follow that pastures are good because they contain clover; it is just as reasonable to suppose that they contain clover because they are good pastures. Mr. Murray also points out that a considerable time is required for the growth of clovers and the subsequent chemical changes by which the nitrogen thus accumulated becomes available to plants. Further, the quantity of produce can be increased more rapidly by the application of nitrogenous manures, and if the hypothesis is sound the quality would not suffer unless the amount is in excess relatively to the phosphates.

The presence of clovers, however, will add to the nutritive value of the herbage; in short, it puts protein into the feed. The question therefore arises as to what clovers, if any, are suitable for the hot, dry conditions frequently experienced in Southern Queensland, also as to the kind of clover that will grow in association with such coastal grasses as paspalum.

During the last few years the increase of White Dutch, in association with paspalum has been remarked by many, and it is to be noted that this spread of White Dutch has been natural, not the result of seed sown.

The objection to the ordinary strains of White Clover is, that owing to its profusion of seed heads it soon becomes unpalatable to stock, which it will be noticed prefer the Medick Burr (*Medicago denticulata*) to White Dutch in seed head, so much so that it is commonly accepted in other countries that "a profusion of flowers is no indication of an abundant bite."

Those who have from time to time imported small quantities of *Trifolium repens* var. *sativum*, the ordinary White or Dutch Clover of commerce will, on careful examination of the resulting crop, find an occasional plant with a distinct variation in the size of the leaves, also a difference in the colour. Such plants usually produce more herbage, and are later in running into seed head, which it will be noticed are not produced in such profusion as in the ordinary strain of White Clover.

In both England and New Zealand attention has been given to the selection of the best individual plants, in order to isolate strains giving a heavier yield of herbage, and it is now possible to obtain seed of the strain known in England as Kentish Wild White Clover. The value of this strain of clover is now acknowledged in both countries.

True Kentish Wild White Clover produces a denser growth, it is later in flowering, and the strong stoloniferous roots give it a decided perennial or permanent character. Like most plants they have depended

for their propagation on their roots, it is a shy seeder, so much so that many have in the past endeavoured to introduce it on their pastures by the transplanting of rooted stems.

From the foregoing it is obvious that the seed of true Wild White would be costly and give an opening for the unscrupulous to sell ordinary strains of White Clover at a greatly enhanced price.

In the case of many seeds it is impossible to tell a particular strain, except by a careful examination of a crop grown under normal conditions.

As a result, however, of work carried out some time since, it is now possible to ascertain if a sample of White Clover seed has the characteristics of Kentish Wild White.

To ensure the permanent character of this strain, it is essential that the seed be saved from old pastures of not less than ten years' standing.

Such of our farmers as are sufficiently interested in pasture improvement to give Wild White a trial, are strongly recommended to obtain their seed from reliable sources, and to submit samples to the Seed Laboratory for examination, sowing only such as are found to give the characteristics of Wild White.

That eminent agricultural authority, Professor W. Somerville, D.Sc., writing some time since in an English paper, pointed out that "The value of Kentish Wild White Clover is many sided, it is extraordinarily nutritious, is a wonderful drought resister, and is thoroughly perennial, differing markedly in this respect from Dutch Clover."

MR. H. C. QUODLING, DIRECTOR OF AGRICULTURE.

Mr. Quodling comes from one of the old Southern pioneering families of sturdy English stock, members of which have made their mark in original surveying and engineering work in New South Wales. It was a Quodling who was the construction engineer on a section of the first railway over the Blue Mountains and his grandson, Mr. H. C. Quodling's brother, who did similar work in connection with the rerouting the renowned Zig-zag on the same line in recent years. The family is also identified with large pastoral interests in New South Wales and Queensland.

Born at Sydney in the seventies, Mr. Quodling received his early education at Newington College and Sydney High School. A successful course in veterinary science and agriculture at the Sydney Technical College was followed by a general training in the science and practice of farming at the Longerenong Agricultural College, Victoria, and the Hawkesbury Agricultural College, New South Wales, and then accepted a position as Assistant Experimentalist at the latter institution. Seeking wider fields, Mr. Quodling became interested in grazing pursuits, and, after some experience of station life, developed successfully a large dairying and agricultural property on the Upper Hunter. The opportunities offering in the Northern State proved a magnet to Mr. Quodling, as well as to many other young Southern settlers, and he acquired a half interest in a Queensland sheep property. He subsequently, in January, 1897, entered the service of the Department of Agriculture and Stock as farm foreman at the Queensland Agricultural College at Gatton and was chosen soon afterwards to establish a departmental stud farm. This project was deferred, however, and after terms of management at Westbrook and Hermitage State Farms he was transferred to headquarters to fill the position of Agricultural Inspector. Just prior to and after the death of the late John Mahon, he was Acting Principal of the Gatton College. On the reorganisation of the Department in 1915, Mr. Quodling was appointed Director of Agriculture. His great work for the farmers of Queensland in that capacity is well known and appreciated over the whole of the State. Since 1915 agriculture in Queensland has made extraordinary progress, and in its remarkable development Mr. Quodling has been no small influence.

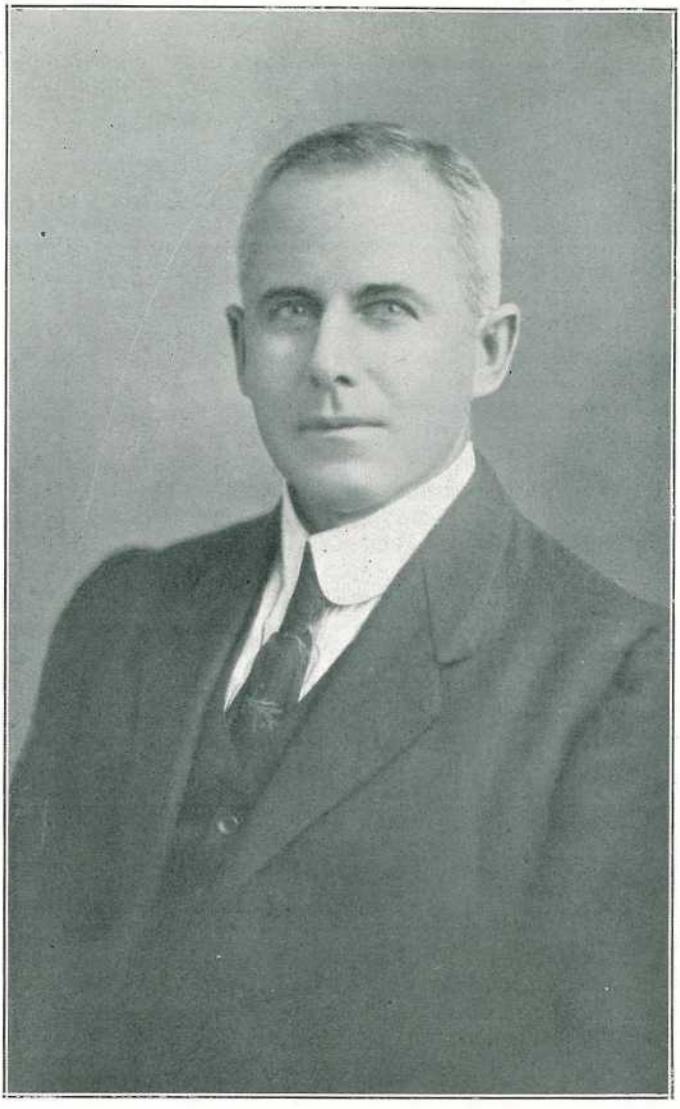


Plate 88.—Mr. H. C. Quodling, Director of Agriculture.

MINERAL DEFICIENCIES IN PASTURE AND THEIR EFFECTS ON THE GROWTH AND STRENGTH OF STOCK.

EXTRACT FROM MEMORANDUM PREPARED BY THE SUB-COMMITTEE OF CIVIL RESEARCH (ENGLAND) ON THE MINERAL CONTENT OF NATURAL PASTURES.

The results of recent research have shown that the mineral content of the diet has a profound influence on the health, rate of growth, and productive capacity of domestic animals, and that serious losses occur through the use of rations in which there are marked deficiencies or excesses of one or more of the essential mineral elements (1), (2), (3).* Though most of our information on the effects of deficiencies or excesses of minerals in the diet have been gained from observations on animals being fed on rations consisting chiefly of concentrates, it is known that animals feeding on pasture may also develop pathological conditions due to deficiencies of one or more mineral elements in the pasture.

The mineral content of pasture depends to some extent on the composition of the soil in which it grows. On cultivated land the composition of the soil is affected by "manuring," the main object of which is to supply either nitrogen or mineral elements thought to be deficient in the soil. Hence there must be a tendency for cultivated pastures to approximate to a common type, which experience has shown to be suitable for the nourishment of domestic herbivorous animals. It might be presumed that the mineral content of this type would be suitable for herbivora, and, as a matter of fact, it has been found that the cultivated pastures proved of most value for feeding, contain the essential mineral elements in the amounts and proportions nearest to those required by the animals feeding on them (4).

But natural or uncultivated pastures grows on soil which has not been treated by the addition of mineral manures, and its mineral content is, therefore, likely to vary in different localities. In their natural state, herbivorous animals are free to range over wide areas, and in their choice of pastures are doubtless guided by their appetite to vary their feeding ground, so that in the whole of their grazing there would be no constant deficiency or excess. It is probable that some of the migrations of hervivorous animals are determined as much by the necessity for the proper quality of pasture in this respect as for quantity.

In the natural evolution of types of herbivorous animals, development in different areas would be towards a type whose size and rate of growth could be supported by the pasture of the area. This idea was put forward over fifty years ago by Brown (5), who showed that the different breeds of sheep in Britain were correlated with differences in the geological formation of the areas where they were found.

From the foregoing considerations it is evident that disturbances in nutrition, due to deficiency of minerals in natural pastures, would be liable to occur under one of the following conditions:—

(*a*) When animals accustomed to select their grazing over a wide area are confined to a limited range within that area.

(*b*) When a type of animal with a rapid rate of growth, usually reared on cultivated pasture, is transferred to a natural pasture which contains markedly less of one or more mineral elements than the pasture on which the type has been evolved.

* Figures refer to references which are given at end of Memorandum.

(*c*) When, over a long period of years, a grazing area has been depleted in those mineral elements which are used as constructive materials in growth, by the removal of animals, or animal products such as milk, without any measures being taken to restore to the soil amounts of minerals equal to those carried off in the bodies and bones of the animals, or in their products.

As a matter of fact, it is under these conditions that malnutrition in herbivorous animals due to mineral deficiencies has occurred. Thus Murphy (6) records that in certain districts of Australia, when land was fenced, cattle suffered from characteristic bone lesions and paralysis associated with deficiency of phosphorus, milk cows and growing stock being worst affected. When the soil was fertilised with the deficient minerals the stock were maintained in good condition.

In the literature there are many recorded cases of domestic animals failing to thrive after being transported to new countries and fed on the natural pasture there. One of the most interesting cases is that recorded by Theiler (7), who has shown that the deficiency of phosphorus in pastures in the Transvaal limits the rate of growth of young stock, and the milk yield of cows, in the imported type of cattle being bred. He has also shown that the feeding of substances rich in prosphorus, such as bone meal or the phosphatic manuring of the soil, prevents the development of these results of malnutrition.

It seems probable that the Falkland Islands afford an excellent example of the effects of depletion of pastures. Sheep have been reared and exported from these islands for about forty years, and neither foodstuff nor manure has been imported. During the last twenty years it has been increasingly difficult to rear lambs, and it seems evident from the result of an investigation recently carried out at the Rowett Institute, Aberdeen, that the difficulty can be attributed to malnutrition, the primary cause of which seems to be deficiency of calcium in the soil.

The signs of malnutrition which appear in animals suffering from deficiency of one or more of the essential mineral elements have been described by several observers. Probably the most recent observations available are those recorded by Munro in a report to the Colonial Secretary of the Falkland Islands (8). He notes that there is "a steady decrease in size of matured animals from one generation to another (unless maintained by importing breeding stock periodically from other countries. . .). In this country young sheep require from six to nine months longer to reach maturity than they do elsewhere, and it is held that if even the best developed ewes are used for breeding purposes when eighteen months old, it permanently interferes with their development to an appreciable extent; besides which the percentage of lambs obtained from them is extremely small. The fact is well recognised that after breeding from local mares and stallions for a few successive generations the progeny become reduced to the size of ponies, and for this reason horses must be imported regularly from South America for breeding purposes. Cattle also, which are the progeny of several generations of locally-bred animals, are very small, averaging only about 500 lb. when fat. They have the dry coat and hidebound appearance which is so typical of cattle suffering from malnutrition. Cattle grazing on country where there is a deficiency quickly develop a depraved appetite, which is evidenced by the chewing of bones, wood, and other articles for which they would evince no desire on healthy country. Here both sheep and cattle have developed depraved appetites to an unusual degree. Cattle eat up all the old skeletons of sheep, and sheep have a great appetite for

the excrement of penguins and wild geese. . . . I have been informed that a lot of sheep hang about the coast to eat the kelp, but what they really are after is the salt and other valuable chemicals that are always associated with salt in small quantities."

The work of Theiler, Green, and du Toit in South Africa is so well known that it need not be referred to in detail. Depraved appetites, with resulting "lamziekte" through the consumption of putrefying carcasses containing pathogenic organisms, emaciation and general unthrifty condition have been noted by these workers.

Fragility of bones has been frequently noted as a result of deficiency of either calcium or phosphorus (Tuff (9), Ingle (10)). In dairy cows in India low milk yield occurs in areas in which the soil is also deficient in phosphorus (Davis (11)), and failure to breed and also increased incidence of certain diseases are observed in deficiency of calcium (Meigs, Erf, Orr, and Crichton (12)).

In these cases to which reference has been made, the correlated deficiencies were either calcium or phosphorus, the two mineral elements which are required in largest amount by animals. There are cases, however, in which malnutrition may arise from lack of some of the other essential minerals.

Aston (13) has shown that in certain extensive areas in the North Island of New Zealand, where "bush sickness" occurs in ruminants, the pastures are deficient in iron. The symptoms of this disease are anæmia and emaciation, with a high mortality. The development of the condition can be prevented by "drenching" the animals with certain iron salts or by grazing them periodically in other districts where the pasture has the normal amount of iron. It is interesting to note that if the animals at an early stage of the sickness be removed from these pastures and put on to other pastures, they will thrive and fatten for a time after they are returned to the iron-deficient pastures. The animal is able to store up in its system a reserve of iron, and the pathological conditions do not develop until this reserve is exhausted. This power of the animal to accumulate reserves occurs also in the case of certain other mineral elements, so that animals may thrive for a time on pastures which are deficient and no sign of malnutrition may develop if the animal has a free range on which it may change its feeding ground as its appetite and instincts direct.

The evil effects of deficiency of sodium chloride on the health and quality of the wool of sheep have been noted by several observers. This has been recently emphasised by Reid in the case of sheep in Australia. In most of these cases it is probably chlorine that is deficient; in other cases, however, this deficiency may be sodium.

Deficiency of iodine has been noted in certain inland districts. In breeding animals there is high mortality in the young (Ennis Smith (14)). Enlargement of the thyroid gland causing a characteristic swelling in the neck sometimes occurs. In young animals there is a slowing in the rate of growth (Orr (15)). Some recent work at Ottawa seems to suggest that deficiency of iodine reduces resistance to certain infectious diseases.

From what has been said above it is apparent that deficiency of one or more of the mineral elements should be suspected, when the following signs of malnutrition are prevalent in certain areas and cannot be attributed to any other cause:—

(1) High mortality, especially in young animals.

(2) Low breeding capacity and slow rate of growth.

(3) Depraved appetites.

(4) Abnormally low milk yield from breeds of cows which are known to have a normal yield in other localities.

(5) Increased incidence of disease when slow-growing or slow producing native types of animals are graded up by the introduction of rapidly maturing improved breeds (which have a higher requirement for minerals than the slower-growing breeds).

(6) Excessive fragility of bones or deformities or weakness of the limbs.

It is known that these deficiencies occur in various pastoral areas throughout the Empire. In districts in South Africa, New Zealand, Australia, and India, the nature of the deficiency has been found, and in most of these cases further investigations have shown that it is possible to rectify the dietary error, either by feeding substances rich in the deficient minerals or by altering the composition of the pasture of the application of mineral fertilisers to the soil, though the second of these methods is not always economically possible. In a recent investigation on the cause of malnutrition and high mortality of sheep in certain hill pastures in Great Britain, it has been found that the nutritive value of the pasture, as determined by the condition of the sheep and the incidence of disease, can be correlated with the mineral content of the pasture (Elliot, Orr and Wood (4)). Reference has already been made to the case of the Falkland Islands, the recent investigation of which has shown the cause of the prevalent malnutrition and high mortality to be deficiency of calcium in the soil. In some districts, such as Kenya and Cameroon, where systematic investigations have not yet been carried out, some of the signs of malnutrition noted above have been observed, and it is probable that investigations now being conducted will lead to the identification of the deficiencies. It is believed that there may be a number of other pastoral areas where malnutrition due to these causes has already appeared or will appear when the native breeds have been graded up by the introduction of rapidly maturing or heavy producing breeds. The pooling of information on the subject, and the dissemination of it in these pastoral areas, may accordingly lead to investigations which will yield results of considerable economic value to those parts of the Empire concerned.

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(15) Orr—Presidential Address, Section M, British Association, August, 1925.

ACACIA ARABICA AS A FODDER.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, writes:—

"I am inclined to the belief that this tree will be of great value in the Western country where sheep are depastured, as, should it do well there, it will provide a grateful shade for sheep and afford a useful forage in the pods which are shed in late October, November, and December, when the pasturage is usually in poorest supply.

"Sheepmen are appreciative of the value of shade trees, especially at lambing time. Should this tree do half as well in the West as it does at Bowen, it should supply a long felt want. The illustration depicts a group of trees in the Bowen Showgrounds from which an idea of their shading capacity and production of pods can be gauged; the photo. was taken during the second week in October. At Bowen, where it was introduced many years ago, it grows to greatest perfection on soils of good quality and loose texture, but thrives also in clayey soils and amongst rocks and stones. All kinds of stock are extremely fond of the pods, it being a rare occurrence to find any lying under the trees to which the stock have access.

"There is, however, a drawback to this tree in cattle country, in that where cattle consume the pods, the seeds are not masticated and pass whole through the digestive track, thus causing numbers of young trees to appear where they are not wanted. The expense thereby entailed has caused the Bowen Local Authorities to regard the tree with little favour. Sheep and goats, however, masticate the seeds, and so the danger of too great a spread need not be anticipatd in sheep country."

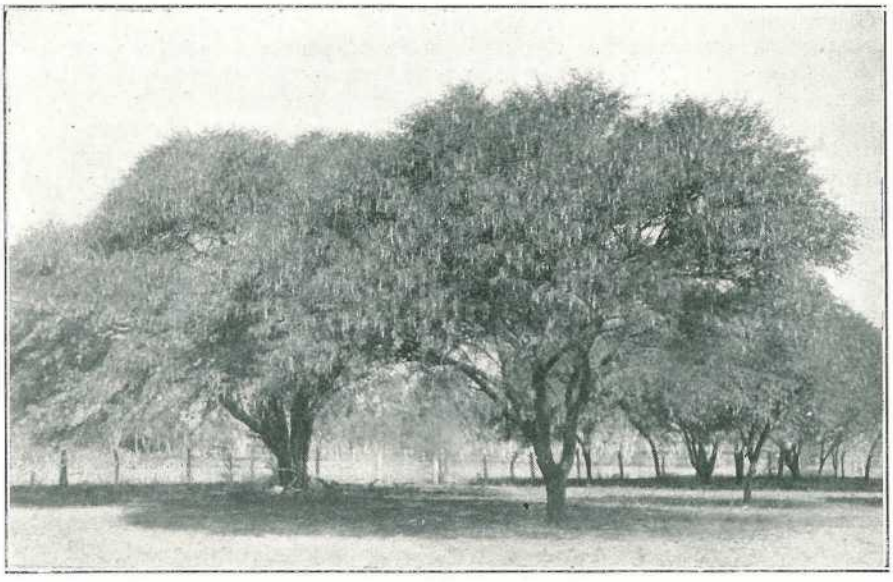


Photo.: N. A. R. Pollock.]

PLATE 89.—ACACIA ARABICA, SHOWGROUNDS, BOWEN.

Some time ago Mr. Pollock forwarded a parcel of pods for analysis as to their fodder value. These were reported on by the Agricultural Chemist (Mr. J. C. Brünnich) as follows:—

ANALYSIS OF SEED PODS OF ACACIA ARABICA.

	Per cent.
Moisture	10.6
Protein	12.5
Fat	1.8
Fibre	14.0
Ash	5.7
Carbohydrates	55.4

Could not detect saponin.

The pods of Acacia arabica have a very good food value, as they contain as much protein as barley or corn. Many acacia pods contain a poisonous saponin, but the sample of beans submitted is free from saponin, and can therefore be safely used as a fodder.

The Government Botanist (Mr. C. T. White) supplies the following information on the tree:—

Acacia arabica has a wide distribution through tropical Africa and Arabia to India and Afghanistan. In India the gum is gathered and forms one of the sources of East Indian gum arabic, but is not, as one would suppose from its specific name, the principal source of supply, which is mostly obtained from an allied species—Acacia Senegal. The wood is very durable and is used in India for a variety of purposes. The beans are fed to sheep and the bark is used in tanning and dying. Unlike many Acacia trees it is a very long-lived species. In his work, "The Leguminous Plants of Hawaii," Dr. J. F. Rock, the well-known authority on Hawaiian plants, strongly recommends the extensive planting of this tree in the Hawaiian Islands; at the end of his article he states, "It will prove a valuable asset, and probably of equal commercial value as the Kiawe." Kiawe is the Hawaiian name of the Algaroba Bean (*Prosopis juliflora*).

The tree does remarkably well in many parts of Queensland, and in one or two places, such as at Bowen and Lake's Creek (near Rockhampton), has run out quite extensively. In Western Queensland I have seen a large tree at Barcaldine. All writers stress the remarkable drought-resistant qualities of the tree.

Mr. Pollock states that persons wishing to give the tree a trial should write to the Secretary, Agricultural, P. and I. Association, at Bowen, and seeds will be supplied by the caretaker of the Bowen Showgrounds.

MANURING FOR MILK.

In the January issue of "The Fertiliser Feeding-stuffs and Farm Supplies Jounral," reference is made to the results of the "manuring for milk" experiments carried out in England by the Staffordshire Farm Institute. The summary of the three seasons' results of these experiments emphasises the need for potash on the light soils of Staffordshire. The experiments were carried out in order to compare the effects of phosphatic and potassic dressings on the quality of the herbage and to ascertain the *milk yield* of each plot of 3½ acres in extent. As a result of these experiments the following results were obtained for the three grazing seasons to 1925:—

	Plot A.	Plot B.	Plot C.
	4 cwt. superphosphate in 1923 and in 1925, costing 28s. per acre in all.	No Manure.	4 cwt. superphosphate and 1 cwt. sulphate of potash in 1923 and in 1925, costing 52s. per acre in all.
1923	870 gallons	881 gallons	1,072 gallons
1924	822 gallons	916 gallons	1,243 gallons
1925	1,072 gallons	1,124 gallons	1,605 gallons
	2,834	2,921	3,920

Expressing the yields per acre of the three plots for the whole period of the experiment, we find that Plot A gave 850 gallons, Plot B 876 gallons, and Plot C 1,176, while the respective milk values (at 1s. per gallon), after deducting the cost of manures, were £41 2s., £43 16s., and £56 4s. per acre.

On this light sandy soil phosphates by themselves have resulted in a loss, but phosphates and potash together have greatly improved the herbage, and have yielded an annual profit of not less than £3 10s. per acre for the first three years.

From the foregoing it will be noted that 4 cwt. of superphosphate was applied in 1923 and the same amount in 1925, to Plot A. Plot B was without manure, and Plot C, in addition to the two dressings of superphosphate, had 1 cwt. of sulphate of potash in 1923 and a similar amount in 1925.

The superphosphate used in these experiments contained 13.7 per cent. of water soluble phosphoric acid, and it is interesting to note that the ordinary commercial grade sold in Queensland contains 17 per cent. of water soluble phosphoric acid.—F. F. Coleman, Officer in Charge of Pure Seeds, Stock Foods, and Fertilisers Branch.

PLATE 90.—BUTTER GRADERS AT WORK, COLD STORES, HAMILTON, BRISBANE.

PLATE 91.—STACKING BUTTER IN THE COLD STORES, HAMILTON—A CHILLY JOB.

THE DAIRYING INDUSTRY.

CONDITIONS, PROGRESS, PROSPECTS, AND PROBLEMS.

A questionaire, prepared by the "Queensland Times," was submitted to the Department recently. Following are the replies to the several points raised:—

Labour.

Where conditions of employment are fair, the supply of labour is adequate. It is not considered that milking machines can be utilised economically in herds of less than forty milch cows, and, as the number of cows in milk on the average dairy farm in Queensland is less than the number mentioned, the general use of milking machines is not advocated.

Share Farming.

Share farming has its limitations, and the system is not readily practicable on farms of small acreage, and, consequently, restricted numbers of milch cows. Share farming usually means that the farm has to support two families—viz., the family of the owner who desires to retire from active farm life, in addition to the family working on the farm.

Transport.

Under certain conditions, a case for subsidy might be cited; but in general practice it would be found more satisfactory to pay a straight out price for the service rendered in the conveyance of cream from the farm to the factory. By the co-operation of the Main Roads Board and Local Authorities, much can be achieved in the improvement of roads in closely settled areas.

Fodder and Water Conservation.

Fodder and water conservation are subjects allied to good farm practices. The majority opinion of farmers, expressed through the Local Producers' Associations, District Councils, and the Council of Agriculture, was to the effect that farmers favour the conservation of fodder on the farm rather than the adoption of bulk storage at central depôts. This decision incidentally places the onus of conserving fodder on the individual farmers. Additional to the desire to grow and conserve fodder, Mr. Gillies, when Minister for Agriculture, foresaw that some farmers would no doubt find the necessity for financial assistance before fodder conservation could be practised by them, and to meet this contingency he conferred with representative leading banking and financial institutions, including the Agricultural Bank, and it was mutually agreed that, while bankers desired to retain the right of scrutiny for overtures for advances, all applications for loans for fodder conservation purposes would be sympathetically considered.

Improved Herds

The conditions of the better bull scheme recently commenced by the Minister for Agriculture and Stock (Hon. W. Forgan Smith) for the payment, under prescribed conditions, of a subsidy of 50 per cent. of the purchase price of approved dairy sires, allow for the introduction of improved dairy bulls, with certified production records of maternal ancestry, into dairy herds. The financial assistance thus rendered to dairy farmers in their efforts to improve the dairy stock should have a decided influence in the improvement of the dairy herds of this State.

Herd Testing.

The herd testing scheme inaugurated by the Department of Agriculture and Stock provides for a production test of dairy cows free of cost to the owners. The services of departmental herd testers are being availed of to a greater extent than formerly; 21,918 cows were tested last testing season. The officers are at present

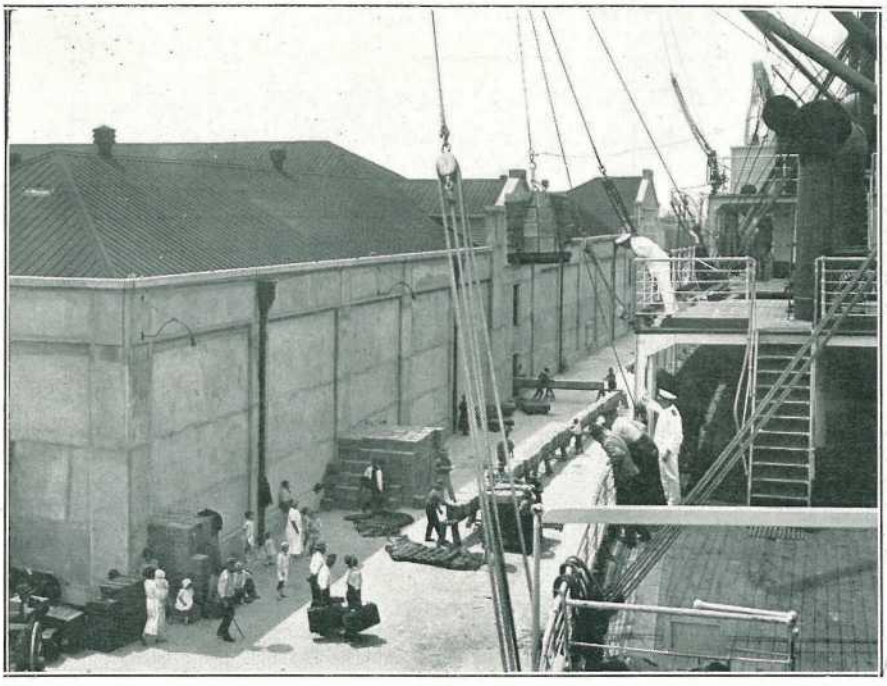


PLATE 92.—A LONDON BUTTER CONSIGNMENT PER "ESPERANCE BAY," EX HAMILTON COLD STORES.

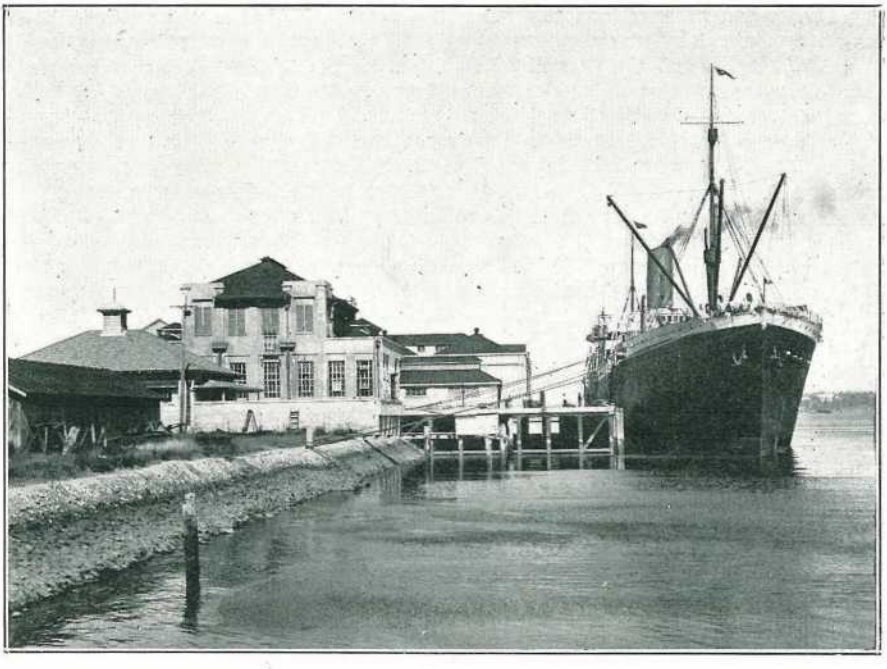


PLATE 93.—BUTTER FOR LONDON—S.S. "EURIPIDES" COMPLETING LOADING AT THE HAMILTON COLD STORES, BRISBANE.

busily engaged in giving attention to upwards of 100 applications for their services, received through branches of the Local Producers' Associations. Herd testing officers give all the necessary information and encouragement to dairy farmers to take advantage of the department's herd testing scheme.

Skim Milk.

Skim milk, with the addition of a substitute for fat, is the recognised food for dairy calves. It has a high food value, and, in conjunction with other farm products, provides a suitable ration for sows suckling their young, for growing pigs, and for fattening purposes.

Pigs.

Pigs are a valuable adjunct to the industry, and this source of additional income is not yet properly recognised by many dairymen.

Male Calves.

It is not profitable for a dairy farmer to rear steers. Only females from profitable producers should be reared. Rearing the progeny of unprofitable producers increases the number of unprofitable dairy females, and is not in the best interests of the industry.

Improvement in Quality.

The quality of butter is to a great extent influenced by the quality of the cream from which it is manufactured. The quality of cream is dependent upon the wealth of the producing cows, the food, and the conditions under which it is produced and cared for until it is delivered to the factory. Modernisation of factory equipment, efficient cream grading and manufacture, secure results that place our choice grades amongst the finest butter in the world.

Pools and Marketing.

Pools provide machinery for the stabilising of the marketing of all primary products. The success of pools in the dairying industry as a stabilising factor has been so pronounced that the principle of pooling has received general recognition. By the means of pools, producers are able to obtain better returns than would otherwise have been possible. They have made manifest to the producer his strong position, and he has found that it is possible for him to be so situated that he can practically control the local and interstate markets, and, at the same time, not lose any of his existing hold on the overseas markets. This control means that he can secure a reasonable price for his produce commensurate with the cost of production. Pools and combines are obviously capable of exercising a form of control that is not practicable in the case of individuals, and the development of the system in Queensland has practically done away with the necessity that so frequently arose in former years for Government assistance to individuals or individual groups of farmers to find profitable markets for their products.

Increase in Local Consumption.

The consumption of butter in the Commonwealth per capita of population is the highest in the world. Few people consume as much butter as Australians. The people of Great Britain are comparatively large consumers of butter. Taking into consideration the relative climatic conditions of Great Britain and Queensland, it does not seem that the consumption of butter per head in Queensland can be readily increased above the existing quantity.

One Floor.

The matter of one floor in Brisbane and in London for Australian butter has been considered by the Pool Board, and the majority decision of that board has not been favourable to the limiting of the wholesale trade in butter to one floor. However, the board will no doubt keep this and other matters relating to the disposal of dairy produce foremost in mind, and, as the marketing of our butter becomes more highly organised, it is possible that the views of the board may be modified.

PLATE 94.—A QUEENSLAND DAIRY HERD.

ADVICE ON THE ROUTINE OF THE DAIRY.

By E. GRAHAM,
Under Secretary, formerly Director of Dairying, Department of Agriculture and Stock

The phenomenally rapid growth of dairying pursuits in Queensland demands that attention be given to the necessity of certain well-recognised factors and conditions, the improper control of which may unnecessarily increase butter-fat losses on the farm, or materially reduce the quality of butter made from "farm skimmed" or "home separator" cream.

Success almost solely depends upon the degree of cleanliness observed in the immediate surroundings wherein the milk is drawn from the cows, the care taken in cleansing the cows' udders, the attention bestowed upon the utensils and appliances used for containing or separating the milk, and the care the cream receives from the time it is separated until it is delivered at the factory.

Too great effort cannot be exerted in encouraging both higher sanitary and higher economic standards amongst the majority of Queensland dairy farms.

So far, unfortunately, little systematic effort has been made on these lines.

THE FACTORY'S RESPONSIBILITY.

It might at first seem that the logical way to reach the cream producer is through the factory returns, but, as yet, few factories have made sufficient difference, in the prices paid for the various grades of cream supplied them, to command the respect of the cream producer for any suggestions factories might make in the direction of improvement in the quality of the raw product.

Many factories receiving at least three distinct qualities of cream from their patrons pay a uniform price for the resultant butters.

This method of making average payments to cream suppliers is not equitable, and positively destroys the chief incentive to produce high quality cream.

As a natural corollary to the present system of factory payments, it follows that the supplier of the good article is sacrificed and underpaid for his product, in order that some monetary preference may be given to those supplying factories with an inferior article.

PLATE 95.—MILK ROOM AND COWSHED ON A QUEENSLAND DAIRY FARM.

Few, if any other, products are paid for with such common disregard of quality, and certainly it is not surprising to find producers negligent in the production and handling of milk products while the above custom of payment prevails.

It is fully recognised that of recent years factories have done much towards the elimination of this practice.

Milk or cream should be graded and paid for by the factories in strict accordance with its quality; and the factory which, in order to gain patronage, is guilty of classifying milk or cream of higher grade than its actual quality merits, does much to retard the progress of dairying interests in this State.

The redemption of quality requires a united effort. Our own citizens demand a full, clean-flavoured, high-quality butter, while for export only the highest grade article can be expected to realise full market rates. During the year approximately 40 per cent. of the butter manufactured in this State is sold on the oversea markets. Generally, export butters are not presented to the consumers until at least six weeks subsequent to their actual manufacture.

This fact alone emphasises the need for every dairyman to possess and exercise advanced knowledge in the modern methods of cream production, for, despite the utmost care in manufacture and cold storage processes, little or nothing can be done whereby the faulty cream supplies can be converted into butter of sufficiently good keeping quality to withstand the lengthy oversea voyage to Great Britain. It is particularly under the stress of export conditions that the butters made from creams of inferior quality behave unsatisfactorily and unduly deteriorate in quality.

Again, the local consumption of low-grade butter is very limited, and it naturally follows that almost all the butter of this character is forced into the export list. Although such butters have a market value, they are not of sufficient merit to build up any good reputation for this State. To so far effect an improvement in the quality of the butter as would allow of the uplifting of the secondary grade butters into the category of the first grade would be a great although not an impossible achievement, and it would result in vastly increased profit to those directly concerned in the industry.

BACTERIAL INFLUENCES ON MILK.

Some of the sanitary and economic features of the cream supply are discussed for the purpose of pointing the way to higher quality and greater profits to those engaged in the production of cream. An

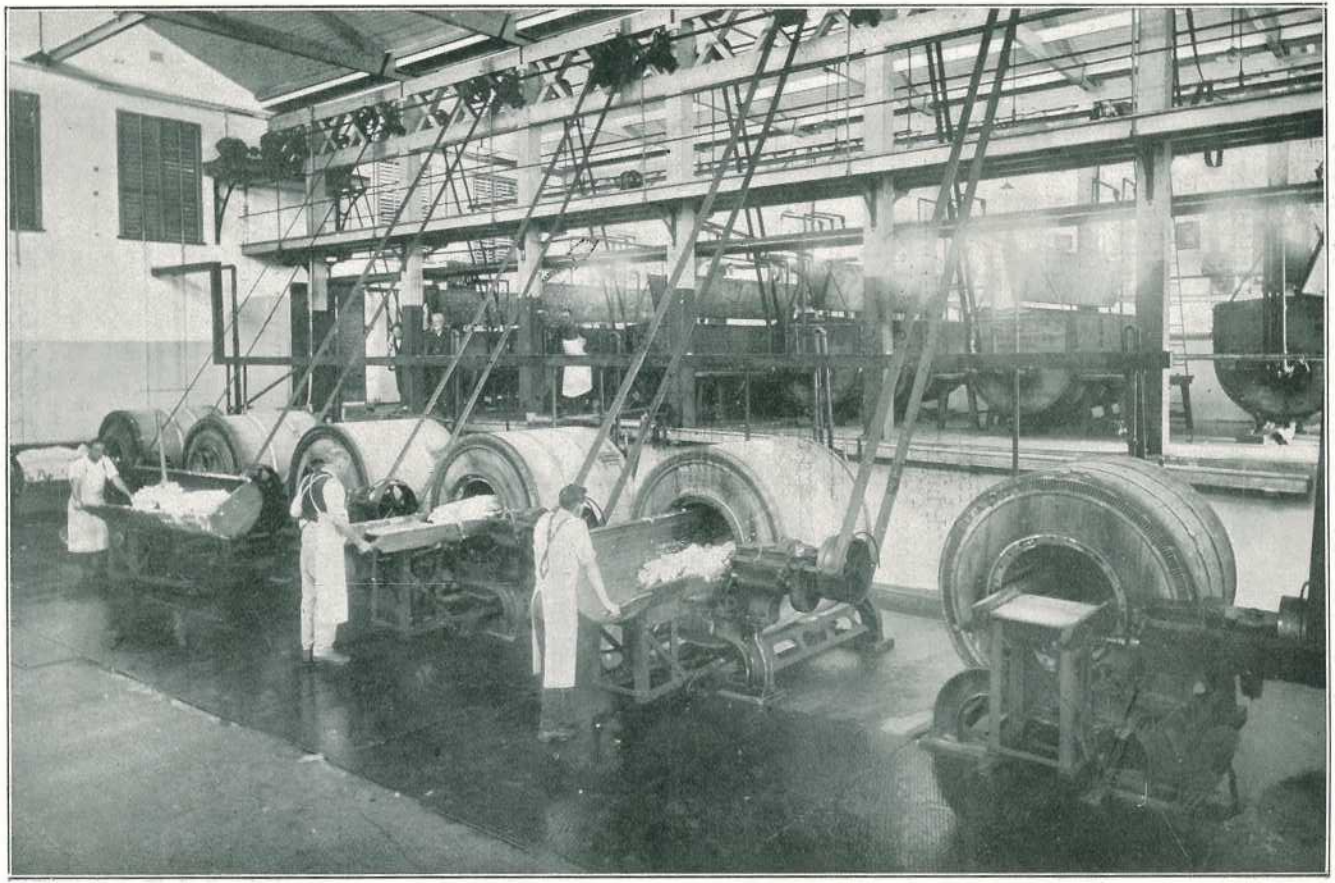


PLATE 96.—INTERIOR OF A QUEENSLAND BUTTER FACTORY.

attempt will be made to deal with the milk at the various stages and operations following from the time it is secreted in the udder until the cream is ultimately despatched to the factory, and it is hoped that some of the recommendations made in these pages will be of interest to dairymen, and sufficiently sound and practical to warrant adoption by those anxious to supply an article worthy of their best efforts.

Attention will be first directed to the early sources of bacterial contamination of milk, and the means whereby infection may be minimised and combated.

Although milk, at the instant it is secreted in the udder, is perhaps sterile, it has been repeatedly shown impossible, except in rare instances, to obtain milk from the cows' teats that is not more or less infected with bacteria.

The germs readily find their way into the inner parts of the udder through the milk duct, and, rapidly multiplying in the presence of favourable temperature and food, they are carried out into the milk by the process of milking.

Any disease or injury to the udder may further add to the numbers and harmfulness of the bacteria in the milk.

However, the most abundant contamination usually takes place after the milk is drawn from the udder. Dust or filth from the cow, hands of the milker, utensils, or dust of the yard may add large numbers of bacteria. Strainers, separators, and other appliances, if unclean, may all prove detrimental to the quality of the milk, and there are innumerable other ways under which the process of infection may occur.

All germs arising from a filthy source are resentful and deleterious to quality, but there are some species of germ life that are helpful to the butter-maker and cheesemaker alike when they can be controlled, but certainly these species of germ life are not associated with nor can they be developed in any other than the most cleanly conditions.

Milk is recognised as a great medium for the propagation of many forms of germ life, and it is this fact, together with the astoundingly rapid multiplication of germs, under favourable circumstances, that enables the bacteria to exert such a powerful influence on the quality of many dairy products.

From a sanitary standpoint it is most necessary to keep the cow's body clean, especially the udder, teats, and flanks; while the animal's tail must be securely fastened and not permitted to switch about during the process of milking. Repeated trials show that where cleanly conditions obtain from day to day it requires little more than one or two minutes to properly brush the flanks and wash and dry the udder of a cow preparatory to milking.

PLATE 97.—INSPECTORS GRADING BUTTER.

The body of the cow, and especially the flanks and udder portions, must be clean and free from dust to ensure wholesome and pure milk. Bacteria are transported upon dust particles, and, because of this, it is unwise to distribute dusty foods for feeding purpose at milking times. It is little short of a crime to proceed to milk a dirty cow without first rendering her parts clean by brushing, washing, and wiping. To wash the hands alone is not sufficient precaution.

To the water used for cleansing purposes, it is recommended there be added enough permanganate of potash to colour the water a bright red colour. Frequent renewals of the water are also necessary. A bowl placed under a water tap, so as to allow of the hands being washed in it, and then the tap turned on so as to rinse the hands, affords a satisfactory method for cleansing the milker's hands.

In milking, it is advisable, if cows are leg-roped, to apportion that work to one attendant, and thus avoid the necessity for every milker to handle the usually none too clean leg-rope.

It is advantageous to reject the first few streams of milk, as such milk is of poor quality and likely to be highly contaminated with forms of germ life that have found entrance from the exterior of the udder as previously explained, and, as the first milk contains little butter fat, no perceptible monetary loss will accrue from the adoption of this practice.

The wise dairyman will, at all times, maintain healthful and clean surroundings wherein the cows are milked. The losses caused by neglect in this particular are too serious to be considered lightly.

Only healthy animals should be permitted in the dairy herd. The health of the consuming public demands this care, while the knowledge that, generally, only the healthy cows can make the fullest use of their food provides a secondary reason for care in this respect.

APPOINTMENTS OF THE DAIRY FARM.

Under usual conditions, the cowyard is a serious handicap to good dairy products. In reasonably dry weather the yard is so dusty that the milk must of necessity be drawn in surroundings certain to assist contamination of the milk, while during the rain the yard becomes so muddy that it provides a positive source of further infection of the milk supply.

The cowyard should be set upon a well-drained piece of land with the slope away from the milking-shed and dairy.

The use of gravel is to be recommended, but it is more satisfactory to employ concrete to make sure that the cows are kept free from mud and filth.

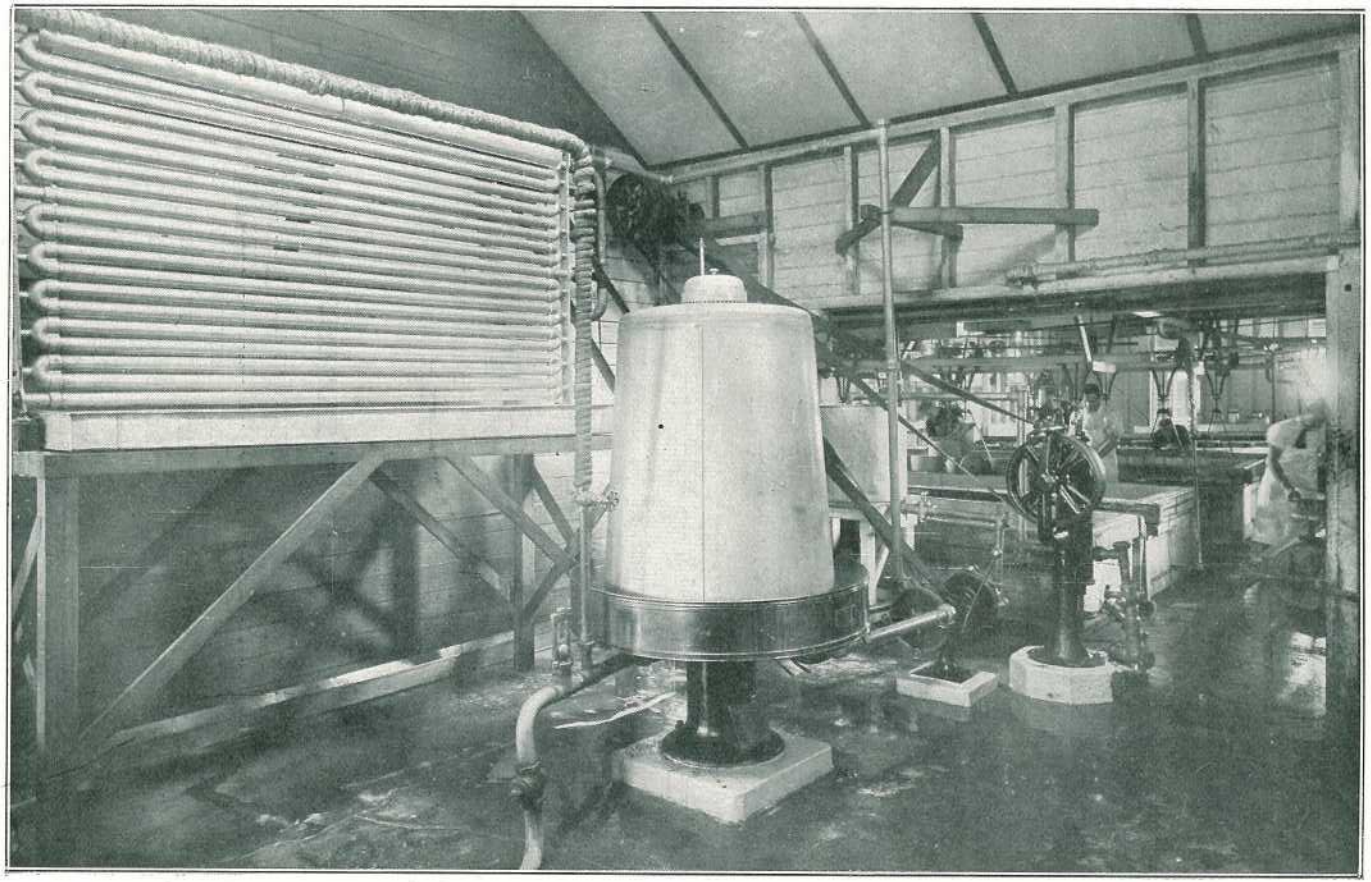


PLATE 98.—INTERIOR OF A QUEENSLAND CHEESE FACTORY SHOWING PASTEURISER

With large herds it becomes somewhat expensive to gravel or concrete the whole of the receiving yards, but it is practicable to subdivide the yard, and gravel or concrete a portion wherein the cows can stand in comfort during wet weather and cast off much of the mud before they are driven into the bails.

The yard should be kept clean and the manure removed promptly and conserved at some considerable distance from the milking-shed or dairy premises.

This precaution will also greatly help in keeping down the number of flies.

The practice of milking in unsuitable surroundings is possibly doing more to retard progress in dairying than any other existing custom.

When the milk, drawn from dairies faulty in the above direction, is tendered at the cheese factory, it produces a "gassy" curd and a low-grade cheese.

Cream from a similar source produces an indifferent butter of imperfect flavour and poor keeping qualities, and is not at all suitable for the local or export market requirements.

The milking-shed and bails must be substantial and well built. Drainage, light, ventilation, protection of the persons milking and the cows from the prevailing winds, ease of cleansing, and good facilities for handling the cows are the main considerations.

Fortunately, these can be accomplished at a much less expense than is usually believed. Concrete floors and gutters with ample fall are recognised as essential to a well-ordered milkshed and bails.

Not only do these assist in securing good sanitary conditions, but they make it possible to effectively save all the fertility in the manure, as well as contributing to the comfort of those carrying out the work of milking.

Some dairymen feed their cows in the bails, but the ideal is to have independent and separate feeding stalls.

The use of odourless disinfectants in the milksheds at frequent intervals is desirable, as it is unreasonable to expect that the broom alone will keep the milkshed as clean as is necessary.

The periodic use of lime wash is essential as a disinfectant, both to present and maintain a cleanly appearance throughout the shed.

Unslacked lime sprinkled on the floor is most advantageous. The whole of the milking routine should be so planned that all operations that tend to raise dust take place after the actual milking of the cows is completed.

In some ways the quality of the milk is dependent to a very great extent upon the person drawing the milk. His personal habits go a long way towards determining the cleanliness of the products. He should be personally clean—have cleanly habits and enjoying perfect health. In no other form of farm work does health count so much.

Unless the regular clothing is above suspicion, it will pay to furnish each milker with a frequently laundered outer garment to be worn only at milking time. Milking with dry hands is essential, or, if this is not possible, a minute quantity of vaseline or crude castor oil may be used, but there must never be any such excess of these substances as will permit of any of the lubricant from the milker's hands reaching the milk pail.

The practice of wetting the hands in the milk is the most repulsive possible, and should disqualify any milker employed on a dairy where the owner has any interest or regard for his business. A properly equipped washbowl and towel are inexpensive accessories to the milkshed; the milker's hands require frequent washing and drying even under the best of conditions.

Much is gained by milking in a quiet manner, both as to cleanliness and the amount and quality of the milk extracted.

MILKING MACHINES.

Of recent years milking machines have been improved and rendered much more perfect in their work. In considering the installation of milking machines, the two chief matters for thought are the likelihood of damage to the quality of milk by infection, and the economic advantages to be gained over hand-milking methods

The process of milking by means of machines has not yet become general, but enough studies have been made to throw some light upon the relation between machine milking and the keeping properties of the milk. While there still exists a diversity of conclusion as to the economic advantages, the general consensus of opinion seems to be—that the machines may be regarded as a paying investment, and that their more general use in the future will be almost a necessity, especially if present tendencies prevail.

The machines, at present, exhibit numerous intricate devices that are more or less difficult to cleanse. Any mechanical appliance for milking cows that offers further means of contaminating the milk has little chance to survive. Nevertheless, with thorough care, the various parts and tubings need not be the cause of further contamination, as it has been shown that they may be kept in a perfect state of cleanliness.

Much depends upon the individuality of the operator. Some

dairymen can, with apparent ease, keep the milking machine and its parts quite clean, while others fail to maintain even a milk can in a fit state of cleanliness.

In the hands of a careful operator the milk extracted by a modern machine will show less bacteria than average milk drawn in the ordinary manner of hand milking.

The protection of the milk from exposure in the milking-shed, which the machine offers, is an important item if the interior surface of the apparatus is clean.

Experience has taught that aeration of the milk, or of the cream from the milk, drawn by the machine, is absolutely indispensable if good quality and flavour are sought.

The milk being extracted in a partial vacuum no doubt explains the need for the subsequent aeration, for in hand milking the milk receives a crude kind of aeration as it is forced from the teat to the milk pail, and even this partial aeration does not occur in machine milking.

All rules relating to the care and operation of the milking machines as given by the installing agent must be religiously followed.

The parts of the machine that come into contact with the milk must be thoroughly cleansed and dipped into clean boiling water after use without exception. The practice of boiling special parts of the machines once or twice weekly is absurd from a hygienic standpoint; and the neglect to cleanse effectually the milk-soiled parts of the machines on each occasion of their use is responsible for a large amount of the inferior milk and cream delivered to factories from dairies wherein machines are installed.

The rapid growth made by germ life under favourable conditions prohibits the tolerance of any other than prompt and persistent methods of cleansing of all tubes and parts of the milking machine that are brought directly into contact with the milk. In general practice the evidence is that the comparatively inferior quality of the milk drawn through machines constitutes the greatest weakness in that system of milking. For the greater part the defects in the quality of the milk or the cream won from it are attributable to the inefficient cleansing of portions of the machines.

DAIRY UTENSILS.

There are also included in the dairy plant many necessary utensils which play a part in deciding the quality of the products.

The use of sound utensils, free from rust and kept in a cleanly condition, is an essential to good and pure milking.

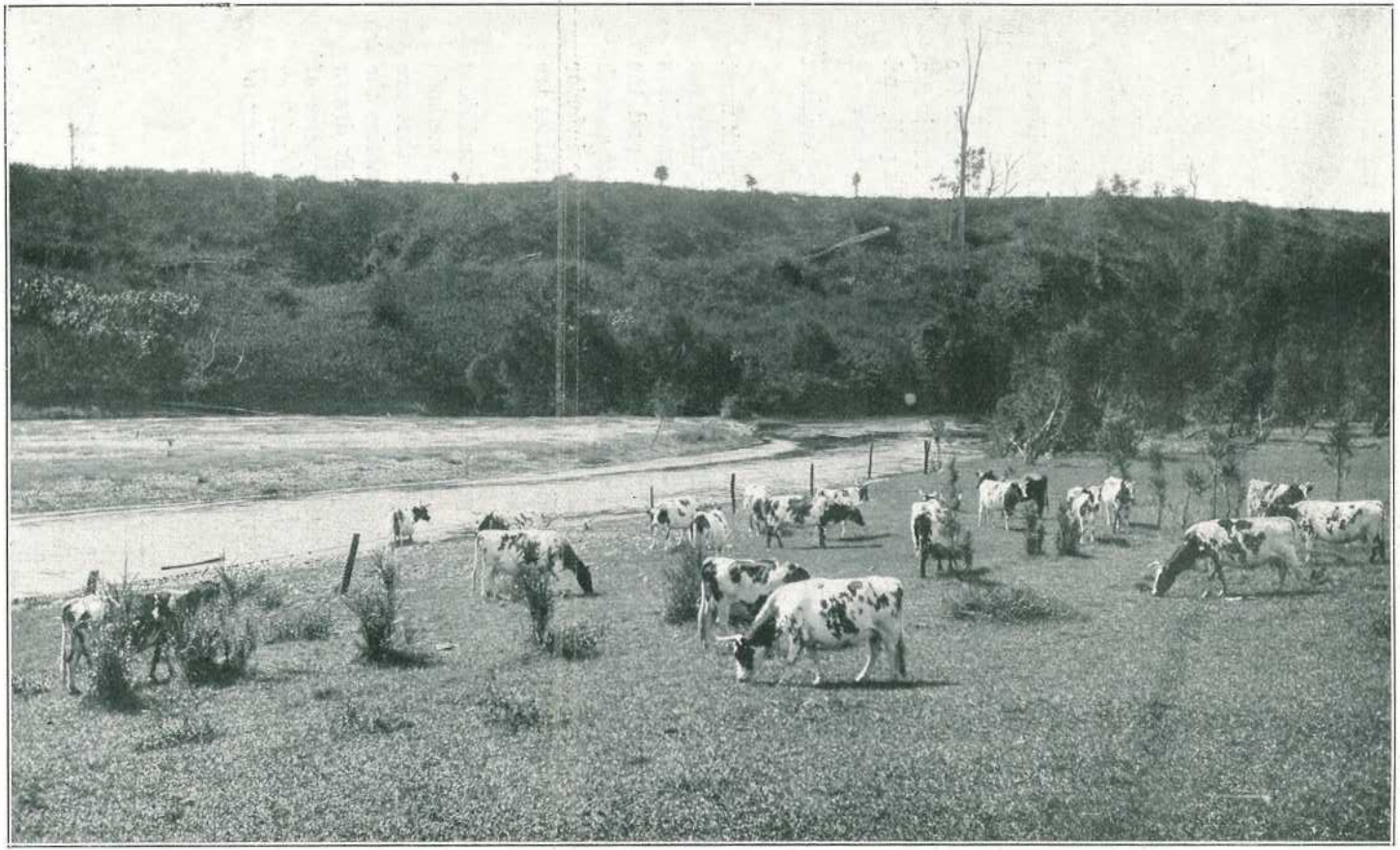


PLATE 99.—DOWN ON THE CREEK—SCENE ON A QUEENSLAND DAIRY FARM.

Battered or dented buckets, pans, &c., with seams that are not evenly flushed with solder, cannot be thoroughly cleansed. The uneven surfaces and crevices harbour germs and invite contamination that is readily imparted to the milk, though the latter may be subjected to it only momentarily.

Such utensils are employed at the expense of the quality of the milk.

Milk and cream cans with narrow necks are to be avoided, and it is false economy to purchase utensils bearing any of the above defects.

Seamless milk and cream cans give the most satisfaction, and well repay for the slightly higher initial cost.

An essential requirement in any utensil used for containing milk is accessibility in cleansing, to which should be added durability.

To keep the dairy utensils in good order, thorough cleansing is necessary.

Using an original can of warm water to rinse a dozen or more dirty utensils should in no way be considered as meeting the requirements of washing.

An appropriate room with means for obtaining hot and cold water, fitted with wash sink, draining rack, and steam jet for sterilising, are the least that can be expected in the way of washing equipments.

In the absence of live steam, a bountiful supply of clean, boiling water may be used as a substitute, and in lieu of exposing the wash vessels to the steam jet they can be submerged in the boiling water.

The washroom may or may not be detached from the separator or milkroom, but it will, of course, be better if separate.

Nothing short of a good cement floor meets the needs of a washroom or dairy-house, both in view of its lasting properties, comparatively low expense, and greater sanitation.

The flooring should be set with an even surface with plenty of slope to the drain, and abundance of light and ventilation in the room should be provided for.

When one thinks of the vast amount of careful cleansing that dairy work entails, it is surprising to note the crude methods generally adopted in carrying out this all-important portion of the work. Thorough cleansing of dairy products becomes well-nigh impossible in the absence of proper conveniences, and it is safe to say that only a small percentage of the dairies are equipped with adequate cleansing appliances.

The actual work of washing dairy utensils is an important operation, though it involves but a few simple considerations. Always use a brush

but never a cloth, as the latter cannot be kept in a sanitary condition. First rinse the utensils in lukewarm water, always avoiding hot water, for the first washing with boiling water at this stage only tends to cook the non-fatty milk solids fast to the tin. After the bulk of the adhering milk is removed, the utensils should be scrubbed in water containing sal soda or other similar cleansing ingredients, but under no circumstances should ordinary soaps be used. Buckets, dippers, strainers, parts of the separator, &c., should all be treated in a like manner.

In cleansing cans, a special brush may be procured which is very effective, and with its aid the shoulder portion of the cans may be reached more easily than with the ordinary scrub brush.

Thorough rinsing after scrubbing in hot water is essential; then the utensils should be steamed over a jet of live steam or submerged in clean boiling water. After this treatment the various pieces should never be touched with a drying cloth, but allowed to dry of their own heat. This not only prevents rust, but leaves the vessels sweet and clean. Exposure to sunlight is desirable if same can be accomplished away from the dust, but by all means avoid the dust—probably the surest means of contamination.

Sandsoaps or similar preparations that are by their use inclined to erase the tinning from the utensils should be strictly avoided.

Although constant scrubbing with a brush is to be recommended, no dairy utensil should be allowed to fall into such a state of uncleanliness that a scouring soap should be necessary for its proper cleansing.

Tin is a metal which more effectively resists the action of the acid that milk or cream naturally develops than does the baser metal over which it is coated. Hence, to remove the coating of tin from a dairy utensil is to render the vessel unsuitable for the purpose of containing milk or cream.

TREATMENT OF MILK AND CREAM AT THE DAIRY.

We will now revert to the process of milking and the treatment the milk and cream should undergo preparatory to its despatch to the factory.

Recognising the fact that the time of milking is the critical period in the life of milk or cream, and that the cleanly habits of milking are important as influencing the keeping properties of the milk, or the flavour of the cream, it is therefore always necessary to remove the milk from the milking-shed to the milkroom as soon as possible.

Open cans or vessels containing milk should never be allowed to stand in the milking-shed. Either a few pails with covers or large cans fitted with fine dust-proof gauze or cover lids should be in use to receive

the milk from the milkers' buckets, and the milk transported to the milkroom at frequent intervals. In some dairies the milkers pass to a convenient room at the side or end of the milkshed where the milk is strained into pans for prompt removal to the milkroom. Others again convey the milk from the milkshed by gravity in chutes to a receiving tank in the milkroom. This latter practice is to be condemned, as the exposure of the milk to dust and flies as it flows down the chutes leaves the milk open to sources of serious contamination.

Circumstances must determine the best method to follow, and the system that succeeds in getting the milk from the cow to the milkroom without contamination is good, provided that it is accomplished with the minimum amount of labour.

STRAINING.

Of vast importance is the straining of the milk.

The milk should be strained immediately it is drawn from the cow.

It is true that the milking process should be so conducted that there is nothing in the form of dirt to extract from the milk, but what a splendid check upon the perfectness of the milking operations the strainer provides!

Examine the strainer after the milk has passed through it, and note the dust particles on the sterilised cotton wad, then you will readily discover the necessity of straining the milk promptly after it is drawn from the cow, and the need for the greatest care during the extraction of the milk from the cow will be apparent.

The pattern of the strainer employed to carry out the process of straining has much to do with the perfectness of the process.

When a strainer is used of a kind which temporarily detains the dirt particles, to be driven through later and incorporated with the milk, its service is of no advantage and may eventually increase the germ content of the milk.

The type of strainer fitted with sterilised cotton wads to be renewed at least every milking is the only design of strainer worthy of recommendation, and when dairymen are encouraged and trained to the fact that quality counts this pattern of strainer will assuredly be in more common use on the dairy farms.

COOLING.

All milk and cream should be subjected to prompt cooling, and no unnecessary delay should be allowed to intervene between the time the milk is drawn from the cows and the actual application of the cooling and aerating process.

The climatic conditions under which the milk or cream supplies of this State are raised are such as demand that the practice of cooling should form part of the daily routine of the dairy.

Milk and cream, no matter how perfect in flavour at the outset, are highly perishable products; and changes of a deterioratory nature will speedily take place unless systematic action is taken to arrest the natural alteration in quality.

All things being equal, the deterioration to which milk and cream are subject is largely governed by the temperature at which these products are held.

The lower the temperature maintained the longer will the milk or cream remain sweet and sound in quality.

The process of cooling may be carried out in the following manner:—

From an elevated receiving vat the milk, or from the separator spout the cream, may be conducted over any of the standard coolers. These are of various designs, and permit of the milk or cream passing in a very thin layer over a more or less extensive surface, the inside of which is usually cooled by a circulation of cold water.

This process, if rightly carried on, may accomplish two things—(*a*) The rapid cooling of the milk or cream; (*b*) the elimination of odours therefrom.

The importance of the cooling and aeration of the milk or cream is obvious, but the air and surroundings where it is done must be pure and clean.

PROTECTION FROM HEAT.

The milk or cream in transit from farm to factory must be fully protected from the sun's rays.

The hauling of milk and especially cream for long distances is a necessary condition imposed upon dairymen and cream-collectors in many parts of Queensland.

Unfavourable temperature conditions extend over a large portion of the year, and some means of protection of the dairy products from the hot sun is absolutely essential.

It is much the better method to have a hood or cover attached to the conveyance in which the milk or cream is carried than to place a covering directly over the cans.

The former method allows of a current of shaded air to pass between the cans and the protecting shade cover—an advantage not to be gained when the covering rests directly on the cans.

SEPARATION.

All that has been said thus far as pertaining to the improvement of the milk supply applies with just as much force to the production of wholesome cream. While the cream represents only a small proportion of the original milk from which it was extracted, it has a comparatively higher commercial value, and any unfavourable influence incident to the production of the milk is to be detected later in the cream.

In diverting our attention more directly to the production of cream, we will first take the separator, the medium whereby the butter fat is won from the milk.

In common with any other piece of apparatus used in the treatment of milk or cream, the separator must be kept scrupulously clean. The disastrous effects of using a foul separator bowl can be imagined only when we recall the fact that all cream passing through it becomes seeded with the bacteria it contains.

Unless the cream is promptly pasteurised, any harmful germs introduced into the cream are certain to develop injurious flavours that are ultimately carried into the resultant butter, which, as a consequence of the injury to its qualities, realises less than first-class market quotations.

This one cause of bad flavours in butters alone, accruing from neglect to always cleanse the separator bowl after use, levies a heavy toll upon the butter industry in this State, and the loss could be easily obviated.

The bowl and the milk-soiled parts of the separator must be taken apart and washed every time the separator is used. This is imperative not only for sanitary but for economic reasons, as will be pointed out later.

Where a separate dairy-house is available, the separator is best placed there, and not operated in a partitioned portion of the milkshed or in any place where the air or the surroundings are imperfect.

I have seen farm separators placed in dilapidated outbuildings and even out of doors, where they serve as lodging-places for dust and filth at times when the machine is not in use. Nothing could be more antagonistic to good quality of the cream—in fact, such conditions are contrary to law, and place the owner liable to prosecution.

A clean room with impervious sloping floors, well ventilated, fitted with screened windows and doors, and with good drainage, can be made to well serve as a place wherein to separate the milk. Further, the initial cost of the separator is of itself sufficient to emphasize the need of protecting the machine from harmful influences.

Every separator supplied to the dairymen is usually accompanied by specific directions for guidance in both setting up and operating the machine. The instructions given should be carefully followed.

Assuming that all parts of the machine are properly adjusted, the first requirement is a firm foundation. With care most hand sizes of separators can be set upon solid wooden floors so as to run satisfactorily. Unless it is a firm floor without vibration, it will not do. A concrete pier, with bolts embedded for attaching, say, 2 in. by 4 in. or 4 in. by 4 in. pieces of hardwood to which the separator may be lagged, is a satisfactory method, as all vibration is thus avoided.

Pieces of 2 in. by 4 in. hardwood bolted to a cement floor may be made to serve as well.

Care must always be taken to set the frame perfectly level, as otherwise the bowl will not be properly balanced and will fail to run true.

Placing a machine upon skids or a foundation of a temporary nature is, to say the least, a questionable practice.

THE SEPARATOR.

The life of a standard separator depends upon its care to a great extent. To allow a machine to become gummy or dirty must materially shorten its term of usefulness. Keep the separator free from dirt and the working parts well oiled; follow the directions as to the number of turns of the handle per minute. A uniform strain applied to the handle, and not a series of jerks, will contribute to both the skimming efficiency and the life of the separator. The continued use of light-grade oils, such as are first supplied with the machine, should be followed, as heavy oils are not suitable as lubricants for separators. A strong calico or oilcloth cover for the separator, to cover and protect it when it is not in use, is quite worth while, as the coverings keep dust and dirt out of the bearings. It is essential that the separator must run smoothly. No machine will do good work if it is not running smoothly; under such circumstances, the layers of milk in the separator, instead of arranging themselves in correct order—the cream in the centre, and the skim milk at the outside of the bowl—are broken up and mixed by the vibration, and much of the fat is apt to escape with the skim milk. When the bowl runs smoothly, the cream and skim milk are perfectly separated and find their respective outlets without interference. The importance of keeping a separator running smoothly may be further shown by the fact that tests of skim milk, taken from the same separator, have shown five times as great a loss under adverse conditions as when the machine has been running satisfactorily. The variation in the percentage of butter fat contained in the cream supply is often a source of concern to dairymen supplying butter factories. The farmer is

likely to feel that when the milk is drawn from the same herd, fed and milked in the same manner, and the cream separated by the one separator and operator, the percentage of butter fat in the cream should not vary, and the average cream producer is likely to look upon a sudden variation in the percentage of butter fat in the cream as incorrect and indicative of careless or dishonest testing, and, while admitting that great care is needed to draw the samples and test cream correctly, variations are bound to occur that are naturally due to the conditions under which the milk is separated, as so many conditions are known to affect the efficiency of the skimming or the density of the cream.

The causes of variation in cream tests may be listed as follows:—

Smooth running,
Speed,
Cleansing of separator,
Volume of milk inflow,
Temperature of milk,
Condition of milk,
Richness of cream,
Richness of milk separated,
Amount of water or skim milk used to flush the bowl,
Position of cream screw.

The centrifugal force required to ensure the efficient working of a separator of any pattern depends upon the speed of the bowl. There is a certain speed at which every machine will do its best work. The manufacturer has asecertained the speed at which the separator works most satisfactorily, and shows the number of revolutions per minute on the crank of the handle for the guidance of the farmer using the machine. Usually a lower speed than that indicated causes loss of butter fat in the skim milk, but a higher speed is without beneficial results or may prove injurious to the machine. With no change in the adjustment of the cream screw which we assume in this discussion, excessive speed tends to increase the capacity for milk and causes the flow of a comparatively richer cream; but a reduction in speed will give a proportionately larger *volume* of cream, which will be *lower* in its butter fat contents. While there is nothing gained by excessive speed, the greater the reduction in the number of turns below normal, the greater will be the loss in the butter fat carried away in the skim milk. The cleansing of the separator should be carefully attended to. It is a noteworthy fact that many users of separators are negligent in the care of the machine, and the idea seems to be that it is unnecessary to wash the separator more than once a day or once in two or three days. Nothing could be further from the truth. Even when the unwashed bowl is flushed with warm water, there remains a coating of slime and milk on the interior parts, which readily undergoes decomposition. When next used, the warm milk in passing through the unwashed bowl becomes

contaminated with bacteria from this source, and is damaged materially in quality. Such cream may be dangerous to health, and it is certainly not fit for butter-making purposes. The repulsiveness of this unfortunately too prevalent practice should be enough to condemn it in the eyes of all intelligent dairymen. There is also an economic loss, caused by the use of an unclean bowl, which makes careful washing necessary each time it is used. With an unwashed separator bowl, butter fat losses in the skim milk are greatly increased. A series of trials with machines in otherwise good working condition show that fully three times as much butter fat is lost from the unwashed as from the washed bowls. It is, therefore, obvious that regular washing as described for all dairy utensils is essential to best results with the centrifugal cream separator, both as far as the extraction of butter fat from the whole milk and the ever-important factor of quality of the cream are concerned.

Every separator has a rated capacity, and any attempt to force the milk through in greater amount or to reduce the inflow to any marked extent below normal may have serious results. It is important for each operator to note the rated capacity of his separator and regulate the inflow accordingly. Forcing milk through in excess of capacity tends towards the production of a thinner cream than that of a normal inflow; while a reduced inflow of milk, other things being equal, gives a thicker cream.

Warm milk separates more completely than cold, and the separator will do much more efficient work when the temperature of the milk is between 85 degrees and 90 degrees Fahr. than at any lower temperatures. Any claim that perfect separation of the milk can be effected when lower temperatures are employed is very doubtful. Variations in cream tests due to temperature of the milk, although of common occurrence, are perhaps not so marked as those due to the influence of the speed at which the bowl is driven. Not more than 3 or 4 per cent. variation of the cream test is due to the matter of temperature under ordinary circumstances. Using cold milk for the purpose of separation should be avoided, for the practice is generally associated with extravagant losses of butter fat in the skim milk. The colder the milk, the less the volume of cream extracted and the higher the test. Separating milk at 60 degrees or 90 degrees Fahr. will usually result in the loss of fat being at least one-half less in the instance where the higher temperature is adopted, as compared with the loss when the lower temperature is used. Milk, as it comes from the cow, after thorough straining, is in the best condition for separation; it is then in a high state of fluidity and at the right temperature. Sour or curdled milk separates with difficulty or not at all. Slightly sour milk or milk that has "creamed" should be well stirred before entering the bowl, and it is better if slightly underfed into the separator.

The richness of cream obtained from the separator may be regulated by a device called the "cream screw." While many other factors may affect a test of the cream, the cream screw is dependable upon for securing either a rich or a thin cream. The cream screw should not be changed unless the cream test shows either too high or too low a reading. The legal standard for cream requires that the cream must contain not less than 34 per cent. of milk fat during the months of April to September, and 38 per cent. during the months of October to March inclusive. The percentage of butter fat specified is given as a minimum, and the ideal percentages of butter fat can only be ascertained by a study of the various localities, seasons, and general conditions under which the supply is raised. For the guidance of dairymen desirous of supplying cream of a high grade, it is recommended that during the warm season of the year the milk be so separated as to yield a cream containing from 38 to 44 per cent. of butter fat, while lower percentages are permissible throughout the cooler period of the year: particularly does the latter apply to cream raised in the colder parts of the State. The existing belief, shared by dairymen, that it is more remunerative to supply to factories a low than a moderately high testing cream has nothing to support it in quarters where testing is carefully and honestly carried out, while the fallacy of paying unnecessary freight and cartage on the increased bulk of the cream, due to its low test and the consequent daily encroachment on the skim milk supply, which is so valuable on the farm, should be sufficient reason for dairymen to arrest the leakage to the industry accruing from the methods of supplying low test creams, which are now in too common practice.

The richness of the milk separated affects the butter fat content, but not the quality of the cream, and practically the same volume of cream is obtained, irrespective of whether the milk has a high or low butter fat content. The amount of fat lost in the skim milk is not affected to any appreciable extent by the richness of the milk separated.

It is evident that any variation, from time to time, in the quantity of water or skim milk used in the flushing of the bowl at the completion of the separating process, will have a marked effect upon the test of the cream. A variation of one pint in the amount of flushing fluid used may change the test of the cream several per cent., depending upon the amount of cream obtained. The manner in which the flushing is done has a marked influence upon the texture and keeping qualities of the cream. If the skim milk for flushing is added at a greater rate than the capacity of the separator can cope with, a deal of the non-fatty solids it contains is carried through the cream outlet and becomes mixed with the cream supply. It is generally recognised that the non-fatty solids are the poor-keeping constituents of cream, consequently their presence in cream is to be limited as far as possible. It was upon the knowledge of this principle that the 38 per cent. butter fat standard during the warm season of the year and the 34 per cent. standard during

the cooler months was based. No doubt more full attention to the general management of the separator, and the method of flushing the bowl in particular, would do much towards removing many "low-test" cream suppliers' names from the list at the butter factories.

GENERAL.

Proper facilities for handling cream to best advantage should be at the command of every dairyman. In a comparatively warm climate, such as that of Queensland, every dairy should be fitted with an aerating and cooling appliance. The vessels in which the milk or cream is contained should be particularly well cleansed. Even when cans are carefully washed at the factories and thoroughly aired, it is possible, when these cans are unlidded at the farm, that they may give off a foul smell. It is always necessary to give the returned cream cans another washing and time to thoroughly air before filling them with milk or cream. On many farms where cream is produced, it is compulsory to hold the cream some time before delivering to the factory, and a thorough application of the principle of aeration and cooling will materially improve the quality of the resultant butter. With cream, as well as milk, the fresh warm portion should never be added to that previously cooled until it has been reduced to a similar temperature. The room in which milk or cream is held and cooled should be used exclusively for the storage and treatment of those products, as both are of such a delicate nature and highly susceptible to taints and contamination. The care and proper handling of milk or cream is exacting work, and should not be entrusted to a careless or ignorant person for performance. There is no point in the life of milk or cream where a reasonable amount of mature experience and judgment will not amply pay for their application. Milk and cream are so readily perishable that only trained persons should be trusted with their care, and the cost of producing them makes carelessness a dangerous and expensive risk to take. Probably no form of human food is produced under conditions where skill and common sense count for more than in the production and handling of milk and cream. There are instances where children of tender years, and other incompetent persons, have been employed to carry out most of the important work of the dairy. It is hard to imagine any arrangement calculated to produce disaster more vicious than one of this kind. This exactness applies not only to milk and cream, but generally to the production of all forms of dairy products.

It is maintained that a large percentage of the cream delivered at factories is, prior to the receipt thereat, so handled that as a result the quality of the butter therefrom is injured. The producer should display greater interest in the delivery of his product to the factory, especially if he has given it good care up to this point on the farm, and is supplying it to a factory where quality is recognised. It is desirable that the time from the cow to the churn should be as short and the conditions as

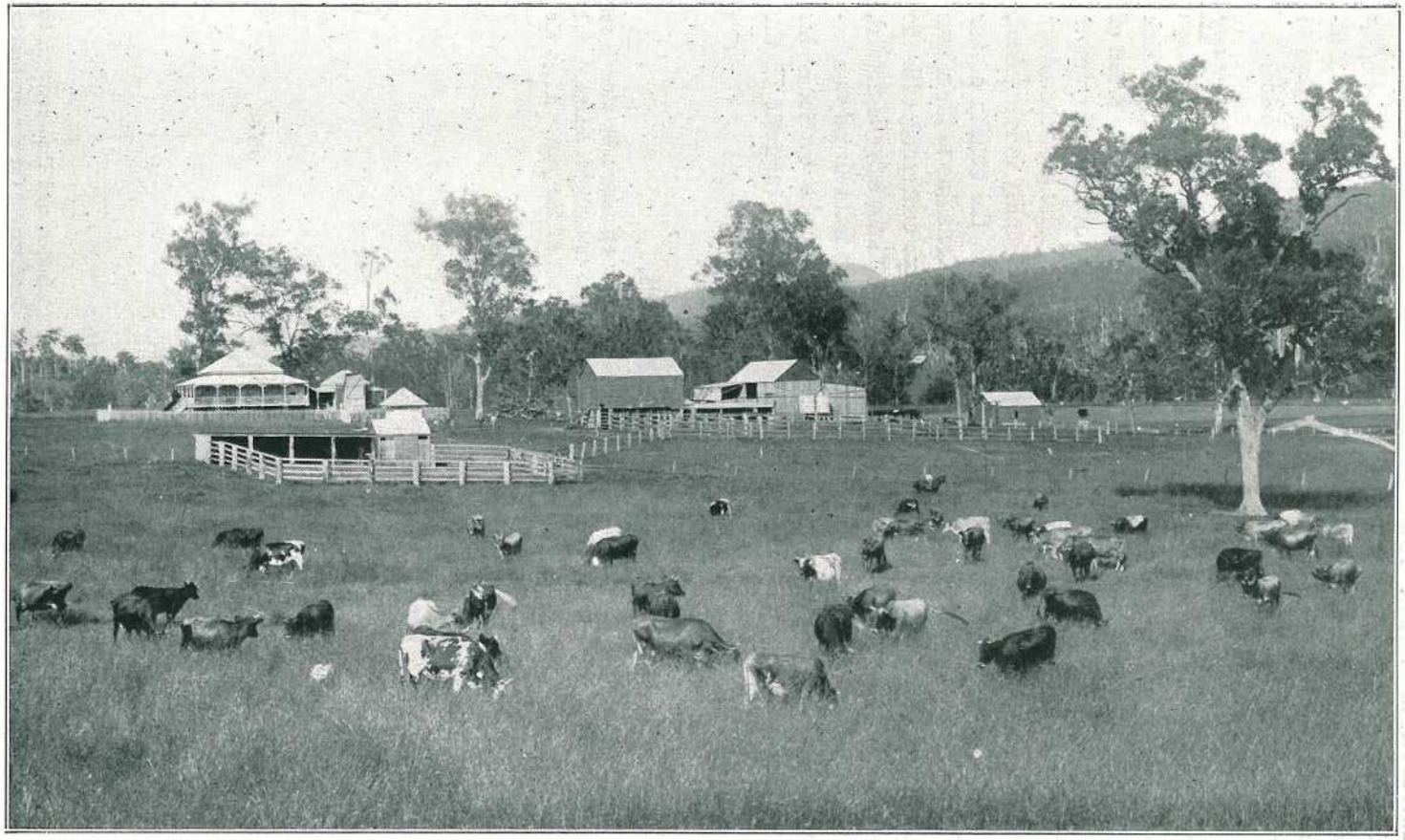


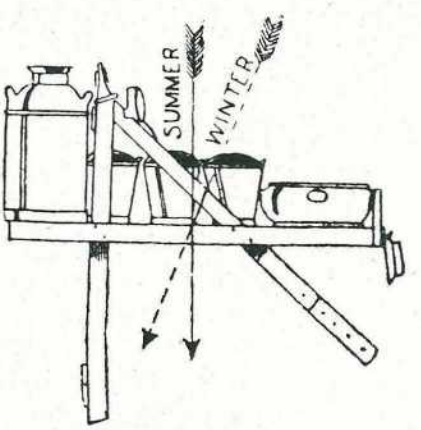
Plate 100.—A Queensland Dairy Farm.

favourable as possible. It is remarkable how much may be accomplished in the way of delivering cream of good quality, if it is first thoroughly cooled, aerated, and cared for on the farm, and despatched in a well-covered wagon or well-insulated van. Why so little interest is taken in this important phase of dairy work is almost beyond comprehension.

It is not wise when the supply of cream is low, or even under any circumstances, to withhold the cream on the farm for four or five days in order to get a full can. To obviate the difficulty of churning, which is apt to take place in the partially filled cans, it is best to use a can of smaller size than ordinarily, and send the cream to the factory more frequently. Greater care in the production and handling of the cream on the farm, and in sending it to a factory where quality is recognised, assuredly would do much towards improvement in the quality of our butter; and the power to remedy and overcome defects due to the causes mentioned rests almost solely in the hands of those concerned with the different steps of the business. It is not that more knowledge is needed, but that a better application should be made of the facts already understood. The cream producer or factory operator who overlooks his responsibility in this regard is not serving the best interests of the industry.

RACK FOR MILK CANS.

The illustration shows an inexpensive, simple rack for exposing milk utensils to the sun. Its advantages are:—Freedom from obstruction to sunlight, drainage, and adjustability to direction of sunlight at different seasons of the year. After the



cans are scalded, they are set up to drain for a few minutes, and then reversed to secure sun-exposure. The material used is 4 by 2 hardwood, except for the crosspieces on the top and front, which are of 4 by 1 hardwood.

FRUIT FLY IN THE STANTHORPE DISTRICT.

By HUBERT JARVIS, Entomologist.

Mr. Hubert Jarvis, Entomologist, Stanthorpe District, has, in his recent progress report to the Chief Entomologist (Mr. Veitch), furnished the following information regarding Fruit Fly in the Stanthorpe District:—

The Queensland Fruit Fly.

In November several fruit flies were trapped with Harvey's lure in the Stanthorpe district. On 5th November the Chief Inspector, Mr. T. W. Lowry, reported the occurrence of fruit fly in the Bald Mountain district, and submitted one female specimen of *C. tryoni*, which he had caught in an orchard in the above district. On 9th November, Inspector F. Jardine submitted to this office two fruit flies (*C. tryoni*) caught with Harvey's lure in the Broadwater district. On 27th November, Mr. J. W. C. Barlow caught three fruit flies (*C. tryoni*) at Applethorpe, with a lure of his own invention.

On 3rd December, one female specimen of *C. tryoni*, the Queensland Fruit Fly, was caught by Mr. D. Stephens, of Dalveen, in a trap baited with Harvey's lure. This trap was set in a leafy gum bush about 2 chains from the orchard. This is the first record, to my knowledge, of the fruit fly being caught outside an orchard. Mr. Stephens later informed me that he caught two additional fruit flies in the same situation.

The first record of fly-stung fruit this season was secured on 4th December, on which date, in the Sugarloaf district, fruit fly maggots in all stages of growth were found in Wilson plums; a quantity of this infested fruit was placed in the Departmental Insectary, and adult fruit flies commenced to hatch from this material on 27th December.

On 8th December, plums harbouring fruit fly maggots were found in the Broadwater district, and from this date onwards records of fly-stung fruit (in very small quantities only) were secured in various parts of the Granite Belt, infestation occurring in a variety of fruits.

On 11th December, Mr. Percy Walker, of Glen Lyon, found fruit fly maggots in peaches grown in his garden. Glen Lyon is situated about 43 miles west of Stanthorpe, and the fly does not usually make its appearance there until after Christmas.

There are few, if any, breeding grounds of the fruit fly between Stanthorpe and Glen Lyon, but it is, of course, possible that stepping stones may exist, although perhaps very widely separated.

Traps baited with Harvey's lure were set at Glen Lyon, and also at Pikedale, during November, but no specimen of the Queensland Fruit Fly was caught.

During the months of November and December the fruit fly was apparently evenly, but very lightly, distributed throughout the Stanthorpe district, and very little loss from fruit fly damage was sustained by any orchardist during these months.

New Native Host Fruit of the Queensland Fruit Fly.

On 11th December, Dr. Bancroft, of Eidsvold, bred the Queensland Fruit Fly from the native Passion vine, *Passiflora aurantia*. Specimens of the flies bred by Dr. Bancroft from this fruit were forwarded to me, and proved to be examples of the Queensland Fruit Fly, *C. tryoni*. Dr. Bancroft also forwarded a quantity of the maggot-infested fruit of *Passiflora aurantia*, from which additional specimens of *C. tryoni* were bred in the Departmental Insectary.

This I consider an important finding, and great credit is due to Dr. Bancroft for his discovery, and for the valuable research work which he is doing in regard to fruit fly.

Native Parasites of the Queensland Fruit Fly.

The breeding recently of several new parasites of the Queensland Fruit Fly by Dr. Bancroft is, I consider, of economic importance, as it is possible that the introduction of some of these parasites to countries other than Australia, where fruit fly control is desired, may prove of great benefit, being (as they in all probability would be) free from the attacks of hyper-parasites.

The fruit fly parasites above referred to have been forwarded to the Chief Entomologist, Mr. Veitch, for identification.

Overwintering of Fruit Fly in Stanthorpe District.

On 5th January, four fruit flies, *C. tryoni*, were found alive in one of the field cages at Mr. J. W. C. Barlow's orchard at Applethorpe. These flies had apparently fairly recently emerged.

This proves beyond doubt that it is possible for the fruit fly, *C. tryoni*, to overwinter (*i.e.*, to carry over from one season to another) as a pupa in the Granite Belt. No other fruit flies have emerged in this cage since the above date.

As there must have been at least several thousands of maggots present in late autumn in this cage, it would seem that only a very small percentage indeed survived the winter, which was a very rigorous one. It is, of course, probable, that a much greater percentage would survive a mild winter.* It is satisfactory that these Departmental cages enabled us to definitely settle the question of the overwintering or otherwise of the fruit fly in the Stanthorpe district.

It is a notable fact, that the fruit fly was present throughout the district prior to the hatching of these flies (*i.e.*, 24th October), in fact, nearly full-grown maggots were found in fruit on 4th December, which proves that the fly had been present in the orchards for four or five weeks.

Although I do not consider the overwintering of the fruit fly in the Stanthorpe district is a factor of major importance, in regard to our annual infestation, yet the above finding emphasises the importance of cleanliness, more especially at the end of the season. That migration of fruit flies from outside areas into the Stanthorpe district is primarily responsible for our annual infestation of fruit flies was, I consider, proved in the season of 1923-24, when all fruit was sent out of the district by 10th April; in spite of this regulation which was rigidly enforced by seventeen inspectors, the fly came in early in October, in greater numbers than formerly, spreading right throughout the district.

Field Experiments.

On 20th December, through the courtesy of the Chief Entomologist, a consignment of fruit fly puparia was received from Brisbane, and 180 fruit flies were bred out in the Insectary; 119 of these were liberated on 4th January, and a further thirty on 11th January, in one of the Departmental cages, covering a Carrington apple-tree carrying about fifty apples. These flies were fed on sugar and water every three days. Female flies were caught at intervals and examined for egg development.

It was noticed that all flies made their way at once to the top of the cage, beating against the gauze and trying to escape upwards. After the first week they seemed more contented, and many rested on the tree, and crawled over the fruit. They were observed at least twice weekly for four weeks; during this priod no sign of mating was observed, and no fruit was stung. The number of fruit flies steadily decreased, but it was, of course, impossible to count the flies once they were liberated in the cage; search was reepatedly made on the ground under the tree for dead flies but none were found.

Pre-oviposition Period.

It was found by the examination of female fruit flies in these cages at intervals, that in some cases mature eggs were present in the ovaries twenty-one days after emergence. In other instances, no eggs were found when female flies were examined up to fourteen to twenty-one, and even twenty-eight days. Copulation has not yet been observed. The foregoing observations would lead us to conclude that possibly the pre-oviposition period of *C. tryoni* is from three to four weeks under the conditions obtaining in the field cages. It is, of course, possible that, under quite natural free conditions, the period may vary considerably. We have to date never been able to induce *C. tryoni* to oviposit in captivity. A further experiment is in hand, in which both peaches and apples will be used in the cages.

Control Experiments with Newman's Fruit Fly Bait.

This pollard fruit fly bait, used so successfully by Mr. Newman, Entomologist, Western Australia, against the Mediterranean fruit fly, *C. capitata*, was tried by me this season in four orchards, the traps used being the slip-lid tin type, recommended by Mr. Newman.

No single specimen of the Queensland Fruit Fly, *C. tryoni*, was trapped in the pollard lure over a period of several weeks.

* This experiment will be repeated.

Absence of Fruit Fly.

During the month of December there was a partial absence of fruit fly, more especially towards the latter end of the month, and the exception in any orchard was stung fruit; this I attribute to meteorological and biological conditions obtaining almost throughout the whole of Queensland this season. Dr. Bancroft reports that, at Eidsvold, Q., peaches almost invariably fly stung were this year quite clean; very many orchards in this district, badly infested towards the end of last season, were this year quite free from fruit fly.

The Destruction of Fallen Fruit.

Although there has been little maggot-infested fruit this season, yet there is always present in every orchard a quantity of fallen fruit, windfalls, &c., unfit for market, and which has got to be destroyed. The practice of boiling this fruit and distributing it in heaps about the orchard is strongly to be condemned, as such fruit gives off an aroma likely to attract fruit fly into an orchard, hitherto free from fly. Personally, I consider burying the fruit *far* preferable; an old well, or a mining shaft, can often be utilised for the purpose of getting rid of fallen fruit, covering each lot deposited with 2 or 3 feet of soil, in the case of a dry shaft. Where water is present, however, this latter procedure is quite unnecessary, as no maggots could possibly survive more than three or four days in water; this has been proved by me in a long series of experiments in regard to the persistence of fruit fly maggot life when submerged in water.

When a quantity of fruit is deposited in water, fermentation sets in, thereby quickly destroying all insect life which might be present in such fruit.

The Solanum Fruit Fly.

The presence of the fruit fly known provisionally as *C. tryoni*, variety *solani* (the Solanum Fly), in large numbers in the Stanthorpe district, prior to the advent of the true Queensland Fruit Fly, *C. tryoni*, was once more a remarkable feature of the season.

Inspector St. J. Pratt reported large numbers of Solanum flies in the orchards in the Broadwater district on 1st November. These flies were caught by him in the ordinary glass traps, baited with Magnet lure. On 20th November Mr. J. W. C. Barlow, of Applethorpe, submitted 150 Solanum flies caught by him at Applethorpe. These flies, all male specimens, were caught over a period of forty-eight hours in Magnet lure. On 23rd November, the writer secured one specimen of the Solanum fly at Glen Lyon, 43 miles west of Stanthorpe; this fly also was caught in Magnet lure.

I could find no host fruit of the Solanum fly at Glen Lyon, or in the country lying between that station and Stanthorpe, but it is, of course, possible that a host fruit of the fly may exist there, although at present undiscovered. The only Solanum found growing there was in fruit at the time of my visit, but a careful examination of the berries failed to reveal the presence of any maggots. The capture of the Solanum fly at Glen Lyon is interesting, in relation to the range of this species of fruit fly.

The Solanum fly has not yet been bred from any cultivated fruits, and the only known host fruit of the fly is the Wild Tobacco (*Solanum auriculatum*), an introduced weed.

On exposing Magnet lure (Metheuginol) in any orchard in the Granite Belt in November the Solanum fly can be captured, and as it is not (as I have already stated) breeding in cultivated fruits, its presence on the orchards is difficult to account for, unless it is drawn thither by the potency of the Magnet lure (presumably a sex lure, as all the flies trapped are males).

The theory that Harvey's lure also is likely to prove instrumental in drawing fruit flies into an orchard in which this lure is exposed in traps has been already stressed by the late Government Entomologist and Pathologist, Mr. Henry Tryon, and his opinion (given after mature consideration) cannot lightly be put on one side.

OTHER SPECIES OF FRUIT FLY.

The Banana Fruit Fly.

On the 2nd October, twenty-two fruit fly puparia were received from Inspector F. Becker, stationed at Innisfail. Mr. Becker stated that he had found the puparia in the soil under bananas. The puparia were placed in a breeding cage, and on 2nd November the flies began to emerge, and proved to be a fruit fly quite distinct from *C. tryoni*, the Queensland Fruit Fly; they were, in fact, a species unknown to me.

Since breeding these flies, we have, through the kindness of Dr. Bancroft (Eidsvold) been enabled to secure a quantity of the fruit of the native banana (*Musa-banksii*), and from this fruit we have bred out a fruit fly identical with the species which emerged from the puparia forwarded by Mr. F. Becker.

It seems probable that the true Queensland Fruit Fly, *C. tryoni*, does not attack the banana in North Queensland. We have, of course, definite records of *C. tryoni* breeding in bananas imported into this district in 1924, but the fruit in which these maggots matured may possibly have been stung in the markets. We have now four records of fruit fly in bananas from North Queensland, and in every case the fly is not *C. tryoni*, but this Northern species, the host fruit of which is as already stated *Musa-banksii* (the Native banana).

This finding is a further demonstration of the fact that certain species of fruit flies, breeding in native fruits, will also attack cultivated fruits. A notable example of this fact is the fruit fly known as *C. jarvisi*, one of the host fruits of which is the Cockatoo apple (*Careya australis*). The writer was the first to breed this fly from cultivated fruit (*i.e.*, pear and quince) in 1923. This record has now been confirmed by Dr. Bancroft, of Eidsvold, who has recently bred *C. jarvisi* from pear in the Eidsvold district.

QUEENSLAND'S CITRUS INDUSTRY.

By A. H. BENSON, Director of Fruit Culture.

For many years Queensland has been noted for the excellence of its citrus fruits, especially oranges and mandarins, but latterly there is a decided falling off in the quality and yield of the fruit produced in many orchards, not only in one district but generally throughout the State. This is, to say the least, unfortunate, and the question that has now to be seriously considered is: Is it possible and practicable to place the industry on a more satisfactory basis and thus enable us to regain our good name for the excellence and quality of our fruit? To answer this question, it is necessary in the first place to give a brief general outline of the present condition of the average Queensland citrus orchard, and this is what we find.

1. A general appearance of neglect due to lack of attention being given to the health and vigour of the trees, which could have been very largely obviated, had the advice given by the officers of the Department of Agriculture and Stock received more consideration.

2. The selection of unsuitable soil and unsuitable situations in which to grow the trees, a matter that could easily have been obviated had advice been asked prior to planting.

3. The presence of disease of one kind or another in the majority of the trees in the orchard.

4. Want of cultivation and the consequent failure to maintain an adequate supply of soil moisture or to provide the artificial means for supplying same.

5. A number of unproductive trees in the orchard, or trees that are only producing fruit of inferior quality.

6. A lack of personal attention on the part of the grower, who, in many cases, considers the orchard merely a side line, to be run in conjunction with dairying, general farming, or possibly some other business. In brief, an attempt on the part of the grower to undertake more work than he can accomplish, with the result that the orchard suffers and becomes nothing more or less than a breeding ground for pests of all kinds.

7. A general lack of knowledge on the part of the intending grower, who, in many cases, has had no previous experience whatever of orchard work, and who, once he has taken up the business, has frequently made no serious attempt to gain an accurate knowledge of fruit culture and will not act upon the advice of those competent to give him instruction. It is, unfortunately, only too true that a very large number of persons who have taken up citrus culture during recent years were totally unfitted for the work, owing to their failing to grasp the fact that a citrus orchard demands one's undivided attention and very competent management to ensure its being a financial success.

8. And finally the failure to maintain an adequate supply of humus in the soil; the absence of which decreases the power of the soil to retain the moisture that is so essential to its fertility and without which no plant foods, whether present in the soil itself or added to it in the form of a fertiliser, can be made good use of by the trees growing thereon.

Having recognised the factors that are contributing to the unsatisfactory condition of many of our citrus orchards, it is advisable to consider these factors in detail.

With respect to items 1, 2, 3, 4, 6, 7, and 8, these factors can be considered as a whole, and what immediately strikes one is the necessity for growers to realise that the growing of citrus fruits is an undertaking that can only be conducted profitably if worked on sound business lines, requiring expert knowledge on the part of the grower. In this respect, the Department of Agriculture can assist growers by giving them instruction and advice, both practically and theoretically. Such instruction would deal with every branch of the industry, such as selection and preparation of the land, the kind of trees to plant, pruning of the trees, cultivation, manuring and (if practicable) irrigation of the orchard; the treatment of diseases, including the use of sprays, dusts, and gas; and the gathering, careful handling, sweating, grading, and packing of the fruit, so that it will reach its destination in the best possible order and condition.

Co-operation of Growers with Departmental Officers.

In order to obtain these results, the active co-operation of every grower of citrus fruits is desirable, as unless growers are prepared to work with and assist the efforts of the departmental officers, it is impossible to secure success. There is an unfortunate tendency on the part of many growers to shelve their responsibilities and to look to the Government for assistance in matters that are purely ones to be dealt with by themselves. The Government can give assistance in many ways, but it cannot be expected to undertake work which it is the province of a grower to carry out. Growers should therefore combine for mutual and concerted action, especially in the case of fighting insect pests and plant diseases, and if they will do so, the Government will give them every assistance to start on the right lines and to see that they carry out the work in an efficient manner, or, failing this, there is no reason why individual contractors should not undertake the work in different districts at a reasonable cost, as is now being done in the case of New South Wales, where private firms are supplying the necessary outfits and materials to contractors on easy terms, and the contractors are now treating large numbers of trees with hydrocyanic acid gas with decidedly beneficial results.

With respect to the fifth factor, this is a matter in which the department can help, as we are prepared to instruct any grower how to convert unproductive or unprofitable trees into more productive and profitable ones by working them over with more suitable and profitable varieties. At the same time, the Department cannot undertake the actual work of renovating trees. If one or two growers in any citrus district will take the trouble to become efficient propagators, there is no reason why they should not be able to deal effectively with all unprofitable trees in their district, with the result that the yield and quality of the fruit of their particular district will be materially improved.

A Co-operative Nursery.

By more careful selection being exercised in the choice of budwood, an adequate supply of a better class of nursery tree would be produced, and the range of varieties now catalogued could be reduced at least 50 per cent. with advantage. This brings up the question of citrus growers establishing a co-operative nursery for the propagation of their trees, where every precaution will be taken to ensure nothing but healthy stocks being used, and where no stock will be worked, except with a scion that has been obtained from a tree that not only produces regular yields of first quality fruit, but that is absolutely free from disease.

Appointment of Citriculturist.

To give effect to these suggestions, it is considered advisable that a competent officer be specially appointed to supervise the citrus industry of Queensland, such officer to be termed "The Citriculturist" and that he be provided with efficient means of transport to enable him to expeditiously visit the various citrus growing centres where he will get in touch with the Local Citrus Producers' Associations, as the value of his work will depend largely on his working in conjunction with and receiving the support of all citrus growers.

In conclusion, the question of dealing effectively with badly neglected and abandoned orchards must receive attention. This is primarily a departmental business, and the best method of giving effect thereto is receiving most careful attention. It is proposed to amend the present Diseases in Plants Act, so as to provide for the Department being reimbursed for any expense incurred by it in the cleaning up or destruction of such orchards when the occupier or owner of such orchards fails to do so when an order has been issued to him by an inspector.

THE CONSTRUCTION OF STIES AND PROVISION OF PADDOCK ACCOMMODATION FOR PIGS.

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

This is the second of a series of articles dealing with the Construction of Pig Sties. The first of the series appeared in the February issue of this Journal and is now available gratis in pamphlet form.—ED.

The provision of accommodation for pigs on the farm is an absolute necessity even though the piggeries might be of the simplest nature, consisting principally of pig paddocks, shelter sheds, food and water troughs, &c. In the course of his work the writer has travelled extensively and has visited farms where pigs are kept in numerous districts throughout this and the sister States, and has everywhere observed that the farmers who have provided the most efficient type of accommodation for their pigs are the men who report the greatest measure of success, the farmers whose pig sty accommodation is but a tumbled down, insanitary, and inconveient structure are the ones who complain that there is no money in pigs, for disease and other calamity eats up all the profits and leaves behind pigs and piggeries which are at the best a serious menace to the progress of the industry.

PLATE 101 (Fig. 1).—PIGGERIES, MENTAL HOSPITAL, GOODNA.

Expensive Piggeries not Advised.

It is not the intention in this series of articles to urge upon farmers the necessity of providing palatial residences for their pigs for these are not, on the great bulk of farms, a necessity; rather the objective will be to illustrate both by plan and section and to describe types of piggeries of an economical and efficient nature such as might be provided even by the humblest farmer or share-farmer. At the same time it is desirable in such a series to cater for the requirements of all classes of pig raisers, hence piggeries of varying types will be referred to, for pig raising is not of necessity a business dependent on the farmer running a few pigs and a large herd of milch cows.

The piggeries at Goodna Mental Hospital, for instance, as figured on pages 372-5 of this issue, are of a type more particularly suited to the requirements of Government institutions of this nature where stud stock are mostly kept, where the

food supply is of a putrescible nature (*i.e.*, waste food from the dining rooms and kitchen, waste meat and vegetable matter, &c., which decomposes rapidly). These buildings and yards also are continuously in use year in year out; they are rarely vacated, and in many instances unskilled labour of a somewhat temporary nature has to be employed in both feeding and cleaning, hence the necessity of having extra strong (even if comparatively expensive) and permanent sanitary quarters for the live stock.

The piggeries recently erected on the property of Mr. J. H. Whittaker, of Victoria Park, Broxburn, *viâ* Toowoomba, is on the other hand of very complete design, is efficient and sanitary, yet withal inexpensive as will be shown later.

The Goodna Hospital Piggeries.

This is essentially a stud piggery, Berkshires being for the most part the only breed kept. The sties are in two groups, one group of ten brick and concrete sties under one roof and another of twenty pens with brick and concrete floors and walls, and a flat roof; these pens have been provided with exercise yards at the rear, one

Plate 102 (Fig. 2).—Piggeries, Mental Hospital, Goodna.

yard for each pair of pens, the pigs from each pen being allowed the use of the yard separately. Water is laid on to all these pens and yards. The sties, all under one roof, are considered the most efficient type, though it is desirable in similar structures that the roof should be higher than that shown in the illustration.

Fig. No. 1 gives a general view of the Goodna piggeries, this building is the one referred to as of brick and concrete providing ten pens each 14 feet by 12 feet under one roof with central passage-way for feeding, cleaning, &c. The roof covers an area of 82 feet by 46 feet with a 6 feet overhang. Pipe rail in the farrowing pens, as shown in the plan, is 6 inches from the floor and a similar distance from wall of pen to prevent sow from lying on her pigs. Half of the floor is covered with hard-wood whereon bedding is placed. The walls of pens are 3 feet high.

Fig. No. 2 is a view of another set of pens of useful design. These pens, twenty in number, ten on each side of the central passageway (see also Figs. 3 and 4) are each 7 feet by 13 feet, with walls of brick and concrete. The pens are half roofed over, with open outer yards 66 feet by 14 feet, to each two pens, as shown in Fig. 4.

Fig. 3.—Another view showing the full set of twenty pens comprising another section of the piggeries at Goodna Mental Hospital. These are ideal pens for the purpose indicated, though we do not necessarily recommend this type of pen for the farmer breeding but a few bacon pigs. The breeder of stud pigs, the suburban pig farmer, and Government institutions like the hospital referred to, must of neeessity have a different set of pig sties to the farmer who feeds more on the paddock system. Fig. 4 shows the outer yards at the rear of the pens shown in Figs 2 and 3. These yards also have the advantage of a shelter shed, as shown in the foreground to the right of the entrance gate to the pen. The yards are 66 feet by 14 feet, and provide ample exercise space for the pigs for the time being housed in this building.

Any further information in regard to these piggeries could be obtained direct from the Medical Superintendent, Mental Hospital, Goodna.

The piggeries at other Government institutions and at State Farms will be referred to again later on in this series.

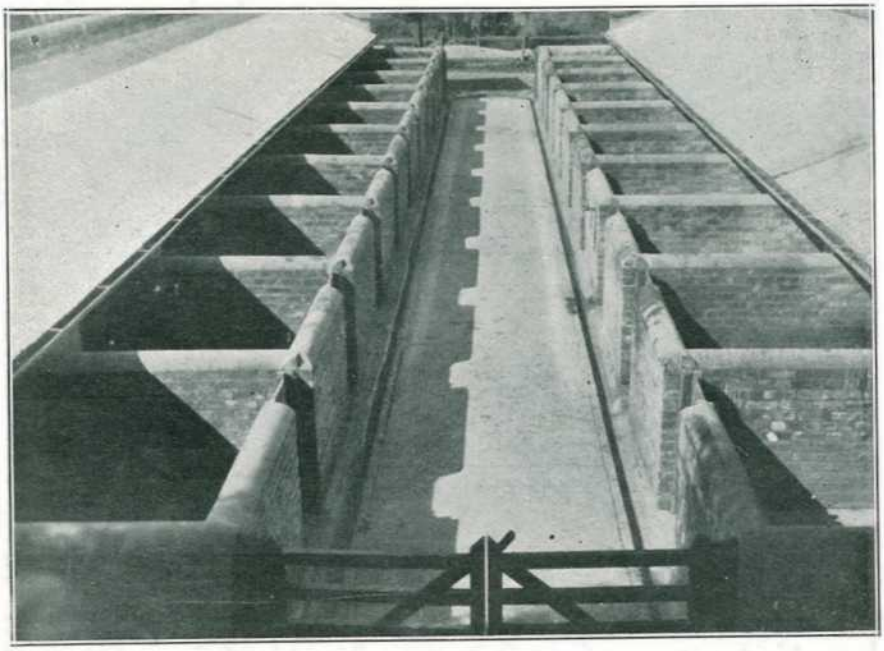


PLATE 103 (Fig. 3).—PIGGERIES, MENTAL HOSPITAL, GOODNA.

An Ideal Farm Piggery.

Through the courtesy of Mr. J. H. Whittaker, the well-known breeder of Tamworth and Poland-China pigs, at Victoria Park, Broxburn, *viâ* Toowoomba, we are able in this issue to illustrate the piggery buildings recently erected by him and his sons on their Broxburn property. The photograph and plan illustrate clearly the general layout of the buildings, which it will be noted were not altogether placed squarely. This was on account of the undulating nature of the ground on which the buildings were placed, though strangely enough the photographs do not feature this. The plan was drawn by Mr. F. Bostock, of the Hawkesbury Agricultural College, Richmond, N.S.W.

Fig. 5 is a side view of the piggery, showing in the centre of the picture the exercise yards at the rear of each pen. On the extreme right is shown the loading race shown also in the plan of the building. This photograph also illustrates distinctly the type of fencing used, viz., hardwood split palings interlaced with plain galvanised wire. The cap rail also tends to strengthen the fence.

Fig. 6 is an end view of Mr. Whittaker's piggery, showing the central passageway with row of pens on each side. The class of Downs country on which the farm is located is well illustrated in the background, the cleared patch having been under lucerne for some time; it provides an ideal grazing run for both young pigs, breeding stock, and also sometimes other farm stock.

The plan shows that the area occupied by the main building is 82 feet wide by 50 feet deep, with the central passage-way 38 feet long, the sties and passage-way covering a space 22 feet 6 inches wide, the passage itself being 4 feet 6 inches wide. The building provides ten roomy pens so arranged as to suit different classes of stock, the farrowing pens have since been fitted with farrowing rails 6 inches from the floor and the same distance from the walls, though these are not shown in the plan. Section AB compares with Fig. 6, the end view of the building.

We cannot do better in referring to the matter of specifications for this piggery than to use Mr. Whittaker's own words, as per letter from him on the subject:—

***Re* Materials Used, &c.**

"I find I have used the following material:—16 round poles (stumps so-called), eight of these 9 feet long and eight 12 feet long; 140 fencing posts, round, many of these could have been split if timber was scarce; 66 heavy saplings for cap rails, these were 9 feet to 15 feet long; 20 heavy saplings for cap rails, these were 9 feet to 12 feet long; 2 cwt. No. 8 galvanised wire; 1 cwt. 8-feet galvanised corrugated iron; 2,200 split palings; 257 feet of sawn timber for roof; also slabs to cover about 700 superficial feet of walls, about 1 cwt. of round iron or dowals, hinges, &c., a good wad of bark for ceiling low sties, and a large quantity of logs and stones for floors.

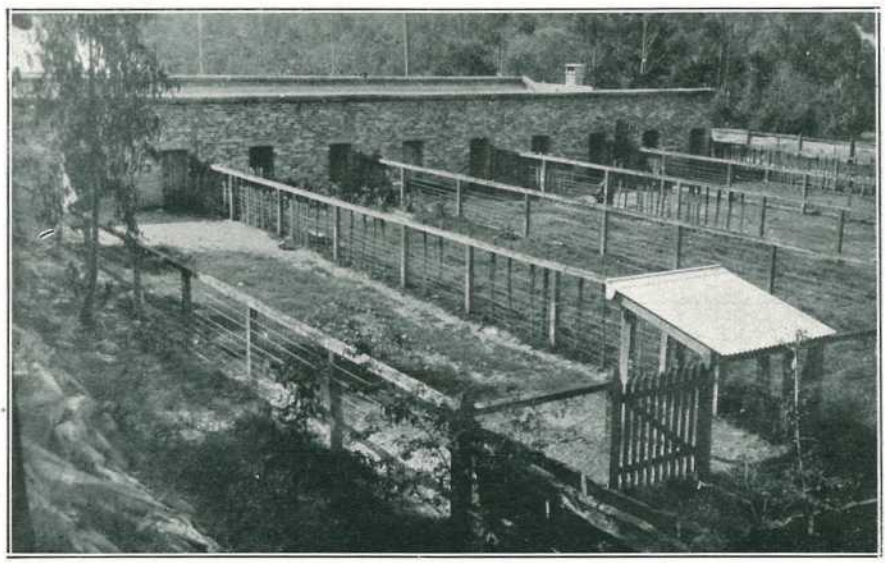


Plate 104 (Fig. 4).—Piggeries, Mental Hospital, Goodna.

"Now, as I had all the timber except that required for the roof of the big shed on my place, and as we have done practically all the labour ourselves, I had only to buy the roofing iron, timber, nails, and bolts. We used old piping for dowal spikes, &c. Therefore, my out of pocket expenses on the whole job did not exceed £40, and any handy man who cares to work can carry on a similar job on this basis, which it might be stated allows £10 for labour we engaged when doing the heaviest part of the work.

"If a farm is well provided with splitting timber and straight saplings, two men should have no difficulty in doing the whole of the work in six weeks at the outside. Had we not used slabs, but closed in the shed with sawn timber, the cost would be about another £15, which amount would certainly provide for a much neater job.

"It will be noted from the plans that all floors are of either stone properly set in place on edge and hammered down to a level surface and blinded over with fine gravel, or they are logged and well packed in, either method makes a really good floor, if on the other hand we had covered all the floors with hardwood joists and sawn flooring the cost would be about £40 more, but would then be a beautiful job.

"To be more definite, I would be prepared to erect a piggery exactly the same as our own, *i.e.*, where timber and stones (or if not stones, straight timber) are available. I would find all galvanised iron, spouting, nails, spikes, &c., cut and split the timber, and complete the job for £130 and food while we were doing the job.

"To do the work in the best manner with hardwood sawn floors in all sleeping and feeding quarters the cost would be increased to £170 and board, subject, however, to the farmer doing all the carting, and if the sinking was very heavy he should either sink the holes or pay extra for doing so. Where sinking is reasonably good no extra charge would apply.

"From the above you will note that in my opinion a farmer could erect a comfortable piggery at a reasonable cost if he can do his own work, and in many instances nothing at all need be purchased except roofing, wire, nails, and spouting, and in some cases the latter could be temporarily done without.

"We believe that any farmer who keeps, say, twenty breeding sows, can make very comfortable accommodation for, say, £20, and in fact if a man spent £1 per head on the total number of pigs, say from weaners upwards, he could have accommodation quite good enough. Of course this is presuming he would graze his pigs

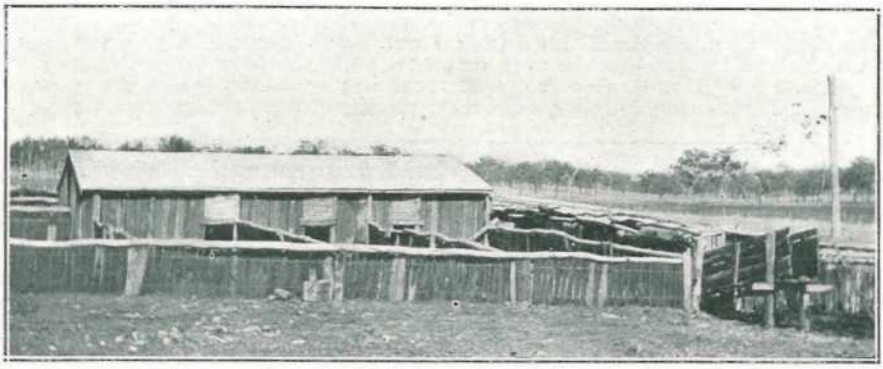


PLATE 105 (Fig. 5).—MR. J. H. WHITTAKER'S PIGGERY AT BROXBURN.

PLATE 106 (Fig. 6).—Mr. J. H. WHITTAKER'S PIGGERY AT BROXBURN.

as much as possible, and it is being proved more every year that to handle pigs at a profit this is necessary. The piggery described above is enclosed in a pig-proofed paddock of about 20 acres, of which 12 acres are under lucerne, the balance growing other green feeds.

"It will be noted that the second section of the buildings, *i.e.*, in the foreground of the plan, are not high; they are ceiled with bark as a protection against heat and cold. The whole of the piggery is just a strong, substantial farmer's piggery; either section could be separated and worked on its own, while the whole combined offers very convenient facilities.

"The pig pens, six of them 8 feet by 9 feet and four of them 7 feet by 9 feet, form the main portion of the building; each sleeping pen and run are numbered 1 to 10.

"The fences consist of round posts, heavy saplings for caps, two No. 8 wires, and hardwood palings 3 feet long.

"The heavy lines on the plan represent the shed used in which the ten pens are built. It will be noted that the corner posts stand nearly 1 foot higher than the others and that the rails and caps fit neatly between corners and afford the very best means of stays to the yards and buildings. This is a very important feature, for pigs are hard on fences. No morticing has been done in arranging fencing, &c.; it provides a place where water lodges and causes rot in the posts and rails. All rails are held in place at corners by dowels cut from old piping and driven into the ends of the rails and let into the posts in an auger hole. Likewise, all rails are doweled together and they are tightly wired to the tops of the ordinary posts. Rails should be not less than 4 inches diameter and posts not less than 6 inches, and corner posts 9 inches. Split palings are the best for the job. It is very important to note the exact position of the posts in the main shed, as on this depends much from a cost point of view. Since the plans were drawn a washing pen has been erected in a convenient place. This is very necessary in a stud piggery."

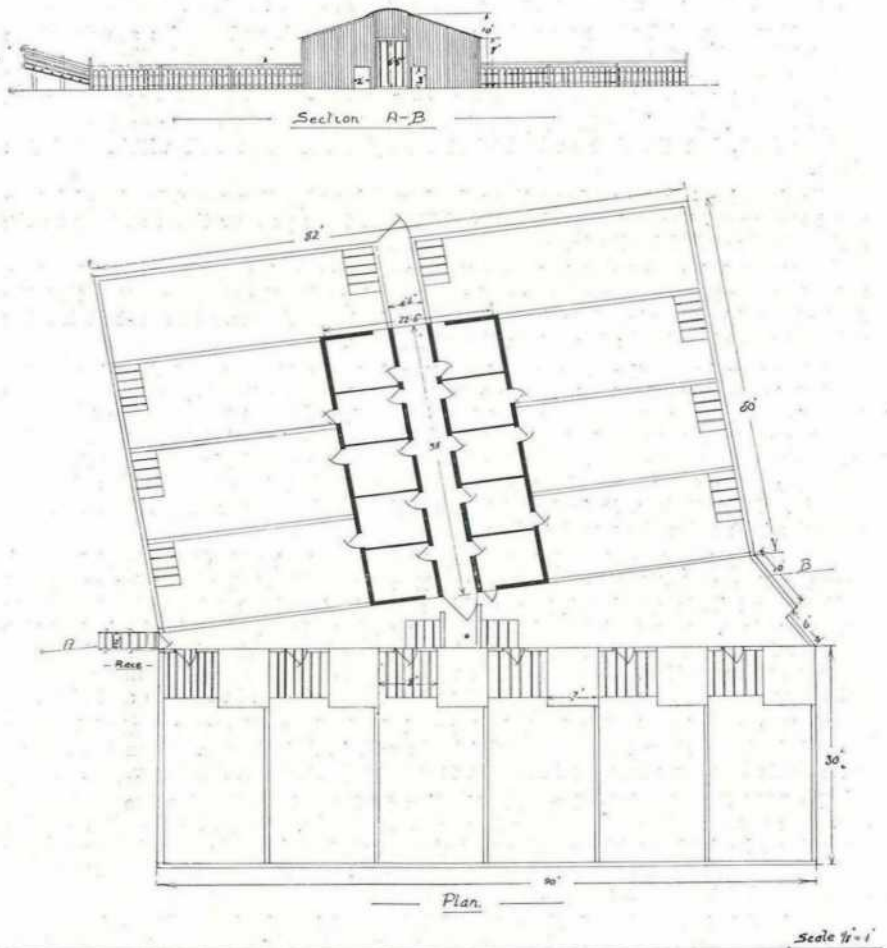


Fig. 7.

The whole subject of the construction of pigsties is one of very considerable importance, for it is extremely difficult for a man with limited labour and capital to attempt anything elaborate in the way of piggery buildings. Other types of pigsty accommodation will be referred to in detail as we proceed, and in due course all the articles will be issued in the form of a complete treatise on the subject. Meantime, any farmer desirous of having early advice on any particular phase of the housing question can obtain same on application, either personally or by letter, to the Department of Agriculture and Stock, Brisbane, where other literature on pig raising is also available gratis.

COTTON.*

When a famous English novelist wrote a history of the world in two heavy but refreshing tomes, he devoted about eight pages to the contributions which America before Columbus made to the world after Columbus. In this cramped space he could not explain how modern industrial England (not to mention New England) owes more to American Indian cotton than to any other material factor. Nor did he explain that the white harvest of poor Lo scattered values and utilities among all the nations of the earth.

It is not part of our emotional complex to feel a twinge of gratitude for the plants that feed and clothe us. In keeping with artistic, rather than practical, judgments on civilisation, we find sentiments enough about the clinging rose, which embodies the philosophy of ideal beauty, but where is our poet who can muster the drumming thunder of a thousand mills and sing the song of Cotton?

Cotton as a wild plant was blown around the world, and species are found on desert islands like the Galapagos. Two kinds were domesticated in India, one a tree cotton and one a small herb, alternating with wheat to complete the agricultural year of the Hindus. Both of these cottons had very short fibres, which could be spun by hand. Mention of cotton in the old world is found as early as the seventh century B.C., but the first archeological examples are from well within Christian times.

In America two, or perhaps three, basic species of cotton were developed into a great many varieties, and were bred to yield fibre three or four times as long as the cotton plants of British India.

Cotton fabrics are found in the south-west among remains of the pre-cliff dwellers. Columbus was the son of a weaver and was familiar with the scraggy cotton that the Arabs brought to Spain. His first day ashore in the Bahamas was spent in trading red caps and glass beads for cotton thread in balls.

Thus was begun the commerce in cotton between Europe and America, which reached its peak in 1911 when about 11,000,000 bales of 500 lb. each crossed the Atlantic from the United States, and half as much stayed at home. Now it is true that the sentimental associations of he Europeans are with Asiatic cotton. Calico is from Calicut, where Vasco de Gama landed in India; muslin is from Mosul, across the river from the place where Sennacherib cultivated tree wool in his hanging gardens. Nevertheless, it is the cotton of the Mexicans, the Peruvians, and the Arawaks that rules the world to-day.

From the tribute roll of Montezuma, it appears that 234,800 porters' loads of woven cotton and 4,400 bales of raw cotton were delivered yearly by conquered Indians as tribute to the Aztecs. This amounts to about 35,000,000 dollars in present values. The first Spanish Governor of Yucatan writes, in 1561, that the Mayas of the northern part of the Peninsula were then paying in tribute 1,280,000 yards of woven cotton. Indeed, cotton was an important item of Spanish commerce till disease and slavery had tremendously reduced population in Mexico and Peru.

Cotton weaving in England had small beginnings, the raw material being secured in the eastern Mediterranean islands and in Asia Minor. Then the British East India Company brought in Hindu textiles and created a London vogue.

In 1692 John Barkstead called attention to the extraordinarily fine fibre to be secured at the British plantations in the West Indies. When by a series of fine inventions, beginning with John Kayes' thrown shuttle, looms, and spinning frames were improved, and put under mechanical power, it was the longer staple of America that made the venture a success.

In 1794 to 1798, when the industrial development in spinning and weaving was in its infancy, England's cotton imports show 45,000 bales from America and 11,600 bales from the old world.

Then followed the introduction of American cottons into India and finally into Egypt.

It is very clear that the industrialisation of cotton in English factories was the first move in our present mechanical age, and, as seen above, it was the old civilisations of America that furnished the necessary product.

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* From Part I., "Economic and Industrial," by Herbert Joseph Spinden, in his article—The Answer of Ancient America to the Query—"What is Civilisation?"—"The Forum," August, 1925.

But it is perhaps worthy of note that the art of weaving had been carried very far in America, the fibres being cotton, henequen, the wool of the llama, alpaca, vicuna, and other allied animals.

Ancient Peru shows more varieties of weaving than any other place in the world, and they are of a degree of fineness untouched on the more celebrated looms of Asia or Europe. Wool weft on cotton warp, in tapestry technique, has been found with 320 or more picks to a square inch. Various finishing processes were developed, such as tie dying and hand painting, but for the most part designs were mechanically involved in the weaving itself. Among the beautiful colours of the New World were cochineal, anil or indigo, fustic, and various other logwood stains.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1926.	Feb., 1925.		Feb.	No. of Years' Records.	Feb., 1926.	Feb., 1925.
North Coast.					*South Coast*—continued:				
	In.		In.	In.		In.		In.	In.
Atherton	9·32	24	3·71	5·96	Nambour	8·70	29	0·82	9·57
Cairns	15·00	43	3·78	14·93	Nanango	4·23	43	1·10	1·75
Cardwell	16·76	53	7·16	14·01	Rockhampton ...	7·36	38	2·34	3·72
Cooktown	13·10	49	3·42	17·99	Woodford ...	8·56	38	0·04	5·87
Herberton	7·38	38	2·27	8·91					
Ingham	15·44	33	16·44	15·06					
Innisfail	21·74	44	8·54	31·93	*Darling Downs.*				
Mossman	14·74	17	4·94	19·32					
Townsville	11·40	54	13·91	11·96	Dalby	2·83	55	0·12	1·87
					Emu Vale ...	2·28	29	...	3·18
					Jimbour	2·78	37	0·06	1·06
Central Coast.					Miles	2·73	40	1·11	1·50
					Stanthorpe ...	3·24	52	1·35	3·12
Ayr	8·78	38	8·11	15·12	Toowoomba ...	4·29	53	1·85	2·65
Bowen	8·63	54	12·20	20·23	Warwick	3·09	60	0·20	1·85
Charters Towers ...	4·51	43	2·04	7·13					
Mackay	11·53	54	4·05	9·55					
Proserpine	11·33	22	7·57	22·13					
St. Lawrence ...	7·94	54	1·01	3·50	*Maranoa.*				
					Roma	3·12	51	0·66	1·71
South Coast.									
Biggenden	3·87	26	0·26	3·67					
Bundaberg	6·09	42	1·41	5·96	*State Farms, &c.*				
Brisbane	6·19	75	1·18	2·78					
Childers	6·03	30	0·32	3·30	Bungeworgorai ...	2·77	11	0·98	1·70
Crohamhurst ...	13·85	30	0·26	7·63	Gatton College ...	3·06	26	0·55	5·92
Esk	5·30	38	0·76	3·84	Gindie	3·03	26	0·68	2·99
Gayndah	4·23	54	0·31	2·20	Hermitage ...	2·36	19	0·40	0·87
Gympie	6·60	55	0·69	3·70	Kairi	8·38	10	3·39	11·58
Caboolture	7·32	38	0·24	7·42	Sugar Experiment Station, Mackay	10·35	28	3·89	9·19
Kilkivan	4·94	46	...	2·08					
Maryborough ...	6·44	53	0·53	4·70	Warren	4·08	11	0·80	2·26

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February this year and for the same period of 1925, having been compiled from telegraphic eports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

POULTRY FOR THE FRUITGROWER.

BY P. RUMBALL, Poultry Instructor.

When the fruitgrower reads the above title he will say to himself, "If I keep fowls there will be more work, and I have as much as I can cope with now." Is this the case? Before proceeding further it may be as well to enumerate the advantages of a combination of poultry and fruit, which are—

(1) Keeping down weeds.

(2) Keeping down many insect pests.

(3) The manurial value of poultry ranging in an orchard.

(4) Additional financial returns.

From the illustrations used the absence of weed growth will be noticed. This is not due to intense cultivation that is generally necessary, but to the presence of poultry. The owners of the farms where these photos. were taken assured the writer that before they kept fowls they were constantly cultivating and that now cultivation was only practised to loosen up the soil for the conservation of moisture. The keeping in check of weed growth means a good deal to the orchardist, while to the fowls it serves as an article of diet which is highly necessary for the maintenance of good health.

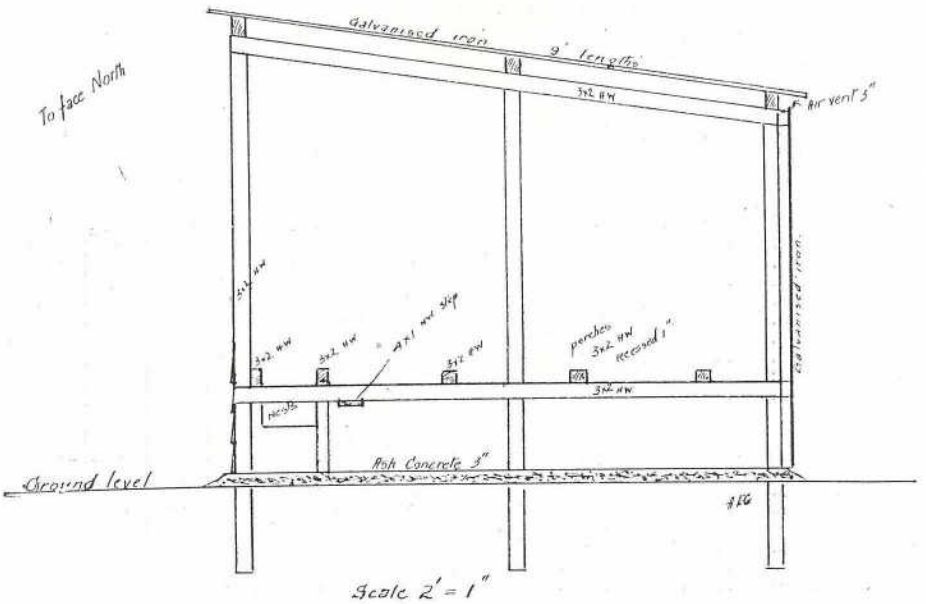


FIG. 1.

Insect Pests.

The fruitgrower knows probably better than the writer, the large numbers of insect pests which are detrimental to his industry, and that many of them, such as pupæ of the fruit fly, &c., hibernate in the soil. These are not safe from poultry owing to their partiality to insect life and their foraging nature. Caterpillars, grasshoppers, crickets, and beetles of many descriptions, which cause damage to fruit trees, fall easy victims to poultry, while the fowls' habits of dust bathing themselves in the shade of the trees, tends to keep the soil loose and prevents the undue growth of surface roots.

Manurial Value.

Possibly the greatest advantage in keeping fowls in conjunction with fruitgrowing is that of the manure distributed throughout the orchard. The grower knows what it costs to manure per acre or what it should cost, but he does not recognise the value of fowl manure. The quantity voided varies to some extent with different types of fowls and the method of feeding.

From a report published in the Journal of the Ministry of Agriculture of Great Britain of data collected at the College Poultry Farm, Theale, Reading, the following figures are taken:—

QUANTITIES VOIDED BY DIFFERENT BIRDS.

Kind of Fowl.	Weight.	Manure Voided Weekly.	Percentage of Body Weight.	Manure Voided per Bird per Annum (Fresh).	Number of Birds to Void One Ton per Annum (Fresh).
	Lb. oz.	Lb. oz.		Lb.	
Wyandotte cock ..	6 12	1 13	26·8	94¼	24
Faverolle hen ..	5 12	1 11¼	29·6	88½	25
Growing chicken, 14 weeks	3 12	1 2½	30·8	..	..

The breeds principally used for egg production in Queensland are not shown, but it will be seen that the laying hen and the growing chicken void a greater percentage than an adult male bird, and with high-producing birds, such as the Leghorn and Orpington, a conservative estimate would be 30 per cent. of live weight; therefore, a 4-lb. Leghorn would void per annum 62⅓ lb. and a 5-lb. Orpington 78, while it would take thirty-seven Leghorns or twenty-nine Orpingtons to void a ton.

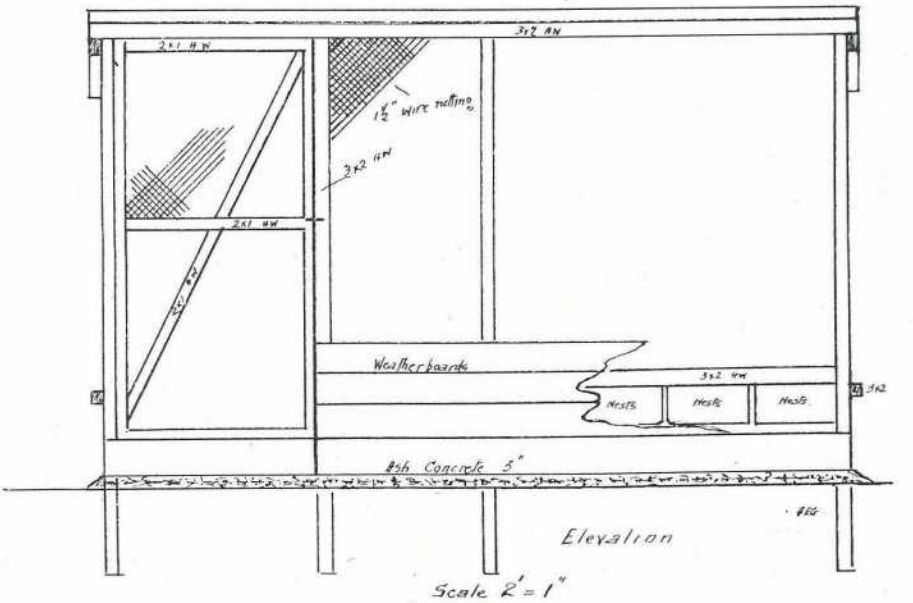


FIG. 2.

Composition of Fresh Poultry Manure.

The analysis of poultry manure varies with feeding, but that from stock fed on lines usually adopted for the maximum production should comply very closely to the following:—

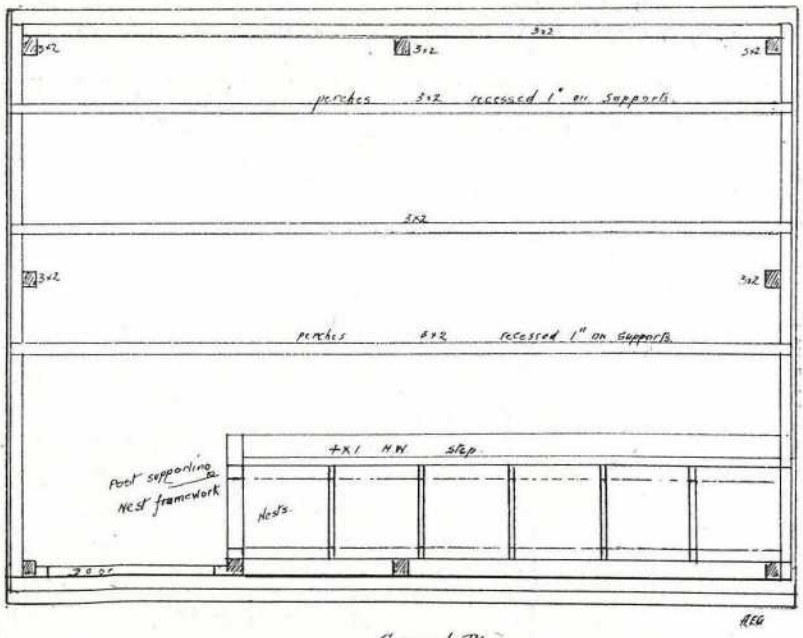
Moisture.	Dry matter.	Nitrogen.	Phosphoric acid.	Potash.
59.50	40.50	1.47	.71	.49

The commercial value of this manure based on its unit value is 39s. 6d. per ton, and the running of 200 fowls or slightly less, per acre, would be the means of manuring the land to the value of £10. However, its principal property being nitrogen some will be lost owing to its volatile nature, but there is in addition to the principal concentrates the organic matter—material which is an improvement to all soils.

Additional financial returns will depend largely upon the class of stock kept and the attention bestowed on them. Although they will save the grower many days labour in cultivation, spraying, &c., they will demand daily attention, and to the producer who is not inclined to give them this attention they are not recommended. Only the best should be kept. The breeding, rearing and feeding should receive the same attention as the poultry farmer devotes to this work, as it is only by these means that the maximum results will be obtained. Generally speaking, each hen should return a profit over cost of feed, when kept in the vicinity of Brisbane, of about 10s., and 150 to 200 could be run per acre. This in conjunction with the manurial value should prove an incentive to fruitgrowers to work along these lines.

Making a Start.

Although the foregoing may appear attractive, in making a start, caution should be observed. The work of keeping poultry has to be fitted in and the great majority have to gain the experience essential for the rearing of young stock and the feeding of layers. A start should be made by the erection of a poultry house on the lines outlined in the plan, Figs. 1, 2, and 3. This house can be used with the addition of a cold brooder similar to that in Fig. 4 as a brooder house. After the brooding stage it can be used as a rearing house, and ultimately serve its original purpose of housing the adult laying stock. The rearing of chickens in quarters used for adult stock is not usually recommended, but under the conditions of range in the orchard soil contamination does not take place to any great extent.



Ground Plan.

Scale 2' = 1"

FIG. 3.

The purchase of day-old chickens should then be made from some reputable breeder and so save the necessity of buying breeding stock, and the work entailed in incubation. By doing this the number of chickens you have for a start are definite, they will be of the same age, which facilitates rearing and prevents the period of chicken rearing being unduly prolonged and becoming irksome. In making the purchase be sure and go to a reputable breeder who maintains the qualities, of both numbers and size of eggs in his stock.

Possibly the best months for securing chickens is during August and September. Earlier chickens can be made use of if it is desired to have two lots during the one season, and so allow the first lot to get off your hands before a second lot is commenced with, say, in September.

PLATE 107 (Fig. 4).—THE MULTIPLO BROODER.

PLATE 108 (Fig. 5).—PAWPAWS AND POULTRY.

The luxuriant growth here seen is undoubtedly due to the value of the poultry manure. The soil is of a light loamy nature, and not naturally rich in plant food.

PLATE 109 (Fig. 6).—CUSTARD APPLES AND POULTRY.
This class of fruit tree offers a maximum amount of shade to poultry in summer.

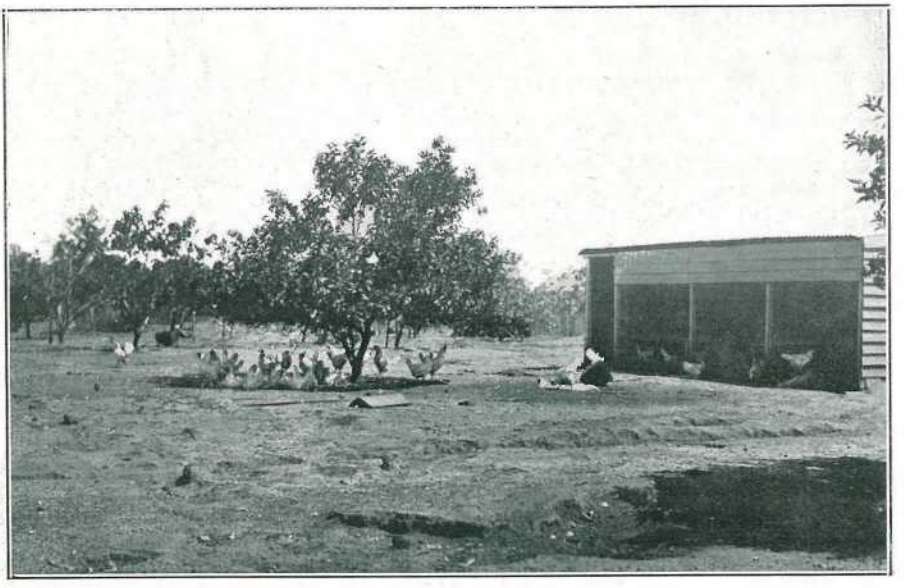


PLATE 110 (Fig. 7).
Citrus fruit growing and poultry keeping is commonly practised in various localities. The benefits to this particular farmer of the combination have been less work and greater returns.

Netting partitions to keep various ages separate can be erected at convenient spaces if desired, but they would interfere with the cultivation of the orchard and are not absolutely essential. If chickens are reared in a special house and confined for the space of two or three weeks with a temporary fence they will invariably return to their own quarters to camp. Larger houses than shown in the plan may be built, but units of fifty placed at intervals about the orchard will ensure a better distribution of the birds' droppings and incidentally will cause the birds to forage over the whole of the orchard.

The system of feeding which is adopted may be either wet mash in the morning and grain at night or dry mash in hoppers which is before the birds all day and grain at night. The latter system especially to the novice and to the grower who desired to reduce his work is recommended. The birds by this means are assured of getting all the food they require for egg production, while the grower is relieved of a good deal of work daily.

Reference to the plan, Figs, 1, 2, and 3, plainly indicate the simple nature of the house suggested for the purpose of housing fifty laying hens. It is simple in structure, being open fronted, roofed, and walled at back and ends with corrugated iron. A 3-inch open space is provided between the top of the back wall and roof to permit of a good circulation of air. In front weather boards are used as a shield to the nests, the balance being netted in to allow of the stock being protected from predatory animals during the night. The nests are made from petrol tins, one side of which, with the exception of 1¼ inch, is removed. This is then turned at right angles to prevent the tin falling through the nest frame-work. Three perches are shown, 3 by 2 hardwood being used. This is placed on edge and the top corners slightly champered. They are supported on the bottom batten, and by being recessed in to the depth of 1 inch are perfectly firm, at the same time are easily removed for cleaning purposes.

The floor is raised to the extent of 3 inches above ground level to ensure dryness. Concrete is recommended, being readily cleaned and it does not become saturated with droppings. Earthen floors become foul and require renewal at frequent intervals.

The lines suggested on which a start should be made are economical as regards permanent fixtures and equipment, and also relieve the producer for the time being of establishing breeding pens, the necessity of purchasing incubators, and becoming acquainted with the operations of an incubator.

QUEENSLAND SHOW DATES, 1926.

Sydney Royal: 29th Mar. to 7th April.
Herberton: 5th and 6th April.
Miles: 7th and 8th April.
Pittsworth: 8th April.
Chinchilla: 13th and 14th April.
Kingaroy: 15th and 16th April.
Toowoomba: 20th and 22nd April.
Nanango: 29th and 30th April.
Dalby: 29th and 30th April.
Taroom: 3rd to 5th May.
Oakey: 6th May.
Toogoolawah: 6th and 7th May.
Murgon: 6th and 7th May.
Goombungee: 13th May.
Boonah: 12th and 13th May.
Kilkivan: 12th and 13th May.
Roma: 11th and 12th May.
Wondai: 19th and 20th May.
Ipswich: 19th to 21st May.
Wallumbilla: 25th and 26th May.
Esk: 26th and 27th May.
Maryborough: 25th to 27th May.
Buderim: 29th May.
Childers: 29th to 31st May and 1st June
Marburg: 2nd and 3rd June.
Bundaberg: 3rd to 5th June.
Gin Gin: 8th to 10th June.
Woombye: 16th and 17th June.
Lowood: 18th and 19th June.
Gatton: 30th June and 1st July.
Kilcoy: 1st and 2nd July.
Laidley: 7th and 8th July.
Biggenden: 1st and 2nd July.
Woodford: 8th and 9th July.
Wellington Point: 10th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Bowen: 28th and 29th July.
Proserpine: 30th and 31st July.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Zillmere: 11th September.
Rocklea: 25th September.

CAPONIZING.

BY P. RUMBALL, Poultry Instructor.

The question whether caponizing is profitable or otherwise is best left to the individual producer to decide, as the feature governing the commercial side of the proposition, that is cost of feeding and ultimate sale, are of a varying nature.

The capon, however, has advantage over the uncaponized bird in weight, quality of flesh, cost of maintenance, &c. The opinion frequently expressed that capons grow to a greater size than cockerels is wrong. When the reproductive organs are removed cockerels lose any fighting instinct and lead a lazy, inactive life, thereby putting on more weight or flesh but not size. It is possible also to retain capons until they

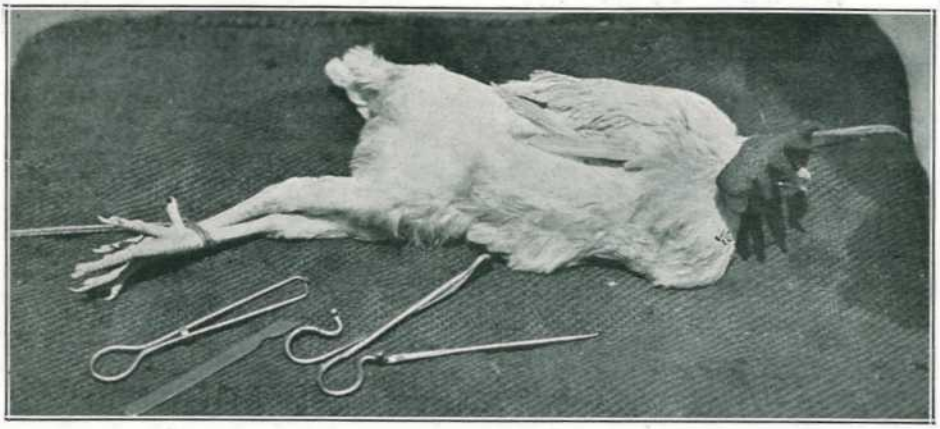


PLATE 111 (Fig. 1).—BIRD IN POSITION FOR CAPONIZING. IT CAN BE TURNED OVER WITHOUT UNFASTENING, WHICH FACILITATES THE OPERATION.

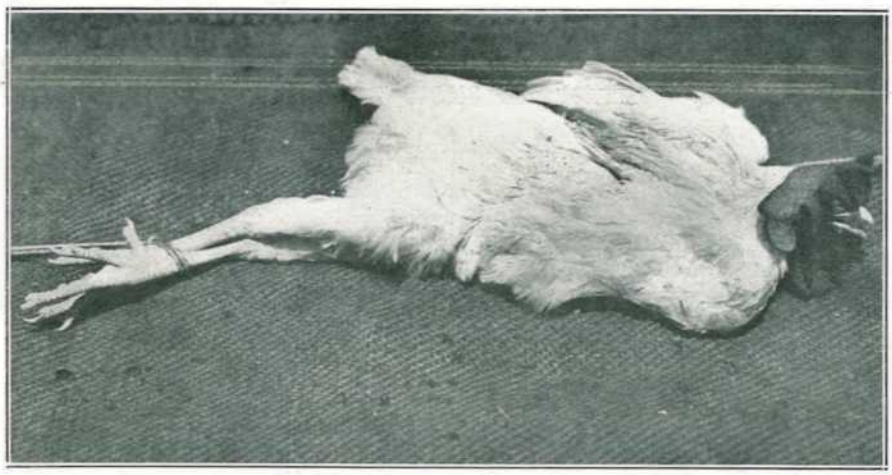


PLATE 112 (Fig. 2).—CLEARING THE FEATHERS IN FRONT OF HIP JOINT AND HOLDING OTHERS BACK BY DAMPING.

are fully developed and to market them as desired. This is not so with cockerels, as they become troublesome and lose the quality of flesh. The inactive life a capon leads, naturally reduces food consumption, and so they are kept at greatly reduced costs, which materially assist a producer in catering for a regular supply of poultry. To the mixed farmer, however, capons should appeal most, inasmuch as they can be allowed to range with the farm flock. There is no necessity of segregating sex, and by being sterile the egg product is in no way injured.

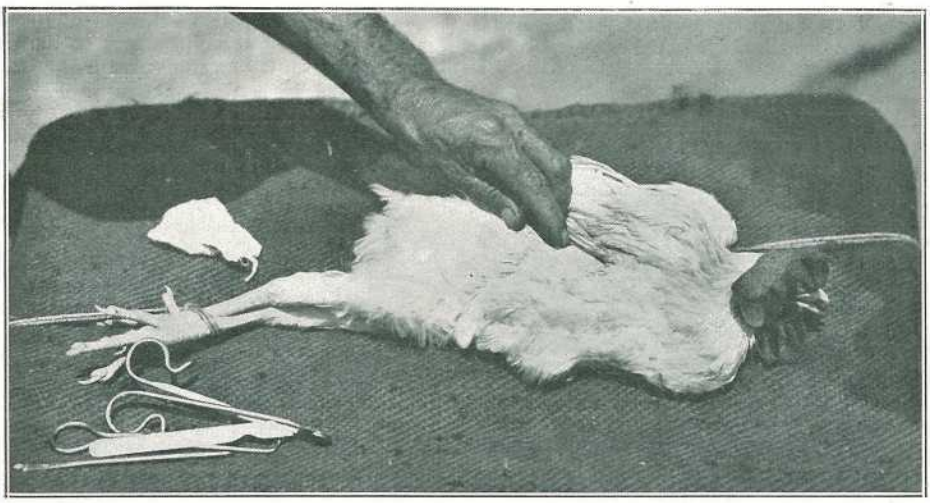


Plate 113 (Fig. 3).—Ascertaining the Correct Position for Operation by Locating the Last Rib with the Forefinger.

Plate 114 (Fig. 4).—Drawing Skin Back with Forefinger and Making Incision between Last Two Ribs.

Appearance of a Capon.

The comb and wattles of a capon do not develop and the head remains small and colourless having the appearance of unhealthiness. The pointed feathers of the neck and those in front of the tail and large sickle tail feathers grow profusely, and in countries where capons are recognised in their true value as table birds these feathers are left on the bird in dressing and serve as a trade mark.

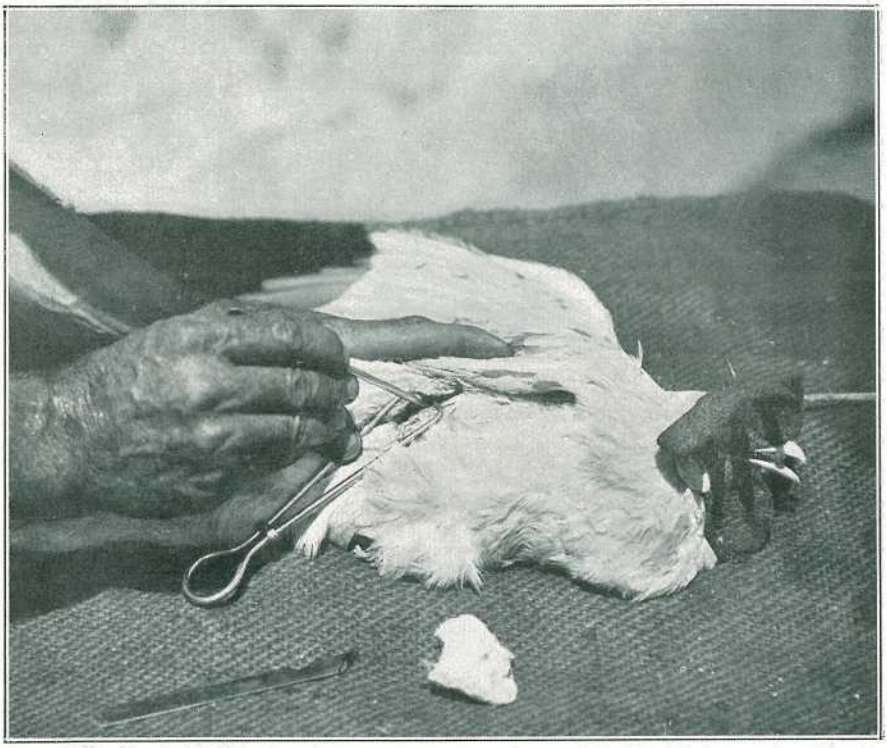


PLATE 115 (Fig. 5).—INSERT SPREADER, ENLARGE OPENING, AND TEAR MEMBRANE WHICH COVERS INTESTINES.

Marketing.

At present the caponizer should cater for regular customers, but if his supply is greater than demand the marketing of the surplus should take place when young birds of quality are scarce, which happens annually from March until early cockerels are on the market—say September. Cockerels of any breed may be caponized, but breeds of the light or small varieties, such as Leghorns, are not so suitable as the larger varieties, such as Orpingtons, &c., although in this article Leghorns have been used for illustration purposes.

The age at which the operation is to be performed naturally varies with development and various breeds, but generally speaking the correct period is between eight and twelve weeks when the chickens are about 2 lb. in weight. The next point which the caponizer must keep in mind is light. A good light (sunlight) is essential, especially to the inexperienced operator. With practice he can operate under indifferent conditions, but for start the position of the various organs must be thoroughly understood. The third requirement is to refrain from feeding and watering the bird for at least twenty-four hours—thirty-six would be better. Under such treatment the intestines become empty and will of their own account fall away from the side where the incision is made and, as well as lessening the chance of injury, permit of the reproductive organs being seen much easier.

The Operation.

In addition to knife, spreader, probe, and forceps, a table and two pieces of soft cord with a running noose at one end and two half bricks attached to the other, with a basin containing a weak antiseptic solution, are necessary. The table may be an

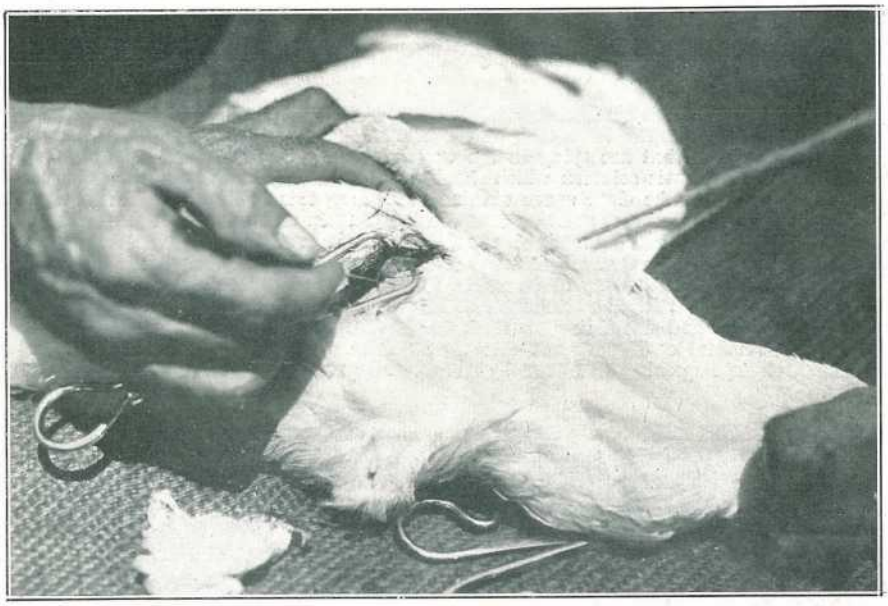


PLATE 116 (Fig. 6).—CLOSE-UP VIEW, SHOWING POSITION OF TESTICLE.

PLATE 117 (Fig. 7).—SEVERING APPEDNAGES AFTER REMOVAL OF TESTICLE.

old packing case or barrel, or the operator may prefer to make a more elaborate and possibly convenient bench. The bird is fastened down by means of the cord and bricks, one noose being placed around its legs, and the other around its wings, close to the body, and the bricks allowed to hang down on either side. The correct position is illustrated in Fig. 1.

The next move is to pluck a few feathers off the seat of operation, which is just in front of the hip joint. In a bird of the correct age very few feathers will need removing and those that are lying in the way can easily be held aside by damping them with the antiseptic solution which should always be used to cleanse the position to be operated on. The clear space obtained by doing this is illustrated in Fig. 2. Having done this the correct position to make the incision must be ascertained. This is best done by placing the thumb on the hip joint, gradually moving the forefinger along the body until the last rib is felt, as shown in Fig. 3. It is between the two last ribs that the incision has to be made, but before doing that draw the skin as far back as possible with the forefinger as shown (Fig. 4) so that when the operation is completed and the skin goes back to its natural position the wound in the skin and abdominal cavity are not directly opposite. Having made the cut insert spreaders, enlarge opening to about 1½ inches, and gently spread the ribs as shown in Fig. 5.

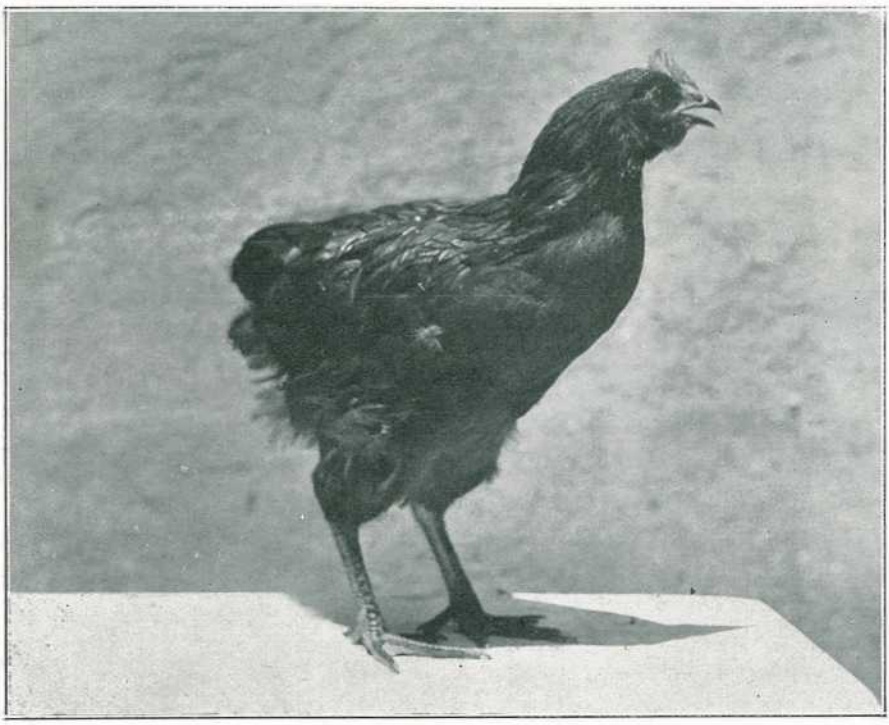


PLATE 118 (Fig. 8).—PHOTO. OF BIRD IMMEDIATELY AFTER CAPONIZING.

When this is completed a thin membrane will be noticed covering the intestines. This has to be removed, which is done by means of the probe, as shown in Fig. 5, before the testicle can be seen. The testicle is easily noticed if the bird has been properly starved. It is yellowish-white in colour, runs parallel with the backbone, and in birds of correct age about three-quarters of an inch long and a little thicker than a plump grain of wheat. The position of this is shown in Fig. 6, although somewhat enlarged due to the advanced age of the bird operated upon. With the forceps take hold of the testicle, being careful not to grasp the large artery which runs parallel with and close to it. Withdraw the instrument, as shown in Fig. 7, with testicle attached with a twisting motion, and after appendages have been twisted up and pulled out, cut them about 1½ to 2 inches from testicle to make certain that no portion of the organ remains.

When the operation is completed on one side turn the bird and repeat the process. Some operate from the one side only, but this method carries more risk and saving in time is doubtful.

The operation does not appear to cause a bird much distress, Fig. 8 being a photo. of a bird taken immediately after caponizing.

In about a week it is a very difficult matter to find where the incision was made —a few wind puffs are occasionally met with, but they merely need to be pricked.

After the operation of caponizing turn the bird loose. If the operation has been correctly performed the skin covers the wound, and no dressing of any description is required. It is as well, however, to keep the capons in clean quarters and away from untreated birds for a few days, but beyond this other treatment is unnecessary.

WASTE BANANAS AS PIG FOOD.

Pigs will eat partially or fully ripened bananas as readily as will human beings, but of course it is only damaged, small, or ill-shaped fruit that could be profitably used as a pig feed.

The Director of Fruit Culture to the Department of Agriculture and Stock, Queensland (Mr. A. H. Benson), is of opinion that in the coastal districts of the North many tons of bananas are wasted annually that could be turned to profitable account if fed to pigs, but it should be borne in mind that it would certainly pay better to feed them in combination with milk, maize, maize meal, sweet potatoes, or other farm crop than to attempt to feed them as the principal food given to the pigs. If conveniences existed for soaking or even for boiling the maize or other grain—and for very young pigs, also the sweet potatoes before feeding—so much the better, for a good mash could then be made up, though there would be no advantage at all in cooking the bananas or other fruit except where the latter were infested with fruit fly in which case boiling is strongly recommended, for fruit fly infested fruit should always be cooked thoroughly before being used as stock food.

Pigs also require ample supplies of green food, clean drinking water, and mineral matters to balance up the ration. Milk is an ideal food for pigs of all ages, and if it were possible for fruit farmers to arrange for a supply of milk for their pigs, either skim milk, butter milk, or whey, and to feed this in conjunction with fruit and other green stuffs, greater benefits would result than would be the case in the absence of these dairy by-products.

All the root crops are useful, sweet potatoes where they can be grown successfully being by far the most prolific and valuable crop. Jerusalem artichokes make an excellent food also as do mangolds, and in some districts sugar beets and peanuts, though the latter must be fed with caution in order to avoid the tendency to soft, oily pork.

Bruised or otherwise damaged and very small English potatoes can be used to advantage, and in some districts cassava is being successfully used for pig-feeding purposes; details regarding these crops can be had on application to the Department of Agriculture and Stock at any time.

Quite recently on visiting the Miva district the writer visited one farmer, Mr. W. H. Sauer, who uses annually several tons of shaddocks as a pig food. Shaddocks in appearance resemble a giant orange or mandarin, though the percentage of skin and fibre is far in excess of the quantity of juice, still they are much appreciated by the stock. Mr. Sauer finds them particularly useful during dry spells when other green foods are scarce; he has the trees growing on his property and says he cannot find any other means of disposing of this fruit commercially to more advantage than per medium of his pigs.

Other damaged fruits, such as oranges, apples, pears, stone fruit, persimmons, pineapples, mangoes, &c., can be used to considerable advantage, as also melons, squashes, rios, pumpkins.

One of our Pig Club Members in the Mapleton district used a quantity of cape gooseberries as a special delicacy for his club pig, the husks and vines making useful bedding. Another Club Member considered chokos and vegetables generally ideal pig food.

"The Pig is truly the husbandman's best scavenger and the housewife's most useful sink."—E. J. Shelton, H.D.A., Instructor in Pig Raising.

Answers to Correspondents.

Bird Identified—Podargus or Frogmouth.

"FARMER" (Gordonvale), writes:—

In January I noticed a large bird sitting in a grey wattle overhanging a creek on an apology for a nest, with two eggs. It sat for about four weeks, and apparently never moved a feather during that time. . . . It looked just like the stump of a broken limb. . . . It has since hatched out one chick, and the male bird, which had not been seen before, then came along. As soon as the chick was able, the three perched motionless all day on a limb until the youngster was as big as its parents. They then left. It seemed remarkable that birds of their size could sit thus quite exposed and come to no harm. Can you tell me how they live? They do not look in any way like an owl, yet I think they must hunt at night.

The Director of the Brisbane Museum, Mr. Heber A. Longman, supplies the following information in reply:—"The large bird resembling the stump of a broken limb, with "an apology for a nest," is undoubtedly a Podargus or Frogmouth, of which we have four species in Australia. Although these quaint birds in some respect resemble owls, they belong to a very distinct group in the order Coraciiformes. They are nocturnal, and feed on large insects and mice, and must be regarded as very useful birds. Owing to their remarkable resemblance to a gum-tree stump they usually escape observation during the daytime. In common with the Boobook Owl, they are responsible for the "Morepork" call, which is so frequently heard, but the "Morepork" of the Podargus is louder, more prolonged, and distinct from that of the Boobook, and it appears to be usually silent except in spring and summer. In disposition it is a much milder bird than the owl, and it has frequently been studied in captivity. Two white eggs are laid in the carelessly-made nest.

Tree Identified *(Acacia fasciculifera).*

A Rockhampton correspondent, in forwarding a small botanical specimen for identification, writes:—"The fruit consists of a 'bean' about 4 inches long and ½ inch wide (from description), bark apparently similar to Black Bean, and the wood is nut-brown in colour." The Government Botanist, Mr. C. T. White, F.L.S., identifies the specimen as *Acacia fasciculifera*, a native of the drier scrubs from the Caboolture district to Rockhampton. It is variously known as "Bean Tree," "Brigalow," and "Ironwood," all names belonging more rightly to other trees. The timber has the reputation of being very durable in the ground.

Arrowroot as Pig Food.

"Robin" (Riverview) asks: (1) Can arrowroot be grown in the Ipswich district; (2) time for planting; and (3) methods of cultivation? The Instructor in Pig Raising (Mr. Shelton) advises that there is apparently no reason why it should not be successfully grown on the blackish sandy loams of the river bank. It certainly is a crop worth cultivation, though under suitable conditions sweet potatoes would probably pay better. Both crops require to be kept clean and free of weed growth. In this connection arrowroot has an advantage in that it is a comparatively upright growing plant, whereas sweet potatoes soon cover the ground and hinder cultivation. A leaflet covering more fully information asked for has been posted direct.

Cape Cotton or "Wild Cotton" *(Gomphocarpus fruticosus).*

T.A. (Iveragh)—

The Government Botanist, Mr. C. T. White, F.L.S., advises that the specimen forwarded for identification is *Gomphocarpus fruticosus*, the Cape Cotton or Wild Cotton, a plant belonging to a family containing several plants poisonous to stock. The present species has often been accused of poisoning stock in the Gladstone district and elsewhere, but no definite feeding tests have been carried out with it. In view, however, of its relationships, it would no doubt be injurious if eaten; the plant also can become a very tenacious pest, and on this account alone should be cleared out. Fortunately it seems to be rarely touched by stock, except during very dry times.

The Care of Pigs.

W.N. (Kingaroy)—

Mr. Shelton advises that the type of shelter shed illustrated in the February journal can be adapted to various uses at the piggery, for more important still than the matter of sties is the provision of suitable pig paddocks with good shelter sheds and water troughs, and if convenient, concrete feeding floors, for pigs develop far more satisfactorily on the paddock system of feeding than they do when kept continuously in sties. Provided they have sufficient feed and a more limited range they can be prepared for market more satisfactorily in roomy yards than they can in small sties, for we do not require a fat pig in these days, the great demand being for fleshy, early-maturing baconers.

According to section 57 of "*The Dairy Produce Act of* 1920," "no swine (pigs) shall be kept or be permitted to be or to approach or to remain within 150 feet of any dairy produce premises wherein dairy produce is handled, kept, or stored."

You will see, therefore that the minimum distance between the dairy and the piggery is 50 yards (150 feet), but if convenient it is preferable to have the piggery at least 75 yards away from the dairy premises; this allows for extension of holding yards for cows, &c., without interference with the piggery.

Pig paddocks should be 1 acre or more in extent, and should be so arranged that they can be cultivated occasionally and then be laid down to grass again. In this way the land is kept in profitable use all the time.

Noxious Grasses—Sprays.

In reply to a query raised by a correspondent, the Government Botanist (Mr. C. T. White, F.L.S.) writes:—

Grasses and sedges with an underground vegetative system, such as Nut Grass and Johnson Grass, are, as a general rule, not very susceptible to poisonous sprays. All methods of eradication must be towards checking leafy growth so as to gradually exhaust the underground parts on which propagation largely depends. Spraying would have to be done regularly at fairly brief intervals as fresh green shoots were developed. A spray recommended by the Agricultural Chemist (Mr. J. C. Brünnich) for weeds and grasses can be made up as follows:—2½ lb. of caustic soda (95 to 98 per cent.) are intimately mixed with 4 lb. of white arsenic, and 1 gallon of water is added very gradually to the mixture. Great heat is evolved, and the water will boil of its own accord. The arsenic should be all dissolved on stirring the mixture, but, if not, a further heating to boiling point for ten to fifteen minutes may be necessary. This strong solution is, before being used as a spray, made up with water to 40 gallons.

Any of the commercial dip concentrates may also be used as weed killers, by diluting them with only one-fifth of the volume of water recommended for the preparation of the dipping fluids.

Care must, of course, be exercised to keep stock away from the sprayed grass.

Grass Identified (*Paspalum conjugatum*).

B. (Ravenshoe)—

The Government Botanist, Mr. C. T. White, F.L.S., advises that it is very difficult to name grasses correctly from leaf specimens only. As far as can be judged, however, the grass forwarded is *Paspalum conjugatum*, known on the Atherton Tableland as "Sour Grass" or "Yellow Grass." It has a wide range over the tropics, and is commonly called "Mission Grass." In the Hawaiian Islands it is known as "Hilo Grass." In some tropical places it has quite a good reputation as a fodder, and Mr. White has seen pack mules in New Guinea do well on it. There it overruns the rubber plantations. On the Atherton Tableland, however, farmers are very concerned about it, particularly around Yungaburra and Malanda, owing to its spreading and dominating other paspalum pastures. They claim that cows milk badly on it. Send seeding specimens to verify determination.

General Notes.

A Northern Sanctuary.

Millaa Millaa Falls have been proclaimed a sanctuary under the Animals and Birds Acts.

An Indooroopilly Sanctuary.

The Indooroopilly Golf Links have been declared a sanctuary for animals and birds, and Messrs. A. Denholm, H. C. Morrow, G. S. Crouch, and R. C. Philp have been appointed Honorary Officers under the Animals and Birds Act.

Cotton Pool.

A Pool has been constituted for all seed cotton produced in Queensland after the 1st January, 1927, for a period of five years. The Board to administer this Pool will consist of seven representatives selected by the growers and one member appointed by the Minister.

Broom Millet Pool.

A Pool has been constituted for all broom millet produced in Queensland from seed sown after the 1st July, 1925, for a period of three years from the 11th March, 1926. The Board to administer the Pool will consist of two members elected annually by the growers and one appointed by the Minister.

Staff Changes and Appointments.

Messrs. W. M. Nash and J. Armstrong, of Columboola and Landsdowne, respectively, have been appointed Government representatives of Condamine and Tambo Dingo Boards, respectively.

The Officer in Charge of Police, Home Hill, has been relieved of the duties of Acting Inspector of Stock.

The resignation of Mr. S. T. J. Clarke, as Senior Field Assistant, Cotton Section, has been accepted as from 3rd February, 1926.

Mr. L. R. Macgregor has been appointed a Member of the Committee of Direction of Fruit Marketing.

Mr. H. H. Collins, of Atherton, has been appointed Chairman of the Atherton Tableland Maize Board until the 31st August, 1927.

Messrs. R. E. McHugh, of Millaa Millaa, G. A. Shand, Queensport, and Neil Doherty, Queensport, have been appointed Officers under the Animals and Birds Acts.

The appointments of Officers in Charge of Police at Clarke River and Pratten as Inspectors under the Diseases in Stock Act have been rescinded.

Mr. P. L. Barry has been appointed Government Representative on the Tambo Dingo Board in the place of Mr. J. Armstrong, resigned.

Mr. R. H. Ingham, of the Customs, Maryborough, has been appointed an Inspector under the Diseases in Plants Act in the room of Mr. N. J. Keating, transferred.

The appointment of Mr. T. R. E. Mitchell as Manager of the State Nursery, Bribie Island, has been confirmed.

Mr. I. W. Helmsing, Temporary Draftsman, Chief Office, Department of Agriculture and Stock, has been appointed Illustrator, Science Branch, Department of Agriculture.

The Officers in Charge of Police at Yeppoon, Roma, Langlo Crossing, and Richmond have been relieved of their appointments as Acting Inspectors of Stock.

Acting Sergeant J. B. Odewahn, of Jericho, Acting Sergeant T. Brady, of Jundah, Constable J. Biffin, of Urandangie, and Constable P. Leahy, of Sandgate, have been appointed Inspectors of Slaughter-houses.

Mr. R. Leeke, of Great Keppel Island, and Mr. C. N. Sims, of Yeppen Crossing, Rockhampton, have been appointed Officers under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. A. Wynne, as Assistant Instructor in Sheep and Wool, has been accepted as from the 31st March, 1926.

Mr. L. M. Smith has been removed as Millowners' Representative on the Hambledon Local Sugar Cane Prices Board and Mr. J. R. Kerr appointed in his stead.

Mr. E. J. Hickey has been appointed to act as Chairman on the Babinda and Hambledon Local Sugar Cane Prices Boards during the absence of Mr. A. H. O'Kelly.

Protected Birds and Animals.

An Order in Council has been issued giving a list of all the native birds and animals protected throughout Queensland. This is practically only a reissue of lists previously published, the main exception being that in future the open season for finches throughout Queensland will be from the 1st July to the 31st August in each year.

Flashlights Prohibited—A Reminder to Opossum Trappers.

A further Regulation has been issued under the Animals and Birds Acts re-enacting the prohibition against the use of flashlights and the destruction of native animals, whether they are protected or not. This is, of course, not a new regulation, having been in force for some years.

Fruit Marketing.

Approval has been granted to certain additional Regulations under "*The Fruit Marketing Organisation Acts, 1923 to 1925*," dealing with a poll upon the question of the proposed issue of a direction that all pineapples for canneries shall be handled and dealt with or consigned or delivered only by or to the Committee of Direction of Fruit Marketing.

Opossum Boards.

Nominations closed at noon on 22nd instant for the election of representatives of Trappers and Landowners on the various Opossum Boards throughout the State. The following have been elected unopposed:—

Owners' Representative—

Moreton District: C. S. Delpratt.
Darling Downs District: Donald Gunn.
South-Western District: S. R. C. Harding.
Central Coast District: Thomas Smith.
Central Western District: C. P. Copland.
Northern Coast District: J. A. Michelmore.
Northern District: A. Shepherd.

Trappers' Representative—

Northern District: A. H. Bauman.

As more Trappers' representatives than required have been nominated in the Darling Downs, Wide Bay and Burnett, Central Coast, and Central Western districts, elections will be held on 19th April next. An election of Owners' representatives in the Wide Bay and Burnett district will also be necessary. No nominations of Trappers' representatives were received from the Moreton, South Western, and Northern Coast districts.

Queensland at Dunedin.

Many eulogistic references have been made to Queensland's display at the Dunedin Exhibition, this State's section being regarded as easily the best of the Australian exhibits. Apropos the display, the Rev. C. Maitland Ellis, formerly minister of the Brighton road Congregational Church in South Brisbane, and now minister of the United Congregational Church of Dunedin (New Zealand), writes:—"Sir,—It may be of interest to your readers to learn of the huge success of the Dunedin and Southseas International Exhibition now being held in this city, and which is attracting great attention through the Dominion. What is of more than passing interest to Queenslanders is the magnificient display of Queensland primary products. In the Australian section of the exhibition the Queensland exhibit stands out as the most remarkable and the most representative of any. The Queensland Government is to be heartily congratulated upon the magnificent display of minerals, grains and grasses, timber, and wool. Added to all that, the splendid series of views both of Brisbane and the State in general are at once a most attractive and educational feature. The whole display quite outclasses any other exhibit in the Australian Court, and I am proud of the State which was my home for the last six years. I would also like to congratulate the Queensland Government upon the excellent choice it made in the selection of a Commissioner. In Mr. H. W. Mobsby, F.R.G.S., we have a gentleman who fills the office with conspicuous ability. His warm-hearted courtesy and good-natured attention to visitors make him a very fine ambassador for Bananaland. His kindness to myself I can never forget. Well done, Queensland! I am proud of her effort. It is a fine advertisement for the State. In conclusion, I would like to say that should any readers of the 'Courier' be contemplating a visit to this beautiful city, I shall be only too glad to do what I can to make their visit happy and pleasant."—"Courier," 28th January, 1926.

The Evidence of Colonel Evans.

The Minister for Agriculture (Mr. W. Forgan Smith) has received a communication from Colonel Evans, M.A., C.I.E., late Director of Cotton Culture, setting out the principal matters that he had brought under the notice of the Tariff Board in connection with the cotton industry and the proposed bounty. Briefly, the views placed before the Board by Colonel Evans were as follows:—

"1. That the establishment of the cotton-growing industry on a permanent basis depends on the capacity of the farmer to learn how to grow the crop properly, and that it is the duty of the Government to help to forward this end by means of experiment and practical demonstration. I explained fully what the Department had been doing in this direction.

"2. Until the grower had learnt how to grow cotton, financial assistance was necessary, especially in view of the low price of cotton.

"3. I pointed out that the 2d. bounty asked for was 50 per cent. above the total value of the cotton, and that if a *flat rate* without reservation was given, it would be quite possible for growers to grow inferior growths of cotton which could not possibly pay when the bounty was lifted and the industry had to stand on its own feet.

"4. To this end I gave my opinion that a limit with regard to length of staple and grade should be laid down. This limit need not be too high, but it should be insisted that any cotton coming below the required standard of staple and grade should *not under any circumstances receive the bounty.*

"5. In order to keep up the quality also it will be necessary for the Department of Agriculture to have complete control of the seed.

"6. In order that the main object of the bounty should not be defeated, it will be better to make the announcement that the bounty should be on a scale gradually decreasing in value each year, the idea being that the grower should continue to learn how best to grow cotton, and not be content to merely plant cotton and to make no attempt to better his efforts. I pointed out that unless every endeavour was made by the grower to overcome some of these difficulties, such as the high cost of picking, no progress will be made, and the industry might collapse if the bounty was suddenly removed.

"7. I made no suggestion with regard to the size of the bounty, but gave it as my opinion that financial assistance would be required for at least five years."

Cotton Board Election.

Following is the result of the voting in connection with the election of Growers' representatives on the Proposed Cotton Board:—

District No. 1: Lockyer District—

Ferdinand A. Kajewski, Ma Ma Creek	181 votes.
James Scanlan, Flagstone Creek	98 votes.

District No. 2: From Helidon to Toowoomba, Darling Downs, Maranoa, &c.—

Edward Vipond Little, Miles	120 votes.
John Frederick Erdman Olm, Brigalow	45 votes.

District No. 3: From Brisbane to Ipswich; Brisbane Valley Line, South Coast Line, and North Coast to Gunalda and branches—

Charles Litzow, Vernor	132 votes.
David Curtis Pryce, Toogoolawah	112 votes.

District No. 4: Gayndah-Mundubbera Line—

James Bryant, Chowey Siding	135 votes.
Donald Edward Greggery, Mount Lawless	107 votes.

District No. 5: North Coast Line from Theebine to Gladstone and all branches, except Gayndah-Mundubbera Line—

Robert Joseph Webster, Murgon (unopposed).

District No. 6: Dawson Valley Line, and Central Line West from Kabra and branches—

Harry Reeves Brake, Don River	173 votes.
Charles George Young, Wowan	166 votes.
Joseph Henrikus Johannes Koets, Alma Creek	72 votes.

District No. 7: North of Gladstone West, and from Rockhampton to Malchi on the Central Line; whole of the Boyne Valley Line—

George Edward McDonald, South Yaamba	146 votes.
John Edward Harding, Dalma Scrub	104 votes.
Arnot Victor Jorgensen, Mount Larcom	33 votes.

One member is required for each district.

Official Testing of Agricultural Machinery in Great Britain.

According to a Press report, the particulars of the scheme of the British Ministry of Agriculture for testing agricultural machinery will shortly be obtainable. The test, which is in the hands of a scientific committee, is designed to furnish accurate information relating to each machine or implement tested, covering its utility, efficiency, reliability, and working costs. Although the machines tested will not be officially placed in any order of merit, purchasers will thus be able to obtain reliable information as to their capacity. A certificate and report will be issued for each machine or implement tested, the former giving the bare facts of the test, while the latter may express opinions as to the design and performance of the machine. In some cases, such as machines in the experimental stage and not on the market, a confidential report may be made for the manufacturers' information.

Pasture Composition—A Noted Visitor.

The Minister for Agriculture (Mr. W. Forgan Smith) has been advised by His Excellency the Lieutenant-Governor that Professor R. G. Stapledon, Head of the Plant Breeding Research Institute at Aberystwyth, had sailed for Australia and New Zealand per s.s. "Aeneas," on 27th February, and was due to arrive at Sydney on the 17th April. Professor Stapledon is the greatest authority in England on the composition of pastures, and generally on the breeding of grasses, though his activities also extend to oats and other cereals. He proposes during his visit to Australia and New Zealand to see as much as he can of the agriculture here, particularly of those engaged in his own line of research. He is already in personal touch with a number of individual investigators in Australia.

The Cotton Guarantee.

Referring to the Prime Minister's recent statement in respect to the proposed increase in the guaranteed prices of cotton, the Minister for Agriculture (Mr. W. Forgan Smith) said, in the course of a Press announcement, that Mr. Bruce's attitude was most extraordinary. Since Federation, it has been the normal practice of Prime Ministers to give full consideration to any representations made by a State Government, irrespective of which party is in power.

"It is a matter for profound regret," added Mr. Smith, "that Mr. Bruce has seen fit to depart from this sound principle. The cotton growers' case is of so much importance to them, however, that I hope Mr. Bruce will yet see fit to review his present attitude."

Market-Finding Board for Surplus Crop Proposed in the United States.

As a partial solution of the problems that confront the farmers of the United States a plan that would provide them with a market for their surplus products will be submitted to Congress soon. Several conferences have been held at Washington regarding agricultural legislation, and various measures in behalf of the farmers have been discussed.

In effect, the proposal provides that the Secretary of Agriculture shall determine the amount of the surplus of a crop with a view to locating a market for it. To do this it is planned to create a "market-finding board," to be composed of Ministers controlling departments concerned and representatives of farmers' organisations experienced in the marketing of farm products.

Early Maturing Wheat Discovery in Canada.

According to the Canadian correspondent of the "New York Commercial," special attention has been attracted in Canada by the announcement of a new variety of seed which is expected to improve materially farming conditions on the prairies. The new wheat is called Garnet, and is described as being a distinct advance on Marquis, which has added so much to the wealth of Western Canada. The chief advantage of Garnet is its early maturing quality. Marquis reduced the period between sowing and reaping from 120 to 110 days, and Garnet has now cut that time down to 100 days. The result is expected to be the bringing of a large area within the wheat belt and to enable the farmer to avoid many of the risks of bad weather. The new wheat is said to be the result of long experiments by the Dominion Department of Agriculture. During the last summer it has been given a test on about 100 farms in Western Canada under practical conditions, and has fully borne out the expectations of the department and of the Dominion cerealist, Mr. L. H. Newman. In Southern Alberta Garnet wheat ripened and was threshed long before the snow and rain storms came. In Manitoba Garnet was grown alongside Marquis. At the time when Garnet was ready for the binder Marquis had still ten days more to go, and bore considerable rust. Garnet wheat is not rust resisting, but its earlier ripening qualities are claimed to be a tremendous asset in the fight against this disease.

Cost of Imperial Preference.

According to a British Press report, Mr. Churchill, in replying to a question in the House of Commons recently, said:—"On the basis of a comparison of the amount of duty paid in the period on goods subject to preference with the amount that would have been payable on the same goods had there been no preference, the estimated cost to the revenue of Imperial preference during the nine months, January to September, of 1925, is £2,309,000. It will be appreciated that this figure does not take into account any effect on consumption that may have resulted from the alterations in duty on Empire goods."

Co-operation in Japan.

The co-operative movement in Japan dates from 1892, and its progress has been remarkable. In 1900 a co-operative society law was passed which has greatly stimulated the movement. The law provides for four distinct kinds of co-operative societies, viz.:—(1) For supply of credit; (2) for sale of produce; (3) for purchase of supplies; and (4) for the common use of land, buildings, machinery, &c. There are now 14,259 societies, with a total membership of about 2¾ millions, and an aggregate capital of about £40,000,000. The average number of members per society is 210, but there is evidently a wide range, for one society has a membership of 19,782. The co-operative movement in Japan is a rural development. Over 77 per cent. of the members are agriculturists, 8 per cent. fishermen, and 4 per cent. shopkeepers. The law lays down with particularity the general lines on which a co-operative society must be formed. Each member can have only one vote, though he may hold up to fifty shares. One-fourth of the profits must be placed to reserve, and the remainder may be divided among the members, paid to employees as bonuses, or placed in special funds. Profits paid to members may be paid either as dividends on share capital up to 10 per cent., or bonuses on sales or purchases, or in both ways. While the societies are thus under regulation and supervision they also receive substantial help from the Government. They are exempt from many taxes, money is lent at low rates of interest, and the Mortgage Bank of Japan, and other land credit banks, are empowered to lend money to co-operative societies without security. Most of the local societies are federated in organsiations. There are 191 such federations, with an average of fifty-six societies in each, but seven or more societies are permitted to form a federation. The Central Union of Co-operative Societies, which is under the direct supervision of the Ministry of Agriculture and Commerce, is formed to encourage the establishment of co-operative societies and of federations of societies. Amongst its activities are the giving of lectures, conducting research studies, publishing reports and books on co-operation, and building exhibition rooms for societies and federations.—"The Economist," London,

Import Duty on Maize.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith), in the course of a recent Press announcement, expressed pleasure with the recent decision of the Federal Government to review the matter of the import duty on maize, particularly maize grown under black labour conditions. For some years past the State Government and the Council of Agriculture have been in direct communication with the Federal authorities, urging the necessity for the imposition of an import duty of not less than 3s. per cental on maize imported into Australia from South Africa, because of the serious position accruing from the dumping of such maize on the Australian markets.

Under the 1921 Tariff the duty on maize was fixed at 1s. 6d., 2s. 6d., and 3s., but South African maize was admitted at 1s. under "*The South African Preference Act of* 1906." The Commonwealth Government advised that an increased duty could only be imposed by Act of Parliament, and as duty on South African involved the question of reciprocal tariff arrangements between the Commonwealth and South Africa, there was a difficulty in giving effect to the Queensland Government's requests. "I am glad to learn," said Mr. Smith, "that the Federal Government has at last been prepared to see the matter in the same light as it appears to this Government. I am of opinion, quite apart from the question of duty, there should be a complete embargo against the importation of maize grown by coloured labour, either in South Africa or elsewhere. Queensland growers of maize should not be expected to compete with the cheap labour conditions obtaining in South Africa. I trust that this view point will not be lost sight of by the Federal Government when the matter is being finalised. Queensland, in common with several of the States, has large areas of land suitable for the cultivation of maize, and everything possible should be done to protect and foster our resources. The evidence is that the combined efforts of the State Government and the Council of Agriculture in their approach to the Federal Government will result in benefit to the maize growers, and it is hoped that the matter will be settled at an early date by the Federal Government in a manner that is satisfactory to the producers."

The English Butter Market.

According to an American official report, the Danish Department of Agriculture's representative in England visited Denmark during the month of September, and reported that Danish agricultural products are already meeting sharp competition in the British markets, and that in the future such competition will undoubtedly become still keener. Denmark, the report says, has for several years regarded with growing anxiety the increasing competition from New Zaland and Australia in regard to butter, and the decision of the Mother Country to undertake a policy of propaganda to further the purchases of Dominion agricultural products will undoubtedly react unfavourably upon the Danish butter exports to Great Britain.

According to the Department of Markets and Migration, the butter imports into Great Britain amounted to 4,378,227 cwt. during the first ten months of 1923, 4,460,702 cwt. during the first ten months of 1924, and 4,999,572 cwt. during the corresponding period of 1925. Butter imports into Great Britain from Denmark dropped from 1,555,785 cwt. in the first ten months of 1923 to 1,461,641 cwt. in the same period of 1924 and to 1,354,851 cwt. in the 1925 period. This decline in Danish butter imports into Great Britain is said to be partly due to a diversion of Danish butter to Germany. However, butter shipments to Great Britain from Australia and New Zealand show a large increase—those from Australia ranging from 463,957 cwt. in the first ten months of 1923 to 478,945 cwt. in the corresponding period of 1924 and 992,582 cwt. in the 1925 period, while the New Zealand shipments to Great Britain amounted to 955,612 cwt. in the 1923 period, 908,553 cwt. in the 1924 period, and 1,117,863 cwt. in the 1925 period. The imports of butter from Canada into Great Britain showed the greatest growth, increasing from 33,764 cwt. in the 1923 period to 108,131 cwt. in the 1924 period and to 159,602 cwt. in the 1925 period.

Queensland Pineapples in London—Successful Brennan Box Shipment.

In November last Mr. Brennan, the inventor of the Brennan butter box, to test the efficacy of a special fruit case that he has patented, sent a consignment of pineapples to London in one of these cases. With this consignment the Minister for Agriculture (Hon. W. Forgan Smith) despatched a case of pineapples to his sister, who lives at Windsor. Mr. Smith has received a message from her stating that the pineapples had reached her in splendid condition. She spoke highly of the quality of the Queensland fruit, and considered the flavour superior to that of pines grown in the West Indies, where she had resided for a number of years.

Following is an extract from another private advice respecting fruit in the same shipment:—

"The pineapples you sent me arrived in good condition. The colour, &c., and the general type are similar to those familiar to the London market. One or two showed signs of sweating, as it is called in the trade. I did not know if you had made any arrangements other than just sending to the Agent-General to see that they got due publicity in the right quarters; this is, of course, the most important factor. I was myself so impressed with the colour, flavour, and general condition—the flavour compared favourably with the fresh variety—that I consider their importation quite practicable.

"I took a couple round to some prominent local retailers to get their opinion of the quality. They were quite interested in the fact that they came from Queensland, and agreed that they were in quite good condition. I then made inquiries as to the best and largest Covent Garden importers' brokers, and got into touch with them. I showed them two of the pineapples, and asked if they were interested in the importation of such an article. They were quite enthusiastic, and told me verbally that they could handle any quantity for me if they were landed in that condition, and also promised me details as the commercial method of packing and grading adopted in the London market. I saw them at four o'clock Tuesday afternoon, the same day as I received the case, so you will see that I did not allow the grass to grow under my feet. They were equally prompt, and I received a letter from them recording our conversation next morning (Wednesday) at breakfast. I think I could handle the thing quite effectually for you. As soon as I know (if it is done) that I can handle the business I will write formally giving you full advice. I have spent time in Covent Garden comparing and examining pineapples, and am still convinced that the article is good."

Another letter from a London business man states that a case of pineapples from Mr. R. N. Ross, of Montville, had reached him safely, and concludes:—"In view of the fact that the shipment was made in one of your patent crates you may be interested to know that all the fruit arrived in good condition, though, perhaps, a trifle overripe for keeping."

Brennan's Patent Butter Box Company, Ltd., is now trying to secure space for 500 cases of pines for London.

Universal Standards for Agricultural Products.

According to an American Press report, the United States Department of Agriculture is planning to sponsor the adoption of universal standards and practices in world trade for all major agricultural products. The universal standards for American cotton set up two years ago will soon be followed by uniform standards for wool. The department's expert was expected to return in December with the agreement of the British industry to the proposed universal standards. Other representatives of the Department of Agriculture abroad are seeking constantly to promote sentiment favourable to the establishment of uniform standards for other American farm products which are sold on the world market.

In the United States the Department of Agriculture has established standards for thirty-two fruits and vegetables, eight grains, seven varieties of hay, cotton, wool, tobacco, butter, and eggs, and for a number of classes of live stock and dressed meat. Where suitable these standards eventually will be extended to cover the international market.

Farm and Garden Notes for 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.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Malting, Cape, and skinless barley may be sown; also Algerian and Sunrise oats and canary seed.

Potatoes 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.

Although a little late in the season *Phalaris bulbosa*, a perennial, and *Phalaris minor*, an annual type of canary grass, should be sown in the more temperate of the Southern districts of the State. In these areas increased attention should be given to the introduction of a hardy clover, like the White Dutch, to artificial pastures. Clovers usually thrive best when sown in April, but seed may still be sown early in May, provided weather conditions are propitious.

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.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean and well-prepared ground. In favourable weather plant out cabbages, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots, and, where sufficiently large enough, thinned out. Dig and prepare beds for asparagus, using plenty of well-rotted farmyard manure.

FLOWER GARDEN.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for 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 specked or 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 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 in. 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 specky 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. in diameter in a single layer.

Slowly acting manures—such as meatworks manures—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.

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 suface 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 in a droughty season.

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 sweetened 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 manure—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 the use of the trees or vines during the 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.

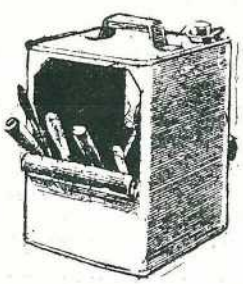
In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown 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.

TOOL CARRIER.

A convenient tool carrier for the garage or home workshop can be made from an old oilcan, as shown in the accompanying illustration, taken from "Popular Mechanics." Two sides of the can are cut open as indicated, leaving the upper corners intact. The free portion of each side is removed, except for an inch or



two, this part being bent or rolled over, as shown, so that there will be no sharp edge at the bottom of the opening. The other edges are smoothed with a file. Small tools and accessories placed in a carrier of this kind can be easily taken from place to place.