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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

The Meaning of Democracy.

AT a great public gathering at Mackay to commemorate his jubilee as representative for the district in the Queensland Parliament, the Premier, the Hon. W. Forgan Smith, LL.D., made a notable speech on national wellbeing as based on an educated democracy. His address was preceded by a presentation to him by the Mayor of Mackay (Alderman G. Moody) of a cheque for £1,000, and a beautiful inlaid table of Queensland woods, as tokens of public appreciation of his services in the Legislative Assembly as member, as former Minister for Public Works and Minister for Agriculture and Stock, and as Premier of the State for more than seven years. Thanking the people whom he had represented continuously for twenty-five years for their magnificent gesture of goodwill, the Premier said that being a member of Parliament in a democracy was a high honor and privilege and also a great responsibility, particularly in a State like Queensland, which was only at the beginning of its development. A great deal had been done since Queensland had been established as a State and a great deal remained to be done. The generations to follow would have their own problems and pioneering to do. It was the duty of the present generation to preserve all that was good in the past and improve upon it, do its share of developmental work, and pass it on to the succeeding generation. They were living probably in the most critical period in the world's

history, when things which were taken as permanent a few years ago, no longer form a permanent part of the life of the people. There were two ideas in conflict, but he believed that social progress could be accomplished only by conference, investigation, and discussion. Again there was the conception of force that all things must go to the strong, which was the cause of world disturbance. He knew that there was the law of the survival of the fittest, but he also knew that in all forms of human life there was the principle of mutual aid and that principle went to form organised society as they knew it and as their forefathers fought for it. They would be false to the people who were pioneers and would be recreant to the best traditions of their race if they did not acquit themselves like men and be strong to resist and struggle to preserve all that was best, highest, and noblest in their lives.

The Premier added that all good things in life came from the upsurge that was in the human heart and the human soul which found expression in the determination to achieve liberty, which had not been handed down like the table of the law on Mt. Sinai. He felt sure that the people of Australia and the people who made up the great British Commonwealth of Nations would be true to those principles of liberty which he had tried to outline. If they preserved their morale no matter what trouble might be in store they would meet it with courage and determination. Nothing could ever live permanently that was based on force, for what was won by the sword to-day would be taken by the sword some other day.

It had fallen to his lot, he said, to hold high office during a period when duty was more difficult than it had been in the past. They had their black moments of deep despair when they appeared to be looking into an inpenetrable haze and did not know which road to take. In a democracy it was necessary always to be able to persuade the majority of the people as to what was required and there were those who sought to retard development—men who tried to knock down rather than build up. It was always easier to destroy than build, but he had the consolation that the people of Mackay had given him their confidence. That was not given lightly or accepted lightly and he felt that he had done the best he could under the circumstances for the people he represented. They had to remember that by far the greatest percentage of the people desired honest government and the greatest good for the greatest number.

The Premier said he wished to thank the Mayor, and those associated with him, for the testimonial. He appreciated to the full the kindliness of the sentiment that was behind it all. Goodwill was something that could not be bought and was something that could not be measured in mathematical terms. It was a wonderful thing and one of the principles that enabled civilisation to go on and become better each year. "This gift," he added, "will enable me to do something that I have wanted to do for a long time—that is something specfic for education here in Mackay and district. I have been associated with the development of education in Queensland. We have a high standard of education in Queensland. We have a standard of education equal to anything in the Commonwealth, and we are improving it each year, giving assistance from the kindergarten right to the university. Many splendid students have gone through our schools and university. There is nothing that Queensland boys and girls cannot do if they are trained to do it. I have been privileged also to be associated with the establish-

ment of no less than seven new faculties in the University of Queensland, and the Government, in conjunction with the Senate, is building a splendid new university at St. Lucia, which will be in keeping with the honor and dignity of the people of Queensland, and will serve not only the present generation, but those of the future. I will be able with this £1000 to help some Mackay boy or girl, or both, to get a secondary education, which they might not otherwise be able to get. The money, therefore, will be used for a bursary, and will be made available to children whose parents have not an income in excess of £300 net per annum. "There is nothing to be compared with the fostering of the youth of the community. They are the future citizens, and no memorial could please me better than a memorial to help some boy or girl in their life."

It would be a very cherished thing, the Premier further remarked, to feel that such a use for such a very generous gift would be for the good of boys and girls perhaps yet unborn.

"Australia is capable of being a great country," he said, "it is a great country now, and you ought to thank God for the privilege of being Australian citizens." He added that there came to his mind the lines of Robert Burns, with which he would close: "And I'll remember thee, Glencairn, and all that thou hast done for me."

Farm Costing.

AT the Annual Conference of the Council of Agriculture the Minister for Agriculture and Stock, Hon. F. W. Bulcock, made particular reference to observations he had made during his recent mission abroad on methods of farm costing and recording being applied in some of the countries visited.

Economic pressure, he said, was becoming so acute in the agricultural industries that primary producers practically the world over were being forced to adopt some system of recording which would disclose the costs involved in the varying methods and practices applied to the many ramifications involved in primary production. He had made a selection of what he considered to be the best of these methods, and expressed the confirmed opinion that, from the information which he could make available, a system of farm costing could be instituted in this State which, if efficiently administered, would be of incalculable value to the rural industries.

Such an undertaking, he considered, should be the function of some organisation other than governmental, and he felt that the Council of Agriculture was the most appropriate body for the purpose. It would require, however, the close co-operation of the various pool boards which, he felt sure, would be readily forthcoming.

He pointed out that in one area in America 87 per cent. of the producers are participating in the work of the Farm Costing Bureau and said it was amazing to note the conclusions arrived at and the efficiency of the methods used as a result of the information obtained by this system.

The Council unanimously agreed to the following resolution:— "That the Executive be requested to devise, in co-operation with the Commodity Boards, a system of farm costing in order to determine economic costs in Queensland."

The Parasitic Worms of Sheep.

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NO animal suffers more severely from worms than the sheep, a feature associated with its close grazing habits and with modern methods of sheep-raising. In Queensland, worm diseases in sheep become of primary importance as diseases caused by other organisms, such as bacteria, &c., appear comparatively uncommon. In fact, it may be said that in this State, were it not for drought, worms, and blowflies, losses in the sheep industry would indeed be small.

Losses from worms are not to be measured solely by mortalities. Such ill-effects as failure to grow and fatten, loss of condition, and decreased wool values must also be taken into consideration. These, not being at all spectacular, are too often inclined to be overlooked.

Most sheep in Queensland harbour worms. Even in the dry western areas sheep are not entirely free from these parasites. It is, however, only when the annual rainfall exceeds about 20 inches that worms become serious. Moisture is essential for the development of larval worms in the pastures and consequently outbreaks are dependent chiefly upon the rainfall, and the higher the rainfall the more prevelant do outbreaks become.

The successful sheep farmer realises the wisdom of keeping his flocks as healthy as possible. Where worm diseases occur, this can be accomplished only by a knowledge of the various kinds of worms that infest the sheep and of the steps to be taken to control them.

HOW SHEEP BECOME INFESTED WITH WORMS. (Plate 104.)

There are a number of different kinds of worms which infest sheep. Some of these live in the fourth stomach, others in the small intestine, others in the large intestine, and others again in the lungs. Each kind has its own favourite place in the body of the sheep and is rarely seen anywhere else.

Worms do not breed inside the sheep. The only way in which sheep can become infested is by picking up the tiny larval stages of the worms, which are present on the grass and in soil and water in the pastures These larval worms hatch from eggs laid by worms in the sheep and passed out of the body in the droppings.

In the case of some worms such as tapeworms, the worm eggs must be eaten by another kind of animal, such as a mite. When the mite is swallowed by the sheep, the tapeworm larvæ in the mite are set free and grow to the adult stage in the sheep's intestine. The mite is known as an intermediate host. The sheep itself is an intermediate host for several tapeworms which infest the dog.

HOW TO RECOGNISE AN OUTBREAK OF WORMS.

A sheep suffering from worms always exhibits certain symptoms. These are discussed later in the sections dealing with the various species of worms. The presence or absence of these symptoms forms a fairly practical guide to the degree of infestation in a flock. Where a heavy

infestation is indicated, it is always wise to kill and examine two sheep from the flock. Such an examination will confirm or otherwise the diagnosis of worm disease and, at the same time, will show which species of worm is responsible. This is a very important point, as it indicates which treatment is to be used.

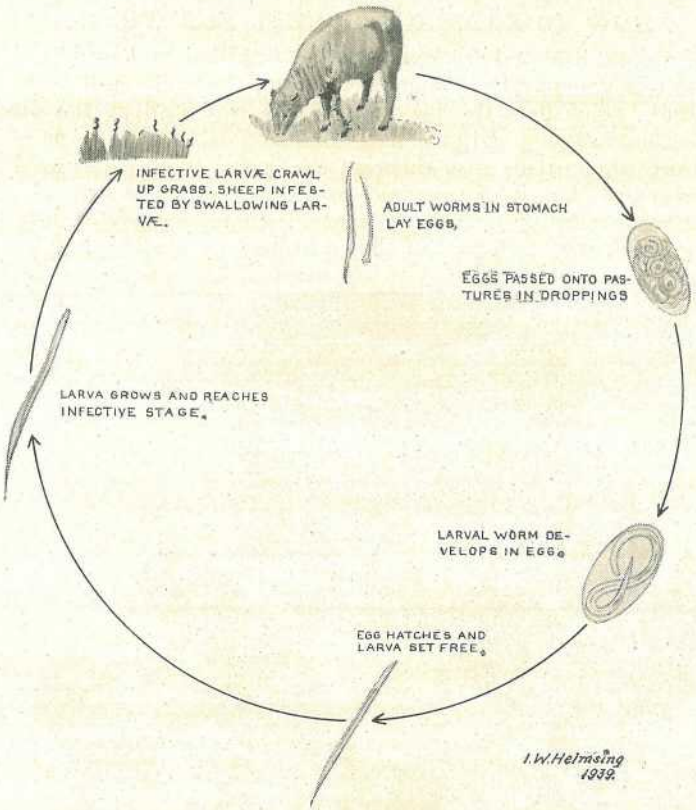

Plate 104.

How Sheep Become Infested with Roundworms.

1. Overstocking.
2. Damp, marshy pastures.
3. Shallow stagnant pools.
4. Continuous dull showery weather.
5. Regular drenching not used.
6. Permanent pastures.
7. Poor nutrition.

It is also advisable to examine for worms any sheep that dies or is killed, for this will give some idea of the degree of infestation existing in a flock.

In making an examination of a sheep, it must be remembered that the presence of a few worms is of little consequence. It is only when worms are numerous that they become serious. It has been estimated that in young sheep, for example, the first signs of ill-health are seen only when 500 or more large stomach worms are present, or 100 or more nodule worms, or 10,000 or more hair worms. Furthermore, when worms

are serious there are usually very marked unhealthy changes in certain organs of the body, in the flesh and in the blood. Thus, worm disease may be recognised, firstly, by the symptoms, secondly, by finding very large numbers of worms, and, thirdly, by certain unhealthy changes in the organs of the body, &c. These three factors should be considered together before coming to any decision.

HOW TO EXAMINE A SHEEP FOR WORMS.

The animal selected for examination is killed and laid on its back. The four legs are partly dismembered from the body and laid back on the ground. This gets the legs out of the way and at the same time keeps the carcase in position. The abdomen is then slit open straight up the mid line, cutting also through the breast bone. The skin is then cut sideways so that it can be laid aside, exposing the internal organs. The stomach of the sheep is very large, filling most of the left half of the abdominal cavity and part of the right half (Plate 105). It is divided

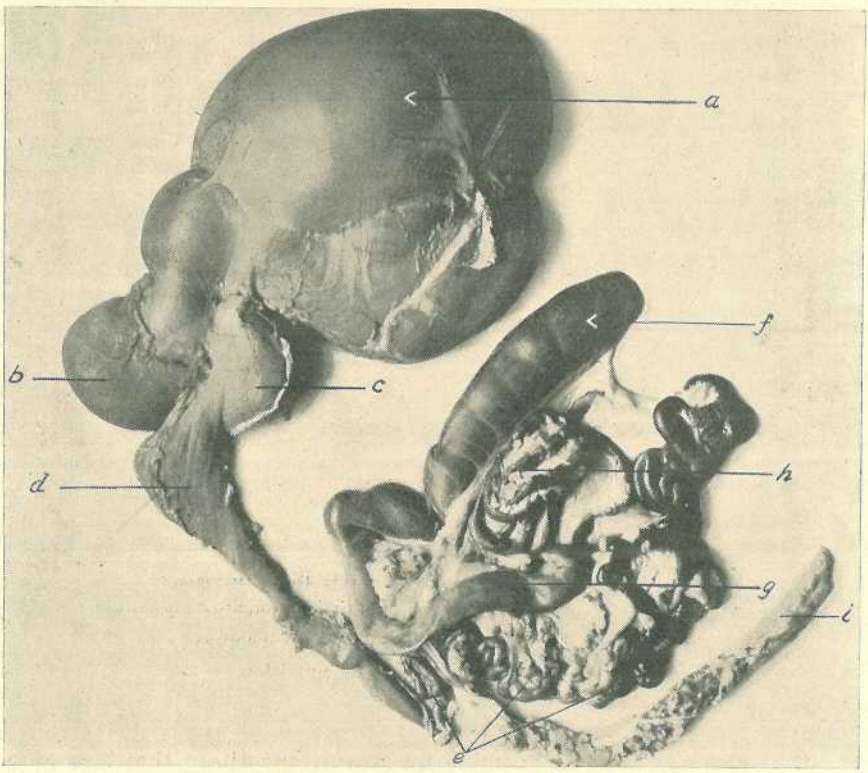

Plate 105.

DIGESTIVE TRACT OF A SHEEP.—(*a*) paunch; (*b*) honeycomb; (*c*) bible; (*d*) fourth stomach; (*e*) small intestine; (*f*) cæcum; (*g*) large intestine; (*h*) "crown" of large intestine; (*i*) rectum.

into four portions—(1) the very large rumen or paunch, (2) the smaller reticulum or honeycomb, (3) the rounded omasum or bible, and (4) the elongate abomasum or fourth stomach. The fourth stomach is where the large stomach worm is found. The other three stomachs are of little

importance as worms rarely occur in any of these. The fourth stomach runs into the small intestine, which attains a length of up to 80 feet. The small intestine continues into the large intestine, which in one direction ends blindly in the cæcum and in the other continues for up to about 15 feet, and is much coiled, to end in the anus. The large intestine and fourth stomach should be slit open and examined carefully. Worms in the fourth stomach and large intestine are easily seen, but for the small worms in the small intestine the following procedure should be adopted:—The small intestine is freed from the webbing that holds it (the mesentery) for a distance of about 25 feet. It is then pulled between the thumb and forefinger, which are held as tightly as possible, and the contents expressed into a bucket of water. These are allowed to settle for about fifteen minutes and the water is then carefully decanted. Further water is added and the operation repeated until the water remains clear. The sediment is then examined bit by bit in a glass dish held over a black background. This is the only way by which some idea can be secured of the number of hair worms present. The first 10 feet or so of the small intestine should then be slit open and examined for any hookworms. These adhere very firmly to the intestine wall and the above method of examination may not remove them all. The lungs should then be cut out and their air tubes slit open and examined for lung worms. Throughout the examination a careful watch should be kept for any unhealthy changes in the various organs.

THE CONTROL OF WORM DISEASES.

The control of worms does not aim at their complete eradication, which under the normal conditions of sheep-raising is quite impossible, but rather at keeping their numbers below the point at which they become harmful. The measures which may be employed to attain this object fall under two headings—(1) preventive measures, or measures which can be applied to prevent infestation, and (2) treatment, or measures by which the worms are removed from the sheep.

Preventive Measures.

The principles which are advised as being of value in preventing infestation have been evolved from a knowledge of the life histories of the parasites, of certain factors which influence the development of the eggs and larvæ in the pastures, and of factors which affect the resistance of the sheep to infestation. In the light of this knowledge then the following principles of prevention may be laid down:—

(1) *Avoid overstocking.*—Overstocking is probably responsible for more outbreaks than any other factor. The dangers of overstocking will be realised when it is pointed out that two animals on any particular area may pick up four times as many worms as one animal; three may pick up nine times as many, ten may pick up 100 times as many, and so on. Overstocking also leads to close grazing by the sheep. As most of the worm larvæ are to be found sheltering in the grasses close to the ground, the chances of infestation are thereby greatly increased.

(2) *Avoid damp marshy pastures.*—Moisture is necessary for the development of the eggs and larvæ outside the sheep and also for their survival.

(3) *Rotate the pastures.*—Where practicable, rotation of pastures is an excellent system of prevention. The animals are kept moving from

pasture to pasture, so that they do not remain on any one pasture sufficiently long to grossly contaminate it. They move each time on to a pasture which has been spelled or fired. A pasture spelled from sheep for about three months will lose most of its infection. Pastures which are being spelled may be used for horses.

(4) *Water from troughs.*—This prevents animals drinking from shallow stagnant pools and other such places which are favourite haunts of worm larvæ. Such places also become danger spots in dry weather as the sheep concentrate on the green feed growing there, thus leading to heavy overstocking on small areas. The formation of moist areas around drinking troughs should be guarded against for the same reasons.

(5) *Periodic firing of the pastures is advisable.*—Whilst firing cannot be depended upon to cleanse a pasture of larvæ, for many of these sheltering in the bases of the grass are protected from the fire, it must decrease their numbers to an appreciable extent. A burnt pasture is a very useful substitute for a spelled pasture. Furthermore, the green feed that comes after burning is very nutritious.

(6) *Nutrition.*—This is a very important factor in the control of worm diseases. It has been shown very definitely that sheep on a highly nutritive pasture can withstand much heavier infestations than sheep on poor pastures. It is therefore a great advantage to be able to provide the sheep with nutritious pastures, particularly in dry times. This may be done by laying down lucerne, improved grasses, oats, &c., or by top-dressing with superphosphate. Otherwise the animals can be hand fed with such economical foods as wheat, maize, oats, lucerne chaff, &c. Improved pastures must be grazed with care. Although the carrying capacity of improved pastures in relation to worm infestation is much higher than on natural pastures, a limit to this is eventually reached, and if exceeded serious losses may follow. Animals on improved pasture should not be permitted to graze backwards and forwards over the one area. They should be kept moving in the one direction.

The provision of a good lick assists sheep to remain healthy and thus increases their resistance to infestation. A good type of lick containing most of the essential elements is—

Bonemeal	65
Salt	30
Limonite	5

(7) *Protection of very susceptible sheep.*—Young sheep up to about 18-24 months old, pregnant ewes, and ewes with lambs are the most susceptible classes of sheep. These should receive special attention when preventive measures are being considered. Sheep of any age brought into wormy districts from areas where worms are few are also very susceptible.

Treatment.

Where an effective treatment is available, it becomes the main line of defence. By a systematic programme of treatment infestations can be controlled and outbreaks greatly diminished. Preventive measures, however, must not be neglected, even when treatment is highly effective. Where treatment is not satisfactory, control relies chiefly, and in some cases almost entirely, on prevention. Where treatment is indicated, it should be applied to every member of the flock and not confined to those sheep which appear infested.

Drenching.

All drenches used for the removal of worms are poisons. If the following principles are adhered to, however, drenching can be made as safe as humanly possible:—

(1) Measure out or weigh out the various ingredients very carefully. Do not attempt to guess the various quantities.

(2) To make sure no mistake has been made in mixing a drench, treat several sheep a day or so before the rest of the flock, and watch them carefully for any serious after-effects.

(3) Give no more than the recommended dose. The too frequent practice of giving a double dose to very wormy sheep is decidedly dangerous.

(4) Drench carefully and slowly and handle the animals quietly. Only by observing these principles will losses be avoided from drenches entering the lungs and from other ill-effects of excitement and nervousness following rough handling. Furthermore, in hurried drenching portion of the drench may be lost, and it is from the full dose only that efficient results can be expected.

(5) The above points should be specially borne in mind when treating very weak sheep. Such sheep should also receive a reduced dose (about three-quarters of the recommended dose). It is better to remove worms from weak sheep by several reduced doses than to give a full dose and risk killing the animal.

(6) The art in drenching is to get the sheep to swallow a full dose and to keep it out of the lungs. Drench only when the animal is standing on all fours. Insert the nozzle of the syringe from the side of the mouth, over the back of the tongue and pointing towards the throat. Depress the plunger slowly and evenly so that the fluid is not squirted violent into the mouth, particularly in the case of the bulkier drenches. While drenching, do not force the animal's head back; keep it in a horizontal position. Allow the animal time to swallow and do try to assist swallowing by such practices as tickling the throat and holding the hand over the nostrils.

(7) Drench in the cool of the morning or evening.

(8) Starvation before drenching is now considered unnecessary, though it is wise to keep the animals from water for an hour or two after treatment.

WORMS INFESTING SHEEP.

The various worms found in sheep are either flukes, tapeworms, or roundworms.

FLUKES.

These worms are usually flattened or leaf-life in appearance, though some flukes are rounded and conical. Their life history is interesting in that the larval stages develop in snails. When development in the snail is complete, the larvæ break out into the open and attach themselves to the grass, and so are swallowed by the sheep as it grazes.

THE LIVER FLUKE (*Fasciola hepatica*). (Plate 106.)

This species is found in the bile ducts of the liver. It is about 1 inch in length and tapers towards the posterior end. The body is usually pinkish and transparent and marked with dark lines and spots.

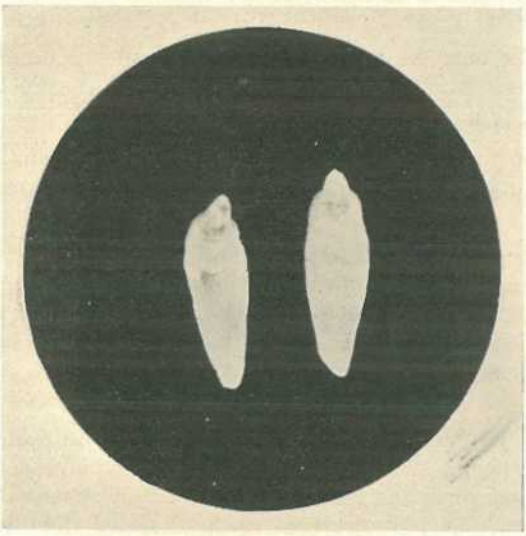

Plate 106.
LIVER FLUKE (natural size).

In areas where flukes are prevalent, they are responsible for a serious disease—fluke disease or liver rot. The species is practically unknown in sheep in Queensland, but is included here as it is sometimes seen in sheep in the Stanthorpe district and in the south-eastern part of the State and also in sheep brought in from the fluky areas of New South Wales. A fluky liver has a mottled appearance. The bile ducts are enlarged and stand out above the liver surface. On cutting into these numerous flukes will be seen.

THE CONICAL FLUKE (*Paramphistomum* spp.). (Plate 107.)

These flukes are stout conical-shaped pinkish worms found adhering to the walls of the paunch and honeycomb. They are particularly numerous in cattle in coastal and subcoastal areas and have occasionally been seen also in sheep.

The adult flukes in the paunch and honeycomb do not appear to be very harmful. The young flukes, however, live in the small intestine, and when sufficiently numerous can cause serious losses. So far conical fluke disease in sheep has been recorded only from South Africa and India, but as the adults are very common in Queensland the disease should be suspected in sheep in coastal and subcoastal areas when they show a persistent black, fœtid diarrhœa, rapid loss of condition, and bottle jaw. If the fluke is responsible, the small intestine for a short

distance from the fourth stomach will be very inflamed. On scraping the inflamed areas, large numbers of tiny stout flukes about $\frac{1}{25}$ of an inch will be found.

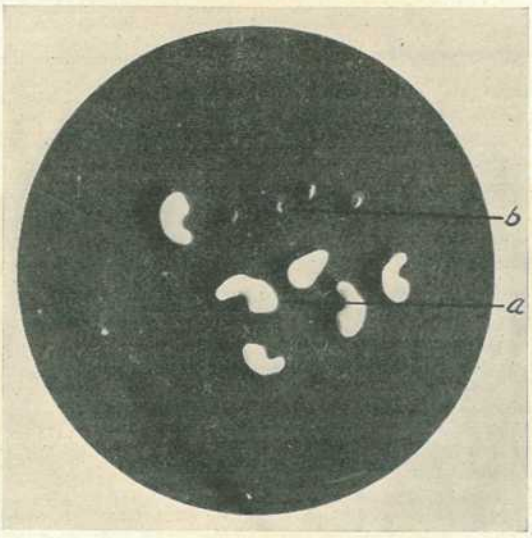

Plate 107.

CONICAL FLUKE.—(*a*) Adults as found in honeycomb and paunch; (*b*) young flukes as found in the small intestine (natural size).

TAPEWORMS.

These are elongate, flat, whitish worms which are found in the small intestine. At the anterior end of the tapeworm is a minute head, which is provided with suckers and sometimes also, though not in the case of the tapeworms infesting sheep, with hooks. The suckers and hooks enable the worm to attach itself to the wall of the intestine. Next to the head there is usually a very slender neck, which is followed by the body of the worm. This is composed of a number of short segments, which become progressively broader towards the posterior end. Some kinds of tapeworms are very minute in size, measuring only a fraction of an inch, whilst others may attain a length of 20 feet and more.

The life history of tapeworms is rather complicated. The segments at the posterior end of the worm contain large numbers of eggs. When the eggs are ripe, the segment drops off the body and passes out with the droppings. Further development of the eggs takes place only when they are eaten by a suitable intermediate host, such as an insect, a mite, or even a vertebrate, such as the sheep itself. Then when the insect, mite, &c., containing a larval tapeworm is eaten by the animal which passed the segments, the larva settles down in the small intestine and grows to maturity.

LARVAL TAPEWORMS.

The sheep acts an an intermediate host for a number of different tapeworms which in the adult stage occur in the intestine of the dog. Three of these are found in sheep in Queensland—namely, water ball or *Cysticercus tenuicollis*, sheep measles or *Cysticercus ovis* and hydatids or *Echinococcus granulosus*.

In each case the sheep becomes infested when it swallows eggs from segments passed by the dog. The adult worms grow in the intestine of the dog when it consumes these organs of the sheep containing the larval tapeworms.

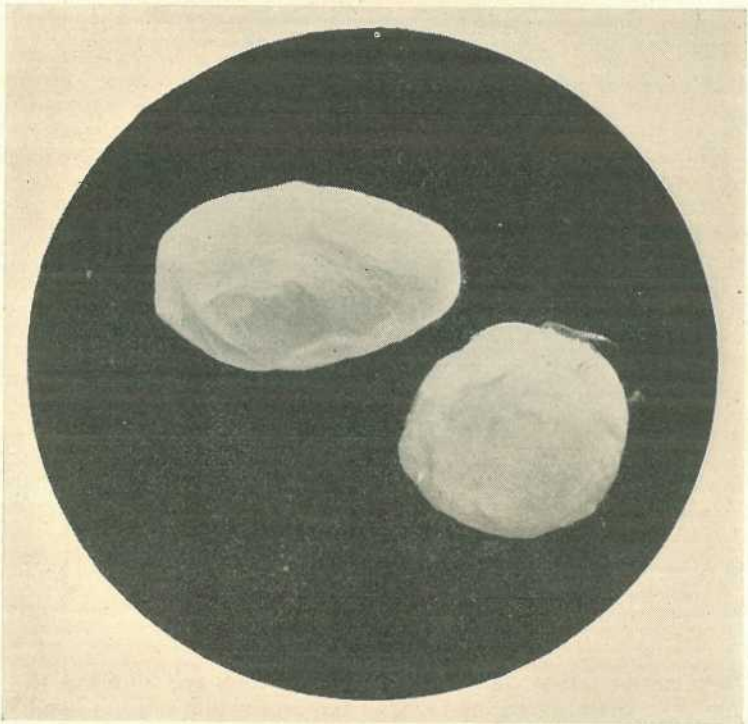

Plate 108.
WATER BALL (natural size).

WATER BALL (*Cysticercus tenuicollis*). (Plate 108.)

This larval tapeworm is very common in sheep throughout the State. It has the appearance of a ball of fluid, within which is an opaque white centre, which is the future tapeworm head. The cyst, as a rule, hangs suspended into the abdominal cavity, though it may at times also be seen in the liver. The adult worm in the dog is known as *Tænia hydatigena*.

Water ball is of little importance in so far as the health of the sheep is concerned. The frequency with which it is seen, however, indicates a very common practice among sheep farmers of feeding raw offal to dogs, a practice which is also responsible for the spread of hydatids, a very serious disease of man.

SHEEP MEASLES (*Cysticercus ovis*).

These tapeworm larvæ appear as small cysts, $\frac{1}{8}$ of an inch in diameter, in the heart and muscles of the body. Should the larva die it becomes calcified. The adult tapeworm in the dog is called *Tænia ovis*.

Infestation does not appear to be harmful to the sheep unless it is very heavy. Infested portions of the body, however, are condemned as unfit for human consumption. Thus, this parasite can be responsible for serious economic loss.

The control measures for sheep measles are the same as those recommended for hydatids.

HYDATIDS.

This name is applied to the larval stage of a tiny tapeworm, which in the adult stage infests the dog. The larval stage is found in the sheep, pig, cow, man, and certain other animals. In the lower animals hydatids are of little consequence, but give rise to a serious and sometimes fatal disease in man.

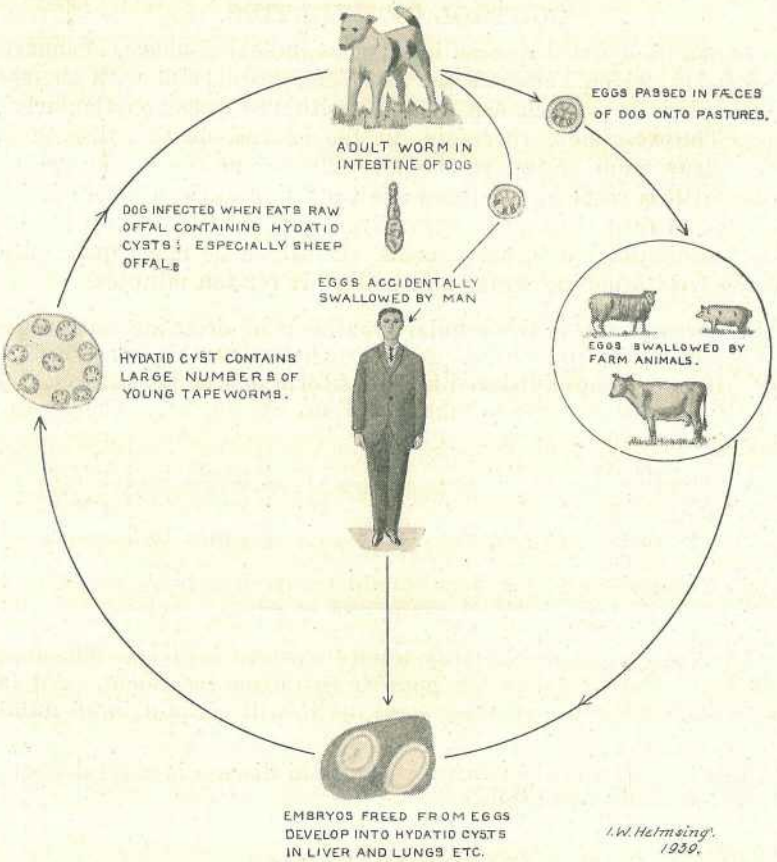

Plate 109.

How Man Becomes Infested with Hydatids.

1. Feeding raw offal, especially of sheep, to dogs.
2. Failure to treat dogs regularly for tapeworms.
3. Careless handling of dogs.

The hydatid cysts occur most commonly in the liver and lungs. They consist of bladders of fluid, which may grow as large as a child's

head. Sometimes a number of cysts may be seen in the liver and lungs, extending throughout a large portion of these organs. If a cyst is punctured, it will yield a fluid containing large numbers of tiny white specks, which are the future tapeworm heads. Such a cyst if fed to a dog will produce some thousands of adult worms. Some cysts, however, are sterile, and in these no white specks can be seen.

Man becomes infested with hydatids by accidentally swallowing eggs passed by the dog. The dog becomes infested with adult worms only when it eats raw offal containing hydatids. (Plate 109.) Australia and other sheep-raising countries, such as New Zealand, show a comparatively high rate of hydatid disease in man, because the sheep is the most favourable animal for the development of the larvæ or cysts.

CONTROL OF HYDATIDS.

Control of hydatid disease in man, as indicated above, is concerned with the dog, which harbours the adult tapeworm, and with the sheep, cow, and pig, &c., which are infested with the cysts, particularly the sheep. The first step, therefore, in the control of this disease is to prevent dogs from eating raw offal. The sheep farmer is the worst offender in this respect, for there are very few stations where it is not customary to feed dogs on the raw liver, lungs, &c., of sheep killed for human consumption or other reasons. Offal can be made quite safe by throwing it into boiling water and boiling it for ten minutes.

The second step is the regular treatment of dogs for tapeworms at about intervals of two months. Arecoline hydrobromide is the best drug to use. It may be administered in tablet form or else the tablets may be dissolved in water (½-grain tablet to 1 oz. of water). The doses are as follows:—

Small dogs	⅛ grain to ¼ grain.
Medium dogs	¼ grain to ½ grain.
Large dogs	½ grain to 1 grain.

Small puppies and toy dogs should be given only $\frac{1}{16}$ grain, a small kelpie ½ grain, a large kelpie 1 grain, and so on.

The stomach should be empty when treatment is given. The animals should be tied up for about an hour or two after treatment. All fæces voided should be collected and burnt, as it will contain large numbers of eggs.

The third step in the control of hydatid disease is careful handling of dogs, especially by children.

ADULT TAPEWORMS.

Three species of adult tapeworms are found in the small intestine of the sheep. The most common species is known as *Moniezia expansa*. (Plate 110). They are all rather long creamy-white worms measuring, when fully grown, up to 18 feet in length and up to half an inch in breadth. Although tapeworms occur in sheep in practically every district in Queensland, they are most prevalent in the higher rainfall areas such as the Darling Downs and Central West.

Life History.

The eggs of the tapeworms as they lie in the pastures are eaten by certain species of mites which are present in the grass. After some time in the body of the mite, the larva which hatches from the egg reaches a stage when, if swallowed by a sheep, it would grow into an adult worm. The sheep normally becomes infested when it swallows mites containing these larvæ as it grazes.

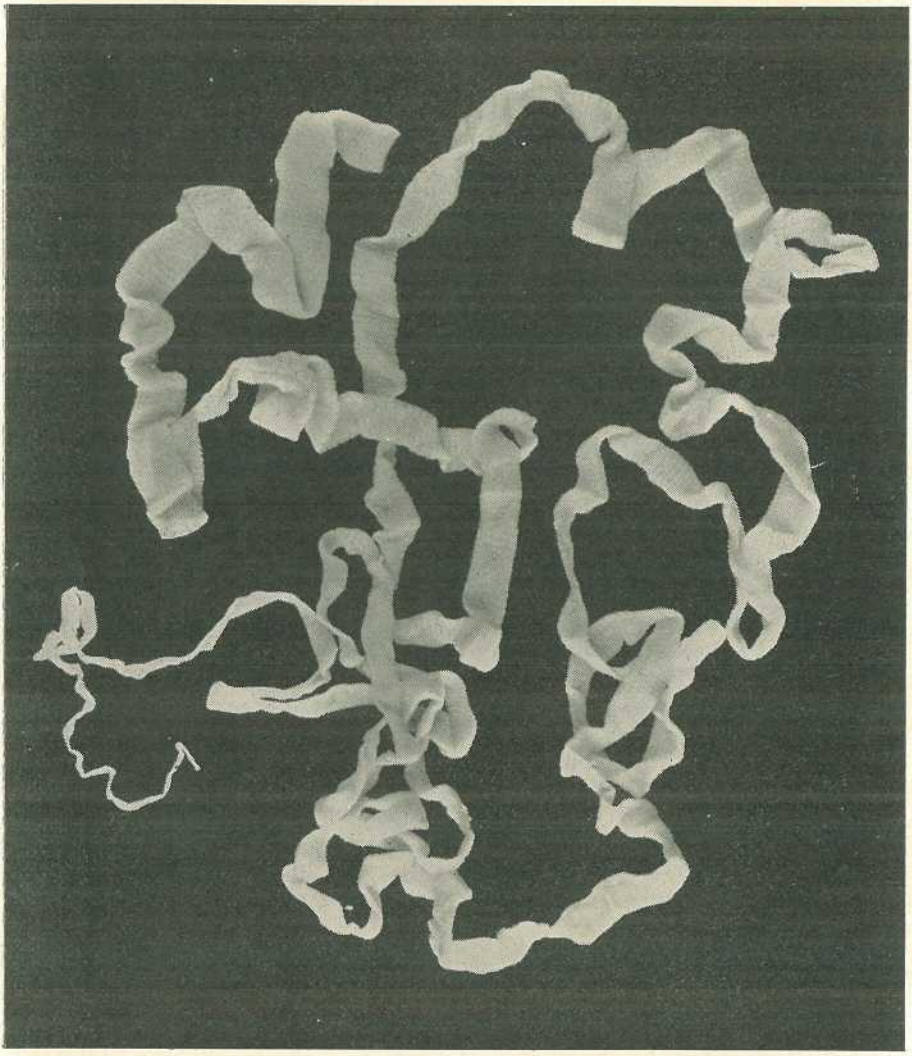

Plate 110.
TAPEWORM (natural size).

The mites are very common in pastures, particularly in damp areas. They are most active in the early morning and during dull, cloudy weather, and it is probably during these periods that the sheep usually becomes infested.

Effect on the Sheep.

As a rule tapeworms are seen only in young animals. Very little is known of their capacity for causing ill-health. Their large size has led many sheep farmers to consider tapeworms harmful, but before holding them responsible for any symptoms of worm-infestation that may be present a careful search should be made for other kinds of worms, such as the large stomach worm, nodule worm, and hairworms. Tapeworms have frequently been blamed for ill-effects which are really caused by hairworms, which on account of their small size can easily be overlooked.

Heavy infestations of tapeworms, however, may be serious in very young lambs, giving them an unthrifty, stunted, pot-bellied appearance, sometimes accompanied by diarrhœa.

Treatment and Control.

Suspected tapeworm infestation may be confirmed or otherwise by examining the droppings. The yellowish white segments are readily seen if tapeworms are present.

The worms may be removed by the bluestone and nicotine sulphate drench recommended for stomach worm (see p. 269).

Infestation of lambs may be prevented to a large extent by avoiding low-lying damp pastures.

ROUNDWORMS.

These are elongate, cylindrical worms, which taper towards the head and tail. They vary tremendously in size and include some very minute forms. The largest species found in the sheep, for example, measures about 3 inches in length, and the smallest only about $\frac{1}{25}$ of an inch. There are usually male and female worms, the males being the smaller.

The sheep becomes infested when it swallows larval worms as it grazes or drinks. These larvæ hatch from eggs laid by female worms in the sheep and passed out in the droppings. They undergo some growth and development in the droppings and eventually reach the infective stage, when they are each enclosed in a sheath which protects them from unfavourable influences such as dryness. Only these infective larvæ can give rise to adult worms in the sheep. They are capable of swimming up the grass blades when these are wet with dew or rain, and are thus swallowed by sheep when grazing.

No less than twenty-five different species of roundworms have been found in sheep in Queensland. Only the more important of these will be mentioned here.

THE LARGE STOMACH WORM OR BARBER'S POLE WORM

(*Hæmonchus contortus*). (Plate 111.)

This worm occurs in the fourth stomach, where it may be seen swimming around in the liquid contents or adhering to the stomach wall. The female worm measures about 1¼ inches in length and is red and white spirally striped. Hence the name barber's pole worm. The male worm is smaller and uniformly pinkish in colour.

Life History.

The eggs laid by the female worms pass out in the droppings and under suitable conditions of temperature and moisture hatch to give

rise to tiny larvæ. These continue to develop, and under summer conditions become infective in four to five days when they crawl up the grass blades to await grazing sheep. When the temperatures are low development is retarded and may cease altogether.

Plate 111.
LARGE STOMACH WORM OR BARBER'S POLE WORM (natural size).

The infective larvæ when swallowed by the sheep make their way to the fourth stomach. Here they settle down and grow to maturity in about three weeks.

Effect on the Sheep.

The large stomach worm is the most prevalent and most serious parasite of sheep in this State. It is a blood-sucker, and the effects of an infestation are primarily those associated with a loss of blood. One of the first symptoms is to be seen by examining the skin and the tissues in the mouth and under the eyelids. These, instead of being a nice healthy pink colour, are pale and even white. Sometimes, when sheep swallow massive numbers of larvæ, they may die in prime condition, and the only symptom seen is this paleness of the skin, &c. Usually, however, sheep swallow only comparatively small numbers of larvæ each day, and stomach-worm disease then becomes more of a chronic type. Infested animals hang around camps and water troughs and are disinclined to move about. The anæmia, which is denoted by the whiteness of the skin, &c., gradually becomes more pronounced and eventually a swelling appears under the jaw—"bottle jaw." When driven, the animals lag behind and fall over and finally become too weak to stand, and die. Scouring is not usually seen, but sometimes young sheep which are also infested with hairworms may suffer from this complaint.

When a heavily-infested sheep is examined the carcase will be found to be very emaciated and the blood thin and pale. On opening up the abdomen, fluid may be present in the abdominal cavity, and the fat will have been replaced by a jelly-like material. If the fourth stomach is slit open carefully some hundreds of worms will be seen, usually so numerous as to appear entangled with one another.

Treatment and Control.

While highly effective drenches are available for the treatment of stomach-worm disease, the preventive measures discussed on p. 257 should also be employed as far as practicable.

The following drenches are used in Queensland—

1. **Arsenic and Epsom Salts.*—This is probably the first drench to be ever employed in Australia against the stomach worm. It is a rather cumbersome drench to prepare and must be used very carefully. It is considered to be the least efficient of the drenches mentioned here.

2. **Arsenic and Bluestone.*—Also a cumbersome drench to prepare and considered to be too severe for continuous use.

3. *Bluestone.*—This is a reasonably effective, very safe, and very cheap drench. It is not, however, as satisfactory against the young worms in the stomach as bluestone and nicotine sulphate.

Recent work has shown that results from drenching with bluestone or bluestone and nicotine sulphate are to some extent dependent upon the bulk of the dose. If we use, for example, a 5 per cent. solution of bluestone, the dose for an adult sheep is 20 cubic centimetres and for a young lamb only about 7 cubic centimetres. Such a small dose tends to become lost when the lamb swallows it. On the other hand, the bulk of the dose should not be too large. It takes some time to administer—say, a 2-oz. dose of a 2 per cent. solution to an adult sheep—and much of it may also be lost during the process. It is therefore recommended that the following formulæ be used:—

(*a*) *For Grown Sheep*—

Bluestone	1 lb.
Water	2½ gallons.

Dose—

Sheep over 18 months	1 fluid oz.
Sheep 12-18 months	¾ fluid oz.

(*b*) *For Young Sheep*—

Bluestone	1 lb.
Water	5 gallons.

Dose—

Sheep 12-18 months	1½ fluid oz.
Sheep 6-12 months	1 fluid oz.
Sheep under 6 months	½-¾ fluid oz.

When mixing bluestone drenches always use enamel or earthenware vessels, as bluestone corrodes unprotected metal surfaces. Similarly, nickel-plated or copper drenching syringes should be employed. Mix up the drench from fresh, blue, bluestone only, and discard any white powder.

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* NOTE.—For those who prefer either of these arsenical drenches details of the formulæ, &c., will be supplied on request.

4. *Bluestone and Nicotine Sulphate.*—This is probably the most effective drench available. It was brought out primarily for hairworms, but is also very successful against the large stomach worm and tapeworms. The formula is as follows:—

Bluestone	1 lb.
Nicotine sulphate	12 fluid oz.
Water	2½ or 5 gallons.

The doses would be the same as advised for the bluestone drench.

5. *Carbontetrachloride.*—This is a very effective drug for the large stomach worm, and the small dose required makes it very easy to administer. Lambs are given 1 cubic centimetre of carbontetrachloride in 4 cubic centimetres of liquid paraffin, whilst adult sheep are given 2 cubic centimetres of carbontetrachloride in 3 cubic centimetres of liquid paraffin. It is a risky drench to use, as it may, at times, cause serious losses The reasons for these losses are not understood.

Drenches Recommended.

The following drenches are advised, and in their recommendation both their efficiency and their safety have been considered.

1. *Bluestone,*—This should be used primarily for ewes well advanced in pregnancy.

2. *Bluestone and Nicotine Sulphate.*—This should be employed for the regular routine drenchings as advised below.

This drench should be also used when drenching for outbreaks of stomach worm. For precautions in using this drench, see p. 273.

Carbontetrachloride is not given any recommendation whatsoever, as fatalities following its use in Queensland have been much too frequent.

Systematic Treatment.

Most sheep farmers treat their flocks only when the animals are so heavily infested as to be noticeably ill. This is a bad practice, for by judicious drenching he can keep the infestations so low that outbreaks do not occur.

Outbreaks may commence shortly after the spring rains, and continue through the summer and autumn. They are most prevalent during the continuous dull, showery weather of summer and early autumn, and are not seen to any extent during the winter.

Sheep of all ages may be affected, but young sheep, pregnant ewes, and ewes with lambs are most susceptible.

With these points in mind, the following recommendations may be made as being of practical value in preventing the worms from becoming sufficiently numerous to affect the health of the flock:—

1. Drenching should commence following the first spring storms, and should be continued throughout the summer and autumn at regular three to four weekly intervals.

All classes of sheep should be drenched. Lambs usually, however, do not require drenching until just before weaning. Special attention should be given to ewes which are to lamb in the winter. In the case of wethers, which are not as susceptible to infestation as ewes and lambs, the interval between drenchings may be extended to five to six weeks.

2. Ewes should lamb in a pasture which has been spelled for at least three months, or has been recently burnt. They should be drenched twice at an interval of ten to fourteen days before removal.

3. Lambs should be drenched twice at an interval of ten to fourteen days before weaning. After weaning they should be placed in a pasture that has been spelled for at least three months, or has been recently burnt.

4. All sheep should be drenched once in June, again in July, and again in August. Very little infestation takes place during the winter, and those drenchings clean out any worms left in the sheep.

5. All sheep introduced, especially from known "wormy" districts, should be drenched twice at an interval of ten to fourteen days, as soon as possible after they have been placed on the pastures.

The intervals between treatments are, of course, dependent upon the weather. If the season is dry, there is no need for such frequent drenching, but it is important that sheep in a dry spell should carry as few worms as possible.

In the event of an outbreak, drenchings should be continued with an interval of about ten to fourteen days between them, until the advent of dry, sunny weather.

Sheep to be removed to cultivated or improved pastures should be drenched before removal, and again ten to fourteen days later.

Sheep which have become very heavily infested may take some time to recover, despite the removal of most of the worms. This point is not always appreciated, and there is a tendency to hold the drench responsible as not being effective. Supplementary feeding by using improved pastures or by hand feeding is of great value in assisting a flock to recover from the effects of a heavy infestation.

THE LESSER STOMACH WORM (*Ostertagia* spp.). (Plate 112.)

This is a very slender brownish worm, about half an inch in length, which may be seen lying along the wall of the fourth stomach. It is most numerous in that portion of the stomach which leads into the small intestine. It is best detected by scraping the stomach wall and examining the scrapings in a glass dish held over a dark surface.

The lesser stomach worm is common in sheep on the Darling Downs, but is of little consequence as it is present only in very small numbers.

Its life history is very similar to that of the large stomach worm.

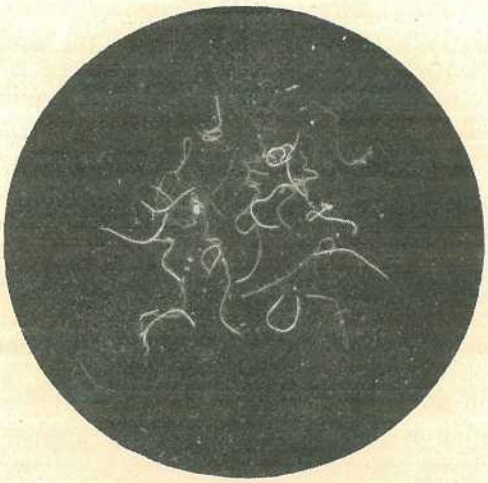


Plate 112.
LESSER STOMACH WORM (natural size).

HAIRWORMS (*Trichostrongylus* spp.). (Plate 113.)

These are very tiny, hair-like, reddish worms, which are to be found in the wall of the fourth stomach, and of the first 20 feet or so of the small intestine. Their small size makes them easily overlooked, but they may be detected by examining scrapings in a glass dish held over a dark surface.

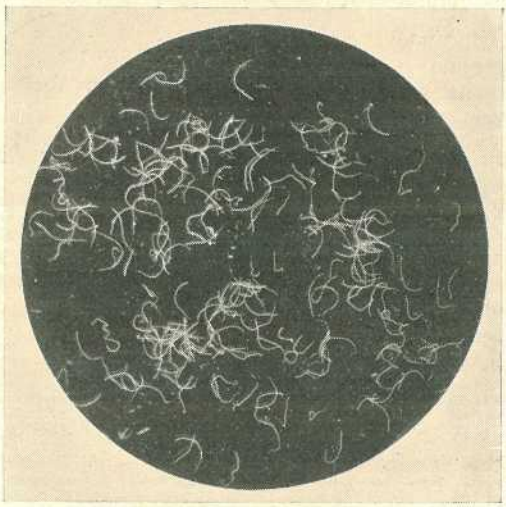


Plate 113.
HAIRWORMS (natural size).

The life history of the hairworm differs only in detail from that of the large stomach worm. The sheep is infested when it swallows the infective larvae whilst grazing.

Effect on the Sheep.

In Australia, only the species inhabiting the small intestine are important. In Southern Australia hairworm disease is very prevalent, but, although the worms are widely distributed throughout Queensland, they are known to be serious only on the Darling Downs, particularly in the Stanthorpe area.

Hairworms are most important among young sheep, up to eighteen months and two years of age. Weaners appear to be particularly susceptible. One of the prominent symptoms of infestation is a dark, fœtid diarrhœa, which gives the disease its popular name, "black scours." Other symptoms are loss of condition, weakness, and a paleness of the skin and tissues of the mouth and eyes. These never become the dead-white colour seen with stomach worm infestation, nor does "bottle jaw" develop. Infested animals may die, but should they recover they may remain stunted in growth.

On examination of a dead sheep, except for a wasted carcase, there are no very obvious signs of the infestation. The disease can be diagnosed only by finding large numbers of worms in the small intestine. The method recommended to find these is discussed on p. 256.

Treatment and Control.

Hairworm disease, or "black scours," usually occurs only when the pastures are poor, and for this reason is most common during the late autumn, winter, and early spring.

Bluestone and nicotine sulphate is the only drench of value against these parasites. For the same reasons given for using different strengths of bluestone, when drenching for the large stomach worm, the following formulæ and doses are recommended for bluestone and nicotine sulphate:—

1. *For Grown Sheep*—

Bluestone	1 lb.
Nicotine sulphate ..	16 fluid oz.
Water	2½ gallons.

Dose.—

Sheep over 18 months	1 fluid oz.
Sheep 12-18 months ..	¾ fluid oz.

or

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

Dose.—

Sheep over 18 months	20 cubic centimetres.
Sheep 12-18 months ..	15 cubic centimetres.

2. *For Young Sheep*—

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

Dose.—

Sheep 12–18 months..	1½ fluid oz.
Sheep 6–12 months..	1 fluid oz.
Sheep under 6 months	½–¾ fluid oz.

When using this drench, the following precautions should be observed:—

(1) Nicotine sulphate is highly poisonous; therefore, mix the drench with the greatest care. The sample of nicotine sulphate used should be of good quality, and should contain 40 per cent., or thereabouts, of nicotine.

(2) Give no more than the recommended dose. Any more may be followed by ill-effects.

(3) For weak sheep give only a three-quarter dose.

(4) Be careful when drenching not to bruise or cut the tissues of the mouth or throat. If this happens, the nicotine may be absorbed and become dangerous.

Nutrition is a very important factor in controlling outbreaks of hairworms. In areas where these parasites are troublesome attention should therefore be given to pasture improvement (see p. 258). When this is not possible, supplementary feeding should be employed during those periods of the year when the pastures are poor.

When outbreaks occur, the lambs should be drenched twice, with a ten to fourteen days' interval between drenchings, and either hand fed or removed to improved pastures. Outbreaks may be prevented by regular drenching at intervals of about a month throughout the autumn and winter.

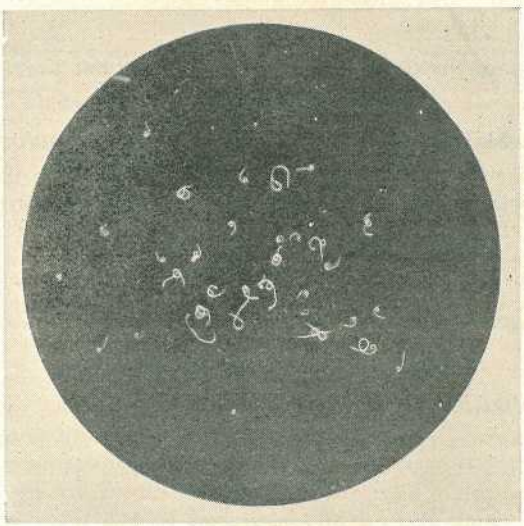


Plate 114.
COOPERIA SPP. (natural size).

COOPERIA spp. (Plate 114.)

These worms also occur is the small intestine. They are a little larger and somewhat stouter than hairworms. In scrapings made from the intestine wall and examined in a glass dish they may be distinguished from hairworms by their coiled appearance. They are of little importance in Queensland, as they occur in only very small numbers.

In countries where heavy infestations are seen they are considered to interfere with the normal growth of the sheep.

The life history of *Cooperia* spp. is very similar to that of the large stomach worm.

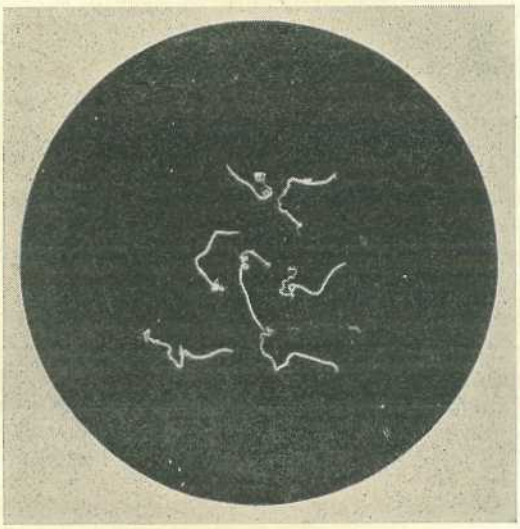


Plate 115.
THREAD-NECKED INTESTINAL WORMS (natural size).

THREAD-NECKED INTESTINAL WORMS (*Nematodirus* spp.).

These species may measure up to three-fifths of an inch in length, and are creamy to pink in colour. The anterior portion of the female is very slender and much coiled. They are found in the small intestine.

The thread-necked intestinal worm is of little importance in Queensland. It is found only in southern parts of the State, and occurs only in very small numbers.

THE HOOKWORM (*Bunostomum trigonocephalum*). (Plate 116.)

The hookworm is a stout species up to an inch in length and white to pink in colour. It is found in the small intestine, and may be distinguished from the other worms occurring there by its large size, and also by the way in which it is firmly attached to the intestine wall by its mouth.

Life Cycle.

The preliminary stages in the life cycle of the hookworm are similar to those of the large stomach worm. The infective larvæ, however, gain access to the sheep chiefly by penetrating the skin, though they may also be swallowed.

Effect on the Sheep.

This is a serious parasite, as it is a blood-sucker. It affects sheep in much the same way as the large stomach worm, but appears to be

more severe. At present the hookworm is rare in Queensland. It is mentioned here so that the sheep farmer can be on the watch for it, as in countries where it is prevalent it causes serious losses.

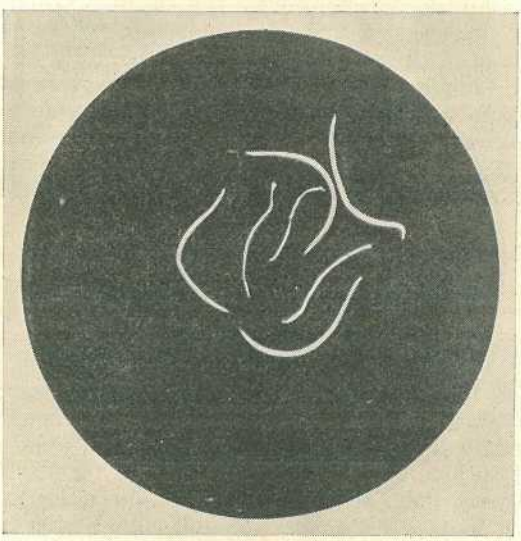


Plate 116.
HOOKWORMS (natural size).

THE NODULE WORM (*Oesophagostumum columbianum*). (Plate 117.)

The nodule worm is found in the large intestine, being most common from 1 to about 3 to 4 feet down from the junction of the small intestine. It is a whitish worm about five-eighths of an inch in length with the head end bent somewhat like a hook.

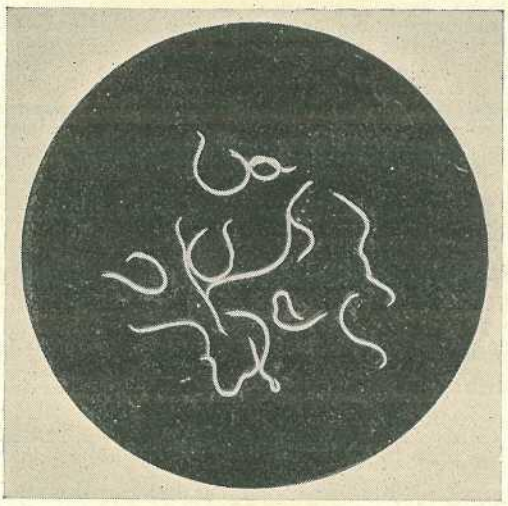


Plate 117.
NODULE WORMS (natural size).

Life History.

The eggs as usual pass out in the droppings and develop into infective larvæ. These ascend the grass blades on dewy mornings, or on dull showery days, and are swallowed by the sheep. When they reach the intestine they burrow into the intestine wall, where they remain for from several days to three to five months, depending largely on the age of the sheep. This invasion of the intestine wall involves chiefly the large intestine and causes nodule formation or "pimply gut." Nodule formation is much less conspicuous in young sheep than in old sheep. After leaving the nodule the young worm comes back into the intestine, where it settles down and grows to maturity.

Effect on the Sheep.

Nodule-worm disease can be very serious, and constitutes one of the principal reasons for the suspension of breeding in certain parts of the State. In cases where a massive infestation occurs, this may be rapidly fatal. The chronic type of nodule-worm disease is much more common, and the infested animals lose condition, show progressive weakness, and may be afflicted with a diarrhœa containing much mucus. If such sheep are driven they run with a stiff, awkward gait, and have a peculiar tucked-up appearance. The skin and mucous membranes of the eyes and mouth become pale, and there may follow a marked break in the wool. Death is not uncommon. Young sheep that survive remain stunted and unthrifty. The nodules in the intestine wall may interfere in the movements of the intestine and are probably responsible for the difficulty in fattening old infested sheep. The presence of nodules also renders the intestine useless for casings.

When a sheep suffering from nodule-worm disease is examined, numerous nodules will be seen along the length of the large and small intestine. If the large intestine is slit open and carefully examined numerous worms may be seen. In such cases the lining of the intestine in the locality inhabited by the worms will be inflamed, thickened, and thrown into folds and covered with a thick, pussy, blood-streaked secretion, in which the worms lie.

Treatment and Control.

The only effective treatment available for nodule worm at the present time is an enema of sodium arsenite and water. A bulk solution may be made by dissolving 4 oz. of sodium arsenite in three gallons of water. When treating sheep, 6 oz. of this solution are then taken and added to three gallons of water.

The quantities of this solution used for sheep of different ages are as follows:—

Aged sheep	1½ to 2 quarts.
6-month to 2-tooth ..	1 quart.
4-month to 6-month ..	1½ pints.
Up to 4-month	1 pint.

The enema may be delivered in two ways:—

(*a*) *By gravitation*—The sheep is held up by its hind legs, and a 3-foot length of pressure tubing is inserted through the anus as far as it will go. A funnel is attached to the free end of the tubing and elevated so that when the fluid is poured slowly into it, it will pass into the bowel.

(*b*) *By means of a large syringe.*

When delivering an enema, the following points should be borne in mind:—

(1) Starve for twenty-four hours, and, if possible, place the animals on green feed for a few days before treatment. This softens the contents of the bowel and reduces the quantity present.

(2) When computing the dose, the size of the sheep should be taken into consideration as well as its age.

(3) Deliver the fluid slowly and carefully, taking at least one minute to deliver a quart. Don't squirt it in violently.

(4) If the sheep struggles or strains suspend administration till the animal becomes quiet. If the fluid is run in while the animal struggles or strains fatal results may follow.

(5) Warm the fluid to blood heat if the weather is cold.

(6) Try the treatment on a few sheep for experience before using it on the flock.

This treatment, whilst admittedly a bit cumbersome and not without risk, is highly effective, and will remove practically every nodule worm.

Nodule-worm disease is acquired during the summer and autumn months, but does not usually become prominent till the late summer, autumn, and winter.

All sheep should therefore be treated during the autumn or earlier, if they are showing signs of infestation. This will send them into the winter free from worms. A further treatment should be given in July, for at this time the infestation from the pastures is at a minimum, and it presents an opportunity to remove any remaining worms.

Ewes in lamb should not be treated later than the second month of pregnancy.

The preventive measures discussed on p. 257 should be given every consideration.

THE WHIP WORM (*Trichuris* spp.). (Plate 118.)

This is a not uncommon species infesting the cæcum or blind gut, and adjoining parts of the large bowel. It receives its common name from its resemblance to a whip. It is white in colour, and when stretched out measures up to 2 to 3 inches in length.

Life History.

The life history of the whip worm is different to that of the other worms infesting sheep, for the whip worm egg does not hatch in the open. A tiny larva develops inside the egg which hatches only after it is swallowed. The young worm then makes its way to the caæcum where it settles down and grows to maturity.

Effect on the Sheep.

Little is known of the damage caused by whip worms. The worm buries its anterior end in the bowel wall, so heavy infestations may be injurious.

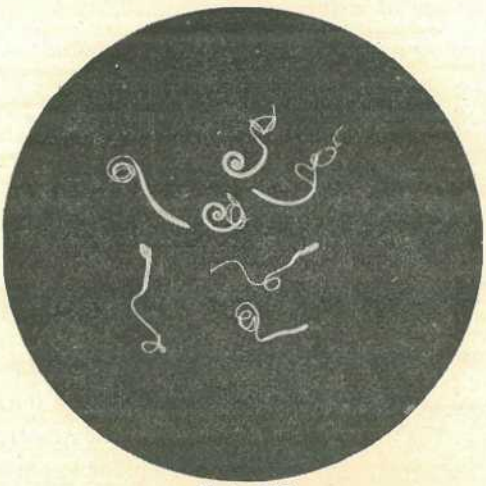


Plate 118.
WHIP WORMS (natural size).

Treatment and Control.

The enema treatment used against nodule worm is also effective against whip worms. It is, however, not advisable to use it for whip worms alone.

LUNG WORMS (*Dictyocaulus filaria*). (Plate 119.)

These are long, slender worms up to 4 inches in length found in the air tubes of the lungs. They are most prevalent in areas with a good winter rainfall, and for this reason outbreaks in Queensland are most frequent in the Stanthorpe-Warwick district.

Life History.

The eggs when laid by the female worms in the lungs contain small active larvæ. These are coughed up into the mouth and swallowed. As they pass along the intestine they hatch and the larva that is liberated eventually reaches the exterior in the droppings. Here, if conditions are suitable, the larva gradually grows to the infective stage. When these infective larvæ are swallowed by the sheep whilst grazing or drinking they burrow into the intestine wall and reach the lymph vessels, which carry them to the lungs where they mature.

Effects on the Sheep.

The first signs of lung-worm disease are frequent coughing and indications that the animal is finding it difficult to breathe. The animal becomes weak, listless, and loses condition. Sometimes a diarrhœa is present. Finally the breathing rate becomes very rapid, and the animal may die.

These symptoms are due to the tangled masses of worms in the air tubes, which so irritate the lung tissues as to cause pneumonia.

Treatment and Control.

Lung-worm disease occurs most frequently in the winter and early spring and is associated, as a rule, with poor nutrition and heavy

infestations of other worms, particularly hair worms and stomach worm. It is seen chiefly in young sheep. It can be prevented to a large extent by supplying supplementary foods during this dry period and by controlling hair worms and stomach worms.

Should an outbreak occur, the animals should be drenched with bluestone and nicotine sulphate, bearing in mind the weak state of the animals. They should then be provided with supplementary foods by hand feeding or also by using cultivations or improved pastures. Sheep so treated will in most cases throw off the lung worms and recover. As most outbreaks occur in pastures of a low-lying, marshy type, containing shallow, stagnant pools of water, the sooner the animals are drenched and removed the quicker will they recover.

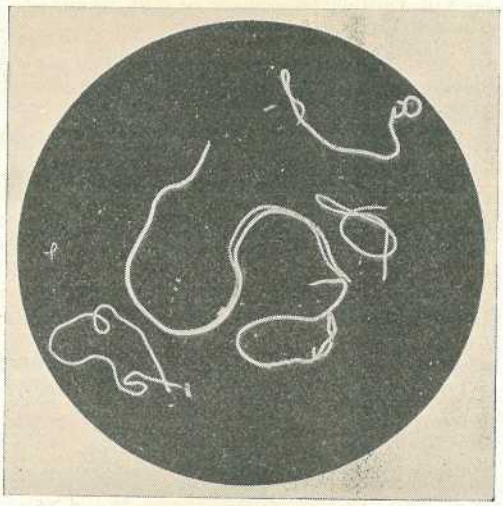


Plate 119.
LUNG WORMS (natural size).

The worms in the lungs may be removed by injecting certain drugs into the windpipe. This method, however, should not be used in preference to drenching and feeding. The following formula is recommended for such an injection:—

Oil of turpentine	2 parts.
Creosote	1 part.
Chloroform	1 part.
Olive oil	4 parts.

Dose.—

Lamb	4 cubic centimetres.
Older sheep	6-8 cubic centimetres.

The injection is made between the rings of the windpipe by means of a hypodermic syringe fitted with a short needle. The operation is not an easy one, and should be carried out only by a person with experience in its use.

Yellow Patch of Tobacco Seedlings.

L. F. MANDELSON, B.Sc. Agr., Research Officer and E. C. TOMMERUP, M.Sc., Soil Bacteriologist.

DURING the past four or five seasons in North Queensland a disease of tobacco seedlings, known locally as "yellow patch" or "yellowing," resulted in poor and uneven stands of plants in many seedbeds and caused increasing concern. In 1936 this trouble was fairly general in the Mareeba and Dimbulah districts and was considered to be of major importance. It not only necessitated additional expense in producing seedlings, but also delayed the setting out of the crop and so at times adversely affected both yield and quality, as a result of the crop missing a considerable proportion of the most favourable growing season.

When it was found that the usual control measures for damping off, a seedbed disease not unlike the one under discussion, were unavailing, a careful investigation of the trouble was initiated. As a result of this work it was demonstrated that yellow patch is a physiological disease, apparently not described previously, which may be avoided by a variation in seedbed fertilizer practice from that generally employed in North Queensland in the past. The disease is associated with the use of nitrogenous fertilizers containing dried blood, or other organic substances such as cotton seed meal and fresh goat dung. There is, however, no loss of plants when nitrate of soda is used as the source of nitrogen.

The object of this article is to describe this disease and to summarise the investigations into its nature and control, which have been in progress since 1935.

Symptoms of the Disease.

In seedbeds which eventually develop yellow patch, the germination of tobacco seed is impaired and a greatly reduced number of seedlings emerge. The young tobacco seedlings which do emerge may, or may not, grow normally. Some patches of seedlings have small seed leaves, or cotyledons, and when the true leaves develop in from ten to fourteen days after germination the seedlings are stunted in growth and are pale green or yellow in colour and usually die off. Meanwhile, neighbouring plants continue growing normally with large, healthy green true leaves. The patches of diseased seedlings vary in shape and size. Individual seedlings in such patches have normally green seed leaves or cotyledons, which are the first leaves to develop, but leaves formed subsequently are pale green or yellowish. The affected patches do not increase in size, but new patches may later develop in a bed. Diseased seedlings remain stunted and yellow, the roots fail to branch and may rot before the plants eventually die. Consequently, after a few weeks, affected seedbeds present a ragged appearance with patches of bare soil surrounded by apparently normal plants. (Plate 120.)

In seedbed experiments it was found that the disease was associated with applications of dried blood and that entire plots had unsatisfactory stands rather than patches of affected plants. It is considered that this was due to the very even distribution of fertilizer materials over the surface of the area treated. On the other hand, with commercial seedbeds, fertilizers are not usually applied so carefully and consequently some areas in a bed receive more fertilizer than the rest of the seedbed.

Furthermore, dried blood being lighter than the other constituents of a commercial fertilizer tends to separate into layers so that when a mixture is applied to a seedbed, there may be an uneven distribution of the dried blood contained in it. Those areas, in such commercial seedbeds, which receive abnormally heavy dressings of blood produce seedlings more affected with yellow patch than do the other areas, and so there results the irregularities in stand which have been discussed above.

The proportion of plants which are lost in this manner varies considerably. In many cases, affected beds may be uprooted and resown, but even then yellow patch may again develop. The severity of the disease, however, decreases with time and as the soil is moistened and worked. After two or three attempts to establish a seedbed a satisfactory stand of plants may be obtained after resowing, provided no additional fertilizer is applied.

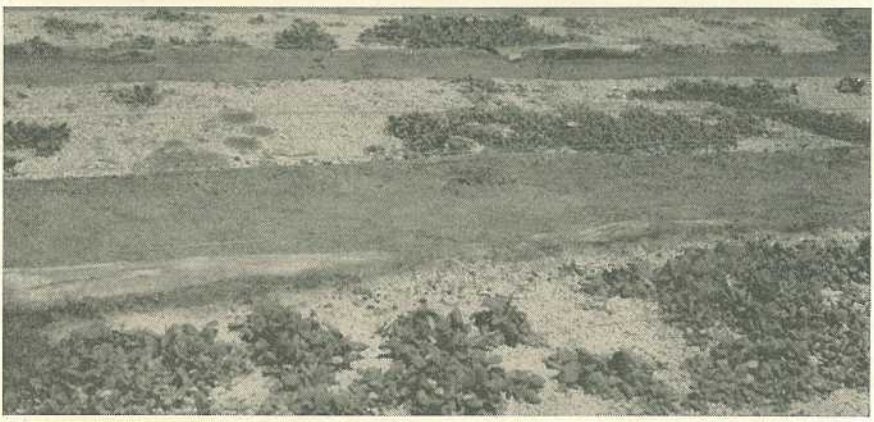


Plate 120.

TOBACCO SEEDBEDS DAMAGED BY YELLOW PATCH DISEASE.—An even germination was originally obtained in these seedbeds, but plants in the areas showing bare patches become yellowish, ceased growing, and eventually died out. The white appearance of these patches is due to the use of a mulch of coarse sand which is generally employed in North Queensland to control the activities of seed harvesting ants.

Preliminary Investigations.

In 1935, numerous affected seedbeds were examined, and it was considered that the disease was unlike any other recognised tobacco disease. From these field observations it appeared unlikely that the condition was caused by a pathogenic organism since it was noted that affected patches did not spread, and that the disease did not increase in severity when affected seedbeds were resown. Furthermore, Cheshunt Mixture, which has been found effective for controlling damping off diseases, did not mitigate the trouble. Some growers associated the condition with the practice of partially sterilising seedbed soil by burning wood or the inner portions of termite nests over the seedbeds.

During the seedling growing season of 1936 a seed-bed experiment was established at Dimbulah to explore several possible causes of the trouble. This experiment consisted of six seedbeds. The soils of pairs of beds was partially sterilised by burning wood over the surface, or by soaking with a formalin solution or by a Cheshunt Mixture solution being

applied at weekly intervals, commencing one week prior to the beds being sown. These beds were each subdivided into eight plots, seven of which received various fertilizer treatments, the eighth being a control plot to which no fertilizer was applied. Since it was found that yellow patch developed in certain plots receiving the same fertilizer treatment, irrespective of the nature of the soil sterilisation employed, it appeared that burning over the soil had no effect in causing the disease. Furthermore, since the regular application of the fungicidal Cheshunt Mixture exerted no control, it seemed unlikely that a plant pathogen was responsible for the trouble.

The seven fertilizer treatments included in this experiment and replicated at random in six seedbeds contained various combinations of the following plant food materials:—(1) Phosphoric acid at the rate of 1·92 oz. or 2·56 oz. per square yard in the form of superphosphate; (2) potash at the rate of 0·32 oz. or 0·96 oz. per square yard as sulphate of potash; (3) nitrogen at the rate of 0·64 oz. or 1·6 oz. per square yard, and applied either half as nitrate of soda and half as dried blood, or in the case of one treatment four-fifths as cotton seed meal and the remainder as dried blood and nitrate of soda.

It was found that variations in the quantity of potash or phosphoric acid did not adversely affect the growth of the seedlings. Those plots receiving the higher rate of nitrogen, however, produced strikingly poor stands of seedlings. In addition, plots which received no fertilizer at all, and so possibly suffered from lack of nutrition, had inferior stands of weak seedlings. These results were consistently observed in the six replications of the fertilizer treatments. (Plate 121.)

From this preliminary work it appeared that yellow patch was a physiological trouble closely associated with the application of organic nitrogenous fertilizers and was not caused by soil sterilisation or by plant pathogens. This conclusion suggested a likely explanation for the occurrence and gradual increase in the severity of the disease in North Queensland. Some eight or nine years ago, when the tobacco industry was in its infancy in that area, the Department of Agriculture and Stock recommended light applications of seedbed fertilizers and stressed the use of nitrate of soda. After some experience of tobacco culture, growers realised the vital importance of an ample supply of healthy and vigorous seedlings. Consequently there developed a tendency during recent seasons to apply goat manure to the seedbeds and to use increasing quantities of mixed fertilizers, often exceeding a pound per square yard. Since these fertilizers invariably contained dried blood as one source of nitrogen it is obvious that increasing quantities of organic nitrogen were added in succeeding years, until, in due course, the amount incorporated in the soil was sufficient to produce that toxicity to tobacco seedlings, which manifested itself in the condition known as yellow patch disease.

Glasshouse Investigations.

In 1937, typical reddish tobacco soil from Dimbulah as well as a rich Brisbane garden loam were used in a glasshouse experiment in Brisbane to further investigate the disease. Some plots of these two soils were sterilised with formalin and others were not sterilised. Fertilizer treatments used for both soil types consisted of either a low nitrogen application of ½ lb. per square yard of 4-10-6 mixture to supply 0·32 oz. of nitrogen per square yard, or a high nitrogen application of

2 lb. per square yard of 5-8-3 mixture to supply 1·6 oz. of nitrogen per square yard. In each mixture half the nitrogen was in the form of dried blood and half as nitrate of soda. Immediately after the application of the fertilizers the plots were sown with tobacco seed.

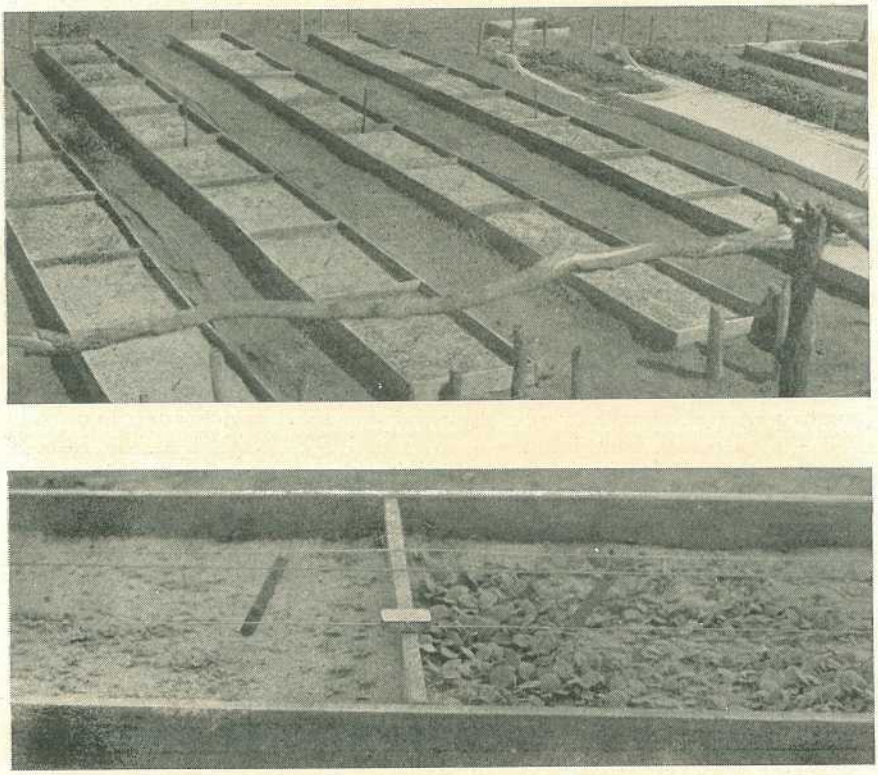


Plate 121.

PRELIMINARY SEEDBED EXPERIMENT.

Above.—

The first four beds on the left were in an experiment designed to explore the effect of various methods of soil sterilization, as well as fertilizer applications, on the incidence of yellow patch. Note the variations between the plots in each bed.

Below.—

Two plots in one of the beds illustrated above showing the effect of different rates of nitrogen, half of which was in the form of dried blood. Each plot received 2·56 oz. of phosphoric acid and 0·96 oz. of potash per square yard, but the one on the left received in addition 1·6 oz. of nitrogen and the one on the right 0·64 oz. of nitrogen. Note the differences in the stand and in the size of the plants.

Owing to poor germination, the results of this first sowing were not very satisfactory. Nevertheless seedling counts strongly suggested that the higher rate of nitrogen application was detrimental, irrespective of soil sterilisation, or the source of the soil used. There were 350 seedlings in the plots receiving the first treatment, compared with only 9 plants in the plots receiving the second treatment.

The soil of these plots was then allowed to dry out, and eight weeks after the commencement of the experiment they were resown without the

addition of fertilizers. Each plot, however, was subdivided, and half plots were treated with calcium sulphate with the object of possibly correcting any toxicity in the soil. In due course the results obtained indicated that the germination and growth of the seedlings were strikingly better where the low application of nitrogen had been used, the counts being 230 and 6 seedlings for the first and second treatments respectively, that the growth was slightly better where the soil had been sterilised, and that the addition of calcium sulphate did not have any beneficial effect.

Four months after the commencement of this experiment soil from each plot was transferred to small pots and sown with tobacco seed. The seed germinated normally and the stand of plants was fairly uniform in all the pots. It appeared, therefore, that by this time any factor detrimental to germination and growth had disappeared.

A more comprehensive pot experiment was also established later in the year to investigate the effect of various forms and combinations of forms of nitrogen on the incidence of yellow patch, as well as to ascertain the possible value of certain chemicals in mitigating toxicity in the soil. This experiment involved ten treatments in triplicate, and an unsterilised soil, conisting of a mixture of a sand and garden loam was used. Treatments comprised a 4-10-6 fertilizer mixture at the rate of ½ lb. per square yard and a 5-8-3 mixture at the rate of 2 lb. per square yard, as had been used in the previous glasshouse experiment. These applications supplied 0·32 oz. and 1·6 oz. of nitrogen per square yard respectively, half being in the form of dried blood and half in the form of nitrate of soda. In addition, the 5-8-3 formula was so compounded as to have its nitrogen component in the following forms:—Entirely as dried blood; or half as dried blood and half as sulphate of ammonia; or about four-fifths as dried blood and one-fifth as nitrate of potash, the latter also being used to supply the potash content of the fertilizer formula; or entirely as nitrate of soda.

Three additional treatments consisted of copper sulphate, manganese dioxide and potassium permanganate respectively being added to the 5-8-3 mixture, where the nitrogen was half in the form of dried blood and half as nitrate of soda. A control treatment was also included where no fertilizer was added to the soil.

Observations on seedling growth indicated, as in the previous experiments, that nitrogen in equal parts as dried blood and nitrate of soda, when applied at the rate of 1·6 oz. per square yard was more detrimental to germination and seedling growth than the same nitrogenous constituents applied at 0·32 oz. per square yard. (Plate 122.) When 1·6 oz. of nitrogen per square yard was supplied as dried blood alone, or as a mixture of dried blood and either sulphate of ammonia or nitrate of potash seedling growth was likewise weak. In contrast, however, a relatively good stand of healthy plants developed where this amount of nitrogen was applied entirely as nitrate of soda. The chemicals added to the 5-8-3 mixture were not effectual in reducing toxicity and stands were as poor with these treatments as where no such additions were made. The control plots also produced unthrifty stands of plants, possibly as a result of insufficient nutrition.

At various dates during the course of each of these glasshouse experiments, the soil was analysed for nitrate, ammonia, and organic nitrogen, as well as for soil reaction. It was noted with particular

interest that where nitrogen had been applied as dried blood and nitrate of soda, the ammonia nitrogen was practically the same at the commencement of the experiment, when either 0·32 oz. or 1·6 oz. nitrogen per square yard had been added, but it increased considerably in the case of the latter during the subsequent ten days. No significant differences were apparent from the other analytical data. It apears probable that the toxicity of the soil, as indicated by the unsatisfactory early development of the seedlings grown in it, may be correlated, with its abnormally high ammonia nitrogen content, caused by the biological decomposition of dried blood during this period. Analyses made at the time of the third sowing of the first glasshouse experiment indicated that the ammonia nitrogen content of the soil had then declined to normal levels, and this fact may be associated with the normal development of the seedlings at this stage.

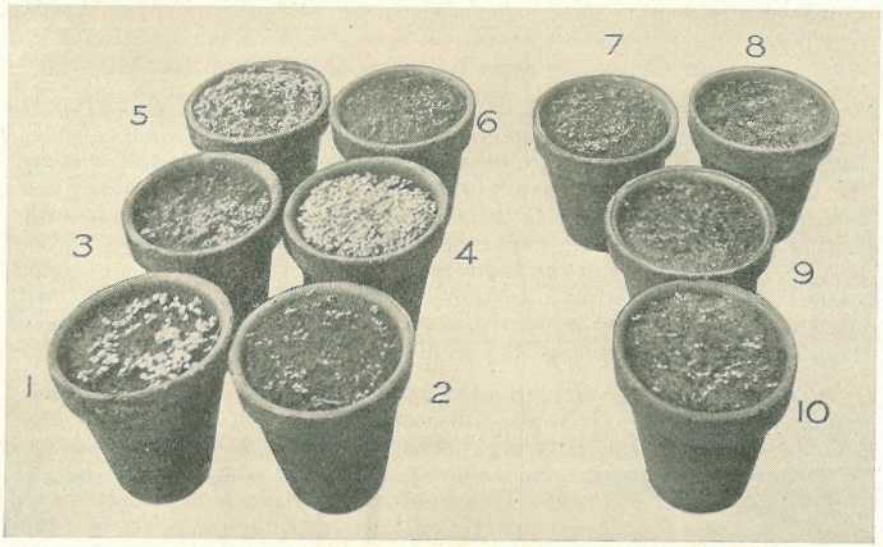


Plate 122.

A GLASSHOUSE EXPERIMENT TO INVESTIGATE FERTILIZER TREATMENT.

1. Treated with 4-10-6 mixture at ½ lb. per square yard to supply 0·32 oz. of nitrogen.

2. Treated with 5-8-3 mixture at 2 lb. per square yard to supply 1·6 oz. of nitrogen.

(Nitrogen half as dried blood and half as nitrate of soda in treatments 1 and 2.)

7, 8, and 9. Same treatment as 2 with the addition of potassium permanganate, managanese dioxide, and copper sulphate, respectively.

3. Same treatment as 2, except that all nitrogen supplied as blood.

4. Same treatment as 2, except that all nitrogen supplied as nitrate of soda.

5. Same treatment as 2, except that nitrogen supplied as blood and ammonium sulphate.

6. Same treatment as 2, except that nitrogen supplied as blood and potassium nitrate.

10. Control. No fertilizer applied.

Note relatively good growth with nitrate of soda treatment (4).

A somewhat similar type of injury has been observed in the United States of America.* In this case, serious root injury to cotton seedlings, growing on light sandy soil, occurred when heavy applications of cotton seed meal were made, and the injury was attributed to the formation of a toxic concentration of free ammonia from the decomposition of the cotton seed meal.

Field Experiments in 1938.

In the winter of 1938, in co-operation with field officers of the Agriculture Branch, an exploratory experiment was established at Dimbulah, to investigate the effect of dried blood, ammonium sulphate, and nitrate of soda when applied separately in three different quantities either at the time the tobacco seed was sown or earlier. Applications were made in such quantities as to supply 0·1 oz., 0·5 oz., or 1 oz. of nitrogen per square yard. In addition, 1 oz. of superphosphate to supply 0·2 oz. of phosphoric acid, and 0·25 oz. of sulphate of potash to supply 0·12 oz. of potash per square yard, were applied to all the plots in the experiment. These materials were added to the soil either twenty-one days, fourteen days, or seven days prior to sowing the tobacco seed, or else at the same time that the seed was sown.

Seedlings commenced to emerge through the soil ten days after the seed was sown, and seedling counts were made eleven and seventeen days subsequently. No significant differences were recorded between the various plot populations of plants. This lack of contrast may have been due possibly to the relatively low minimum temperatures recorded during the course of the experiment and to some unevenness in seed sowing, and in applying the sand mulch. However, symptoms of yellow patch were observed with certain fertilizer treatments and not with others. The yellowing appeared between the eleventh and seventeenth days after the emergence of the seedlings.

The total number of plants in the experiment showing yellow patch symptoms was 224. Of these, 216 occurred in plots where dried blood had been applied and only eight where ammonium sulphate was used as a source of nitrogen. No yellow patch at all was observed in plots receiving nitrate of soda. Hence of the fertilizer materials tested, dried blood was most consistently associated with the incidence of yellow patch. The distribution of diseased seedlings in plots where dried blood was applied is given in Table I.

TABLE I.

Fertilizer in Soil prior to Sowing Seed.	Number of Seedlings Affected with Yellow Patch.		
	0·1 oz. N.	0·5 oz. N.	1·0 oz. N.
0 days	..	..	9
7 days	1	48	134
14 days	..	1	16
21 days	1	..	6

* Willis, L. G., and Rankin, W. H. "Free-Ammonia Injury with Concentrated Fertilizers." Industrial and Engineering Chemistry 22: 1405. 1930.

From the table it will be noted that dried blood applied seven days prior to seed sowing, so as to supply 0·5 oz. of nitrogen or more per square yard of seedbed, was most conducive to the development of yellow patch under the conditions of this experiment.

An attempt was made at the termination of this experiment to investigate any residual effect of the fertilizers originally applied, by making a further application of dried blood to certain plots and resowing the beds. No positive information on residual effects, however, was obtained, although high applications of blood were associated with dwarfed seedlings and reduced counts, as in the previous experiment. During the course of these experiments, two series of applications of dilute solutions of zinc sulphate, copper sulphate, manganese chloride, iron sulphate, magnesium sulphate, borax, sodium nitrate, and free ammonia were made to the soil under both healthy and yellowed plants. In no case did yellowed plants make any recovery, while healthy plants were injured by the copper sulphate, magnesium sulphate, borax, and free ammonia. The symptoms following the application of free ammonia were similar to those of yellow patch disease; the free ammonia apparently only affected seedlings less than twenty-four days old, while eleven-day-old plants were not affected unless the concentration was greater than about twelve parts per million of soil.

In the spring of 1938 a further seedbed experiment was initiated at Dimbulah to ascertain the minimum quantity of dried blood which would cause the development of yellow patch. For comparison the effect of corresponding quantities of nitrogen in the form of nitrate of soda was also investigated. Sixteen levels or quantities of nitrogen were used, increasing from 0 by mounts of 0·1 oz. to a maximum application of 1·5 oz. of nitrogen per square yard. These sixteen levels were replicated three times, so that there were forty-eight plots receiving nitrogen in the form of dried blood, and the same number receiving nitrogen in the form of nitrate of soda. The plots receiving these treatments were randomised in the experiment. In addition to the nitrogenous fertilizers, all plots received applications of sulphate of potash and superphosphate at the rate of 0·25 oz. and 1 oz. per square yard respectively. Five days after the application of the fertilizers the plots were sown, and the seedlings commenced to emerge six days subsequently.

Careful observations were made eight days and seventeen days after emergence. From the outset it was obvious that even where 0·1 oz. per square yard of nitrogen, as dried blood, had been applied, the seedlings were relatively dwarfed. In contrast, all seedlings receiving corresponding quantities of nitrogen as nitrate of soda were of normal size. There were indications that causes, other than fertilizer treatments, were apparently responsible for variations in the relative plant populations of plots, both where nitrate of soda and dried blood had been applied. Nevertheless, it was noted that as the quantity of dried blood was increased above about 0·3 oz. of nitrogen per square yard, there was a definite tendency for the population of seedlings to decrease. Where the application exceeded 0·5 oz. of nitrogen per square yard, there was a striking and significant decrease in the number of seedlings which survived. It was obvious, therefore, that at this level of nitrogen dried blood was definitely detrimental to seedling stand under the environmental conditions of the experiment. On the other hand, nitrate of soda, on the whole, did not adversely affect either the growth of the plants or the number of the seedlings which emerged.

TABLE II.

COUNTS OF SEEDLINGS PER SQUARE FOOT OF SEEDBED IN 1938 YELLOW PATCH EXPERIMENT.

Level of Nitrogen.	Nitrate of Soda.			Dried Blood.		
	Mean Counts of Three Replicates.		General Mean.	Mean Counts of Three Replicates.		General Mean.
Ounce per Square Yard.	8 Days After Emergence.	17 Days After Emergence.		8 Days After Emergence.	17 Days After Emergence.	
0	72	61	67	75	73	74
0·1	51	47	49	50	82	71
0·2	68	92	80	51	61	56
0·3	73	66	69	47	40	44
0·4	52	51	52	36	41	39
0·5	101	88	94	36	47	42
0·6	95	80	87	6	10	8
0·7	64	73	68	11	9	10
0·8	51	54	52	6	11	9
0·9	84	80	82	2	4	3
1·0	101	65	83	4	3	4
1·1	54	53	54	3	3	3
1·2	40	49	45	4	5	5
1·3	57	61	59	0	1	1
1·4	69	68	69	2	2	2
1·5	66	77	72	0	0	0
Means	68·6	66·6	67·6	21·4	24·5	23·0

Seedling counts are summarised in Table II., which is based on the mean counts of three replicates of each treatment. The general means of plant populations for these observations are also presented graphically. (Plate 123.) It will be seen clearly from this graph that where nitrate of soda was applied, plant populations varied fairly regularly about the mean population for all nitrate of soda treatments, and hence these fluctuations apparently were not due to the quantity of nitrate of soda applied. On the other hand, where dried blood was applied, plant populations decreased fairly regularly with increasing applications, until no plants at all survived where the maximum application of 1·5 oz. of nitrogen per square yard in the form of blood was made.

Field Evidence on the Influence of Seedbed Fertilizers.

During the 1936-37 season some experiments were established at Dimbulah to investigate the control of insects and blue mould disease in seedbeds. The fertilizer mixture used for this work consisted of ½ oz. of nitrate of soda and 1 oz. of superphosphate per square yard, as recommended by Mr. N. A. R. Pollock in the departmental publication "Tobacco Growing in Queensland." These beds produced normally healthy plants, whereas most seedbeds in the district, where heavy applications of the 4-10-6 fertilizer mixture, frequently with the addition of goat manure, had been used, were more or less affected with yellow patch. During the same period the preliminary seedbed experiment to invesigate yellow patch indicated, as mentioned above, that the disease was closely associated with the use of organic nitrogen. It appeared therefore that these seedbeds escaped yellow patch because the fertilizer applied contained only nitrate of soda as a source of nitrogen without organic nitrogen such as dried blood, which was so general in the mixed fertilizers used on commercial seedbeds.

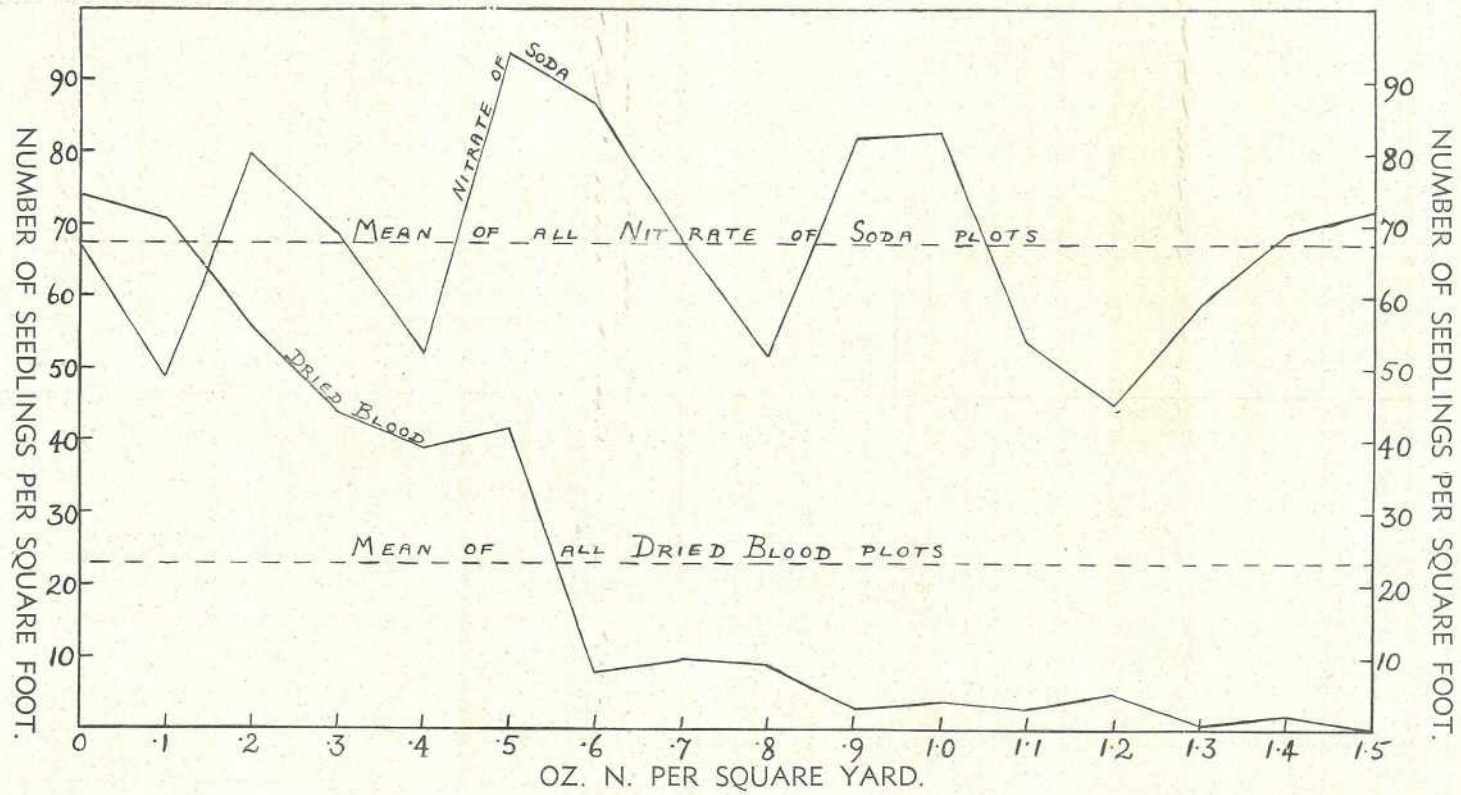


Plate 123.

Graph showing general means of seedling counts as given in Table II. Note how the plot populations decrease rapidly when dried blood, to supply nitrogen in excess of 0·5 oz. per square yard, is applied.

TABLE III.

SEEDLING POPULATIONS IN INDIVIDUAL PLOTS OF THE 1938 DEMONSTRATIONS FOR THE CONTROL OF YELLOW PATCH.

Treatments. High Level of Nitrogen. (N. = 1·28 oz. per square yard.)	1. N. as Nitrate of Soda.				2. N. as Nitrate of Soda. and Dried Blood.				3. N. as Dried Blood.			
Serial Numbers of Demonstrations	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8
Counts of seedlings in five replicates of each treatment	396	2,304	1,312	1,070	40	0	708	233	176	0	152	32
	876	1,548	952	900	66	198	788	268	2	0	287	24
	2,212	1,863	1,028	1,220	2	180	1,268	53	28	108	594	90
	465	1,647	784	1,090	8	360	900	17	0	414	440	130
	1,896	2,016	1,152	1,090	78	432	599	183	10	342	257	3
Means	1,169	1,876	1,046	1,074	39	234	853	151	43	173	346	56
Treatments. Low Level of Nitrogen. (N. = 0·078 oz. per square yard.)	4. N. as Nitrate of Soda.				5. N. as Nitrate of Soda and Dried Blood.				6. N. as Dried Blood.			
Serial Numbers of Demonstrations	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8
Counts of seedlings in five replicates of each treatment	448	1,728	1,288	875	130	576	808	1,015	1,648	1,377	800	790
	1,052	2,232	1,072	870	1,284	90	1,044	980	712	1,413	840	1,090
	1,792	1,800	1,116	890	1,716	2,529	784	1,240	1,140	2,412	1,040	970
	844	1,971	1,208	1,280	1,076	1,863	936	1,030	1,316	1,152	1,052	1,470
	1,308	2,700	1,240	1,050	1,600	1,206	764	1,160	1,128	1,899	1,576	1,080
Means	1,089	2,086	1,185	993	1,161	1,253	867	1,085	1,189	1,651	1,062	1,080

TABLE IV.

AVERAGE NUMBER OF SEEDLINGS PER TREATMENT IN THE 1938 DEMONSTRATIONS FOR YELLOW PATCH CONTROL.

Demonstration Number.	Treatments.					
	High Nitrogen Level.			Low Nitrogen Level.		
	1. Nitrate of Soda.	2. Nitrate of Soda and Blood.	3. Blood.	4. Nitrate of Soda.	5. Nitrate of Soda and Blood.	6. Blood.
M.S.E. 2 (Mareeba)	1,169	39	43	1,089	1,161	1,189
M.S.E. 3 (Mareeba)	1,876	234	173	2,086	1,253	1,651
D.S.E. 7 (Dimbulah) ..	1,046	853	346	1,186	867	1,062
D.S.E. 8 (Dimbulah) ..	1,074	151	56	993	1,085	1,080
Means..	1,291	319	155	1,338	1,092	1,246

Consequently, the following season Mr. R. C. Cannon, Instructor in Agriculture, who was the field officer then stationed at Dimbulah, recommended nitrate of soda and superphosphate for seedbeds to a number of growers in that district. In all cases where this recommendation was carried out there was complete freedom from yellow patch, although the trouble was quite general throughout Dimbulah that season.

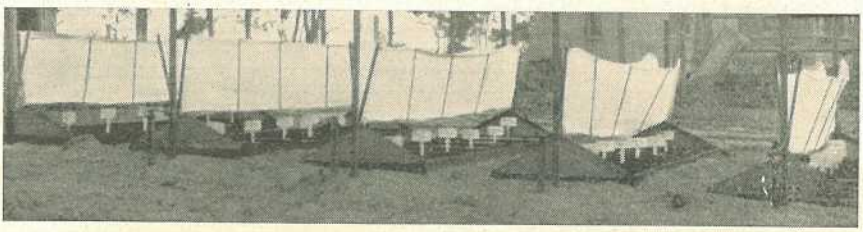
Demonstrations on the Control of Yellow Patch in 1938.

Before the commencement of the 1938-39 season, sufficient data had been collected from experiments and observations to indicate that yellow patch could be avoided by using only nitrate of soda as a source of nitrogen in seedbed fertilizers. An advisory note was consequently distributed to growers during August, 1938, describing the symptoms of the trouble and recommending the nitrate of soda and superphosphate mixture which had been so successfully used the previous season.

To give growers an opportunity to observe the effect of fertilizer treatment on the incidence of yellow patch prior to establishing their own seedbeds, a simple demonstration was designed and established both at Mareeba and Dimbulah in August, 1938. This work was repeated two months later at both centres so that, in all, the demonstration was replicated four times.

In this demonstration, all seedbeds received a general application of superphosphate and sulphate of potash at the rate of 1 oz. and ¼ oz. per square yard respectively. The nitrogenous portion of the fertilizer consisted of nitrate of soda alone, dried blood alone, or a mixture containing half the nitrogen as nitrate of soda and half as dried blood. These sources of nitrogen were applied so as to give either a very low application of 0·078 oz. or a high application of 1·28 oz. of nitrogen per square yard of seedbed. The lower application was the equivalent of ½ oz. of nitrate of soda per square yard, which was the departmental recommendation for yellow patch control. These six

fertilizer treatments were replicated five times in each demonstration. A demonstration consisted of five seedbeds (Plate 124), each of which contained three plots receiving a heavy application of nitrogen and three plots receiving a low application of nitrogen.



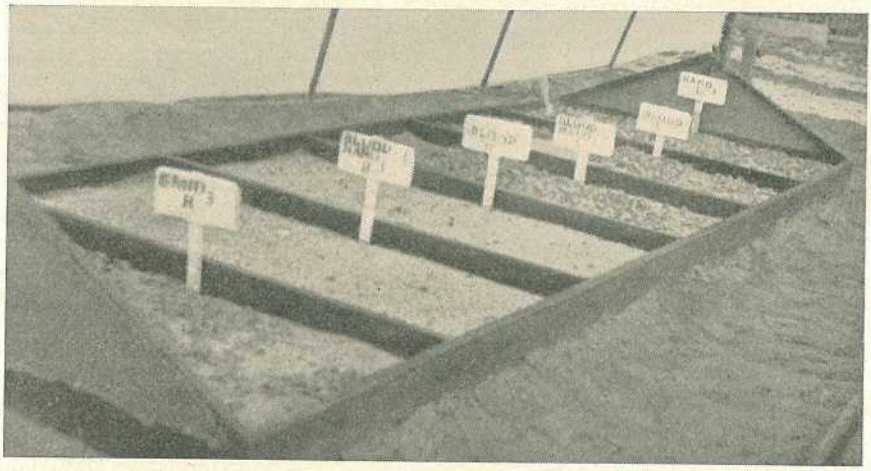


Plate 124.

YELLOW PATCH CONTROL DEMONSTRATION.

Above.—

General view of a demonstration at Mareeba showing five seedbeds, each of which contained the same six fertilizer treatments.

Below.—

One seedbed of the demonstration illustrating failure due to yellow patch in two plots where a high level of nitrogen was used either as dried blood or a mixture of dried blood and nitrate of soda.

Careful counts of seedlings were made during the progress of the demonstrations, and these are summarised in Tables III. and IV. The counts were made ten or eleven days, or in the case of one demonstration, D.S.E. 8, nineteen days after the seedlings emerged. Figures for demonstration D.S.E. 7 indicate that the plant populations for plots receiving the high level of dried blood and nitrate of soda mixture were not on the average less than where the mixture at the low level was applied. This was the position eleven days after the seedlings emerged and was possibly due to low temperatures occurring where the demonstration was situated and the consequent slow decomposition of the dried blood. At a later date, however, a relatively poor stand of plants survived where the higher rate of nitrogen was used. It will be noted that seedling counts for the other demonstrations definitely indicate that dried blood, either alone or in combination with nitrate of soda, when

used at the high rate of 1·28 oz. of total nitrogen per square yard, resulted in a very poor stand of plants. These treatments caused poor germination and induced yellow patch symptoms and the contrast with plots receiving other treatments was striking. (Plate 124.) Satisfactory stands of plants were obtained where the higher level nitrogen was used entirely in the form of nitrate of soda, or with the lower level of nitrogen, irrespective of the source.

The demonstrations suggested that it was dangerous to use dried blood at all, and particularly in relatively large quantities, either alone or in association with other sources of nitrogen in mixed fertilizers for tobacco seedbeds.

As soon as the first of these demonstrations was concluded at Mareeba and Dimbulah a second advisory note was issued to tobacco growers. In it the results obtained from this work were reported and growers were again warned that it was not safe to use dried blood in seedbed fertilizers. They were advised to use the fertilizer mixture, included in these demonstrations, where nitrate of soda at the rate of ½ oz. per square yard, or 0·078 oz. nitrogen, had been employed.

In the Dimbulah district most growers promptly followed this advice and succeeded in raising satisfactory plants free from yellow patch during the 1938-39 season. However, the disease made its appearance, as in the past where this advice was ignored and heavy dressings of fertilizers containing organic nitrogen were applied.

Recommendations for the Control of Yellow Patch.

As a result of the work reported in this paper the following fertilizer mixture for tobacco seedbeds is recommended:—Nitrate of soda, two parts by weight; superphosphate, four parts by weight; and sulphate of potash, one part by weight. This mixture should be applied at the rate of 1¾ oz. per square yard, which is the equivalent of 1¼ lb. for each 100 square feet or 12½ lb. for each 1,000 square feet of seedbed. Such a mixture may be obtained from fertilizer manufacturers, or may be prepared on the farm.

Since the quantities specified make a small bulk of material to apply, it is suggested that, in order to effect an even distribution of the fertilizer, it might be carefully diluted with ashes or with sand or soil, which has been sterilised with heat. Soil from the burnt-over surface of seedbeds might be conveniently used for the purpose. After the fertilizer has been scattered over the surface of the beds it should be lightly raked into the soil prior to sowing the tobacco seed.

Further light applications of nitrate of soda, dissolved in water, may be made from time to time, should it be considered necessary to stimulate seedling growth. After any such dressing it is most important that the nitrate of soda be thoroughly washed off the leaves to avoid burning of the foliage.

Summary.

During the past four or five years a disease of tobacco seedlings, known locally as yellow patch, or yellowing, has caused increasing concern in North Queensland. This condition has not previously been described. In affected seedbeds the germination of the seed is poor, patches or groups of plants are dwarfed and may turn pale green or yellow about ten days after emergence, before they eventually die, thereby causing a

poor and uneven stand of seedlings. Since 1935, this disease has been investigated in seedbed and glasshouse experiments, assisted by soil analyses. The work has indicated that yellow patch is a physiological disease associated with the use of excessive quantities of organic nitrogen in mixed fertilizers on seedbeds. It is probably caused by the accumulation of free ammonia in the soil, which is produced by the decomposition of organic matter, coming in contact with the roots of the seedlings. Even 0·1 oz. of nitrogen as dried blood per square yard retarded growth and where the quantity applied exceeded ½ oz. per square yard, practically all the seedlings failed to survive. The critical quantity conducive to yellow patch and the period which elapses prior to the observation of the disease symptoms are probably closely corelated with soil temperatures and microbial activity in the soil. Attempts to rectify the toxicity in the soil by the addition of certain chemicals were not successful, but it was observed that this toxicity was not permanent and disappeared in time.

Yellow patch did not develop where only nitrate of soda was used in various quantities as a source of nitrogen in seedbed experiments and demonstrations. Growers were accordingly advised to use a seedbed fertilizer mixture consisting of two parts of nitrate of soda, four parts of superphosphate, and one part of sulphate of potash by weight at the rate of 1¾ oz. per square yard of seedbed. Where this recommendation was followed during the 1938-39 seedbed season satisfactory seedlings were produced, which were free from yellow patch.

Acknowledgements.

The authors wish to acknowledge the helpful co-operation of Messrs. R. C. Cannon, H. McNee, and C. Whitehead of this department in the establishment of the seedbed experiments and demonstrations in the Mareeba and Dimbulah districts, and in the compilation of seedling counts and the careful observations made by them in connection with this work. Acknowledgment is also made to Miss Barbara Shield and to Messrs. W. J. Cartmill and F. Keogh, also of this department, for the statistical analyses of the experimental data, and for the chemical analyses of the soils respectively.

FOR MEASURING LAND.

Take three strips of wood and nail them together, as shown in the diagram. One strip projects at the top to form a handle, and the two uprights are each brought to a dull point at the bottom. A convenient distance between the points is 6 feet, but some

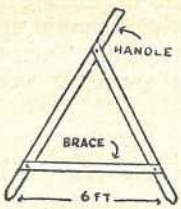


Plate 125.

might prefer them to be half a rod or 8 feet 3 inches. In using this measuring device the ends are swung around alternately. Be sure to travel in a straight line, and when measuring soft ground it is necessary to guard against slippage.

Ulcerative Spirochaetosis of Pigs.

J. A. RUDD, Veterinary Surgeon, Director Animal Health Station, Yeerongpilly.

SEVERAL cases of ulcerative spirochaetosis of pigs have been brought to the Animal Health Station. The condition has been definitely diagnosed in Queensland. The disease has been found in material forwarded from Boonah and also at Cairns. A short digest of all the available information concerning the disease is published in these notes. It is not yet possible to estimate the extent to which spirochaetosis is present in Queensland.

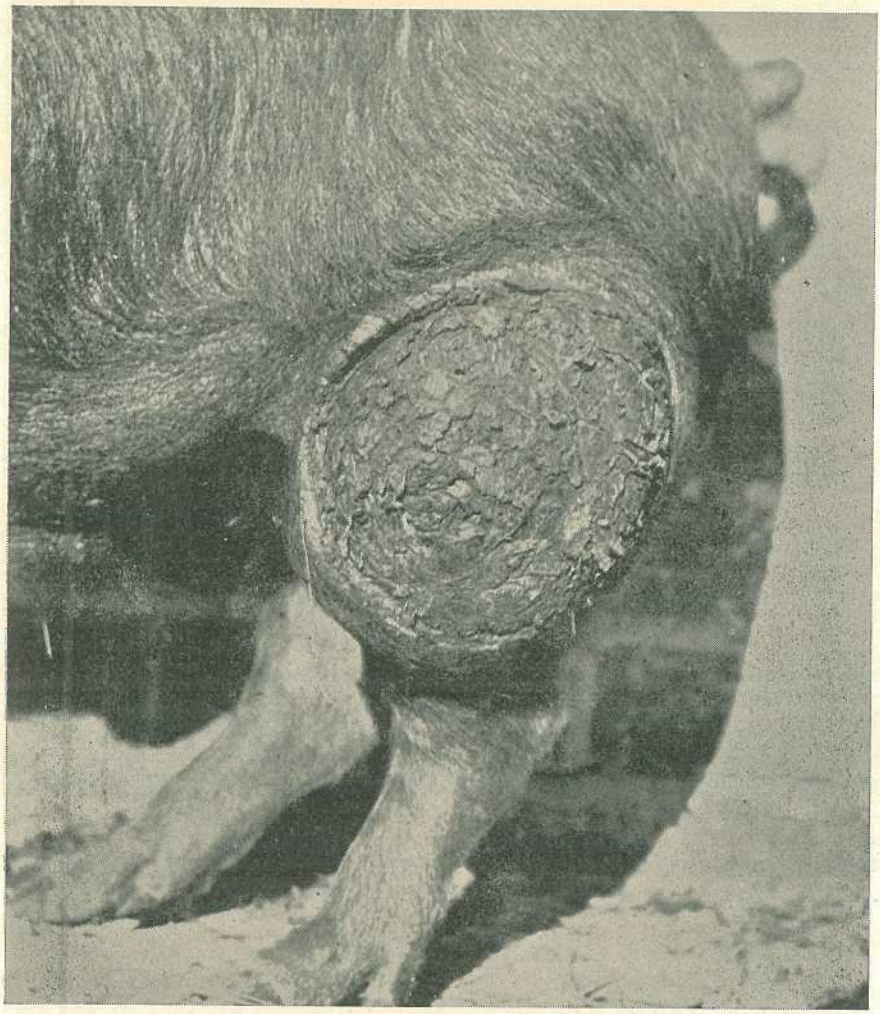


Plate 126.
A TYPICAL SKIN LESION OF ULCERATIVE SPIROCHAETOSIS.

Cause of Ulcerative Spirochaetosis.

As the name denotes, the disease is caused by a spirochaete or spiral-shaped organism.

Apparently they gain entrance to the body through wounds and scratches of the skin or deeper structures. It is not uncommon to find the sockets of the teeth affected when the milk teeth are being shed, and it is frequently seen causing large abscesses following defective sanitation after castration.

Other organisms may also be present, but are regarded as secondary invaders and not the primary cause, which is a spirochaete.

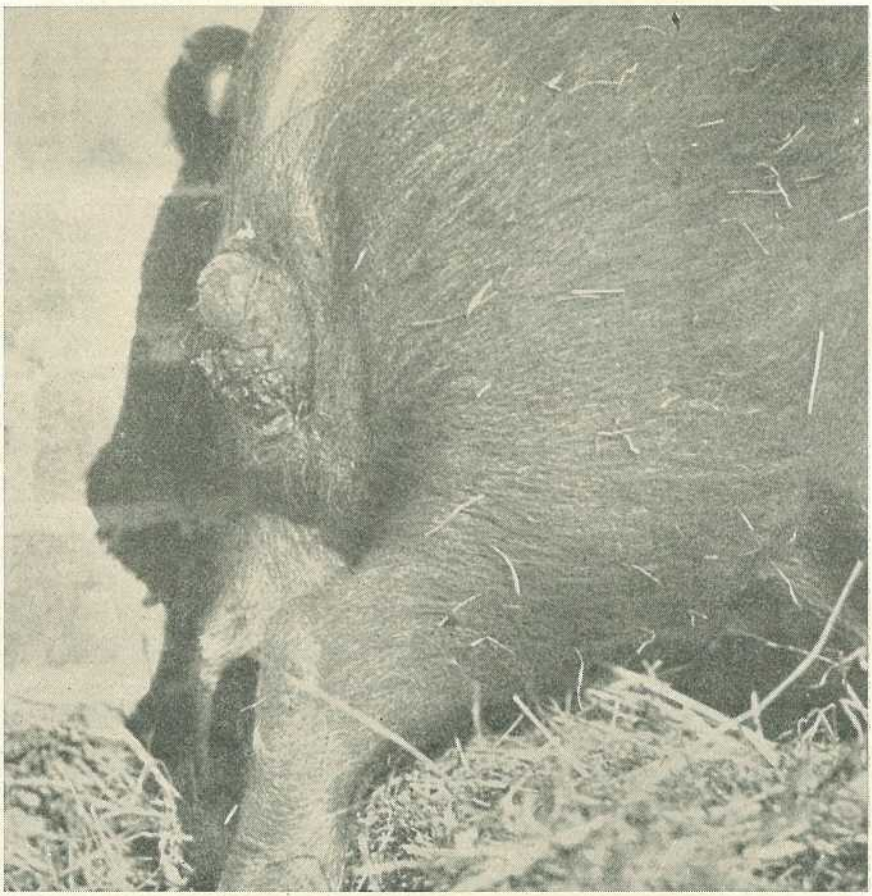


Plate 127.

ULCERATIVE SPIROCHAETOSIS OF CASTRATION WOUND.—Note the protruding mass of excessive granulating tissue.

Symptoms and Lesions.

When the spirochaete gains entrance to the tissues, it seems to remain more or less localised. A swelling which appears in the skin and underlying tissues gradually enlarges, finally bursts, and a dirty greyish pus is exuded. The ulcer so formed does not heal, but gradually extends and becomes covered with a dark granular scab, usually adhering firmly and having under it the pus already described. This lesion may be anything up to 6 to 9 inches in diameter. There is considerable

new tissue, fibrous tissue, and debris as a result of the chronic inflammation. The base of the ulcer is often fairly firm and adherent to the surrounding tissue, but almost invariably the pus extends and affects the deeper structures to a greater or lesser extent.

In the case of infection of the jaws during the shedding of teeth, the jawbone is infected, resulting in channels of pus, dead bone, and loosening of teeth. The tongue often becomes ulcerated and large pieces of it may slough off altogether.

In the case of young pigs the disease is often fatal, but the older ones usually recover.

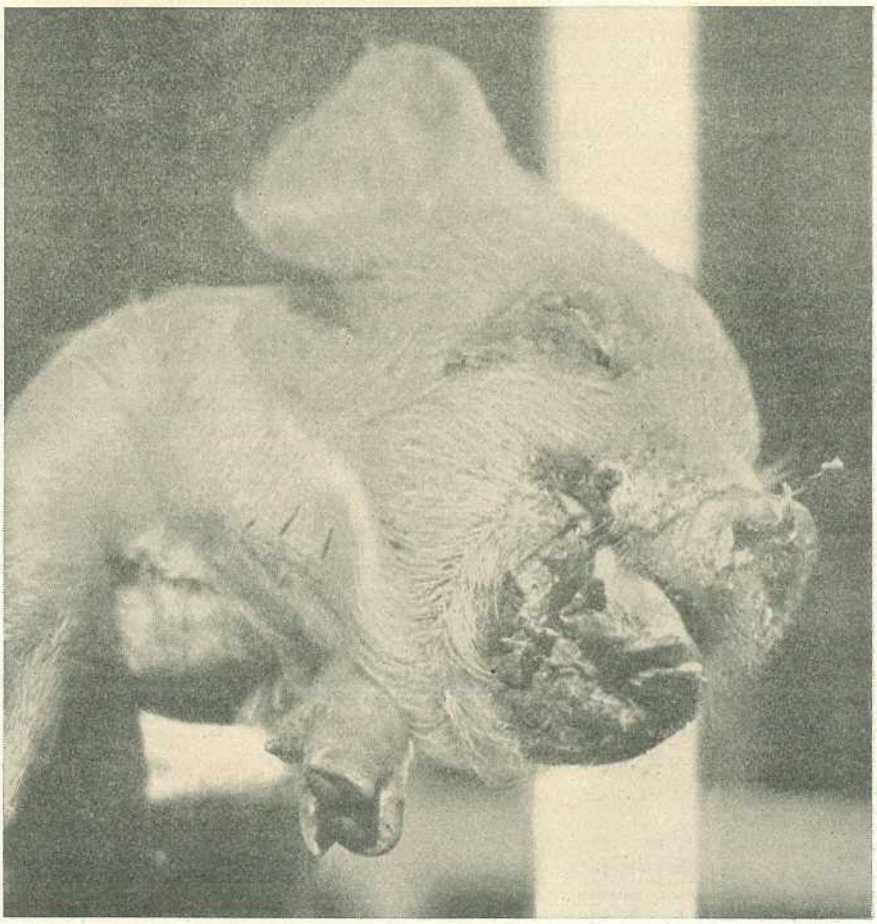


Plate 128.
SUCKER WITH MOUTHPARTS AFFECTED WITH ULCERATIVE SPIROCHAETOSIS.

Control.

(1) Isolate all pigs affected with the disease in clean styes with concrete floors which should slope towards a common drainage system and concrete catchment pit, which could be frequently disinfected and emptied.

(2) Clean and disinfect yards, troughs, &c.

(3) Feed only in concrete troughs, and do not allow wallows or muddy pools for pigs.

(4) Build fresh paddocks for pigs on uncontaminated ground, and do not use barbed-wire, as it may cause cuts and wounds and thus facilitate infection.

(5) Operation of castration should be done under strictly hygienic conditions, and the pigs placed in sties with concrete floors which are cleaned for the purpose.

(6) Operation of castration should be performed as follows:—Scrub around the site of operation with a nail brush saturated with 1-200 cylline. Proceed with the operation of castration as usual, and swab around the wound with 10 per cent. carbolised glycerine. Keep the pigs from food and water for twenty-four hours before operation.

(7) Sows and suckling litters should be kept particularly clean, as young pigs are infected in the mouth from the teats of their dams. Concrete floors are the only rational means of combating this trouble, and they should be kept scrupulously clean.

Treatment.

The pigs in Plates 126 and 127 were specially picked, as they were the worst cases among a large number. The pig in Plate 126 was kept on a clean concrete floor. The wound was painted with pure carbolic at intervals of once a week and also with liquor iodi fort. in between, and dusted with slaked lime daily. This pig continued to put on condition right throughout the period of treatment, and was sold to the bacon factory and paid for as first grade. The pig in Plate 127 could be placed in a separate category, as the wound was a castration infection and very deep-seated. Deep injections of a solution of one of the arseno mercurial preparations were given as several injections on the same site. The subject fattened rapidly, and was destroyed in order to ascertain the extent of the lesions, but there was no evidence of any noticeable damage to the underlying tissues except a very slight shrinkage of the right flank, which was hardly noticeable and was passed fit for human consumption. The little pig on Plate 128 was destroyed, being past treatment and was a good case of teat infection.

KEEPING PEACE IN THE PIG PEN.

It is common enough to have some scrapping among a pen of young pigs put together for the first time, and there are well-known precautions—such as smearing them with oil. Here is another tip from a farmer who had to spend a lot of time recently in refereeing a fierce fight in a pen of baconers. The fight started again as soon as his back was turned, and, as a result, one pig had to be destroyed and another was badly mauled. He tried giving extra feed, thinking that lack of protein was the cause of bad temper in the pen, but still the fight went on. Then someone suggested that the housing of the pigs was dark and uncomfortable. The farmer took the tip and made the pigs more comfortable in better surroundings. The baconers accepted the measures of appeasement, declared an armistice, and proceeded to put on the weight that hastened their end on the factory killing floor. Comfortable, well-lighted quarters for growing baconers are the points of the obvious moral.

The Determination of Milk Solids and its Application in the Dairy Industry.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

AN accurate chemical analysis is the only infallible method of determining the exact composition of a sample of milk. This is laborious and unsuitable for routine work at milk depots, cheese factories, &c., where rapid methods are essential. Owing to the comparative constancy of the relative proportions of constituents other than milk-fat and the physical properties of milk-fat itself, rapid empirical methods have been evolved which are remarkably accurate for milks of normal character. All such methods lose their accuracy to a certain extent if the milk is abnormal, but in the majority of such cases the results are sufficiently unusual to indicate that an abnormal milk is being dealt with. Such empirical methods include the Babcock and Gerber tests for fat, the neutral formaldehyde method for casein, and the determination of solids by means of hydrometers. This article will deal with the determination of solids in milk and buttermilk by means of hydrometers and methods of applying the results at milk depots, cheese and butter factories.

The first essential is to accurately determine the percentage of fat in the product under examination. This is done by the Babcock method for milk and the normal butyl alcohol method for buttermilk. These methods have been given in detail in a previous article (1). The other equipment required is specified below.

(1) *Quevenne Lactometer* (see Plate 129).—This is really a very sensitive specific gravity hydrometer constructed specially for milk. Lactometers are graduated in "degrees" which represent the second and third decimal place of the specific gravity. For example, 32 deg. on lactometer represents a specific gravity of 1·032, 28 deg. represents 1·028, and so on.

Alternatively, a British standard density hydrometer for use in milk, such as is illustrated in Plate 130, may be used. The hydrometers are constructed in two ranges—(*a*) density of 1·025 to 1·035, for use in normal milks; (*b*) density of 1·015 to 1·025, for use in milks of low density and for buttermilks which usually contain a large proportion of added water. They are graduated to indicate density which is slightly different to the specific gravity on which the older Quevenne lactometer degrees are based. It is important that the operator should know which instrument is being used, as the formulæ used to calculate the total milk solids differ slightly for the two instruments.

(2) *Cylinder* of glass or metal with the top finished off square and without a spout. The diameter should be sufficiently large to enable the lactometer to float freely without touching the sides, and the depth should be approximately that of the total length of the lactometer. The cylinder should stand firmly without rocking in a true vertical position. A glass cylinder is shown in Plate 129, and the constructional details of a metal cylinder are shown in Plate 131. The dimensions given are for a British standard density hydrometer, size No. 1, and would require modification for other instruments.

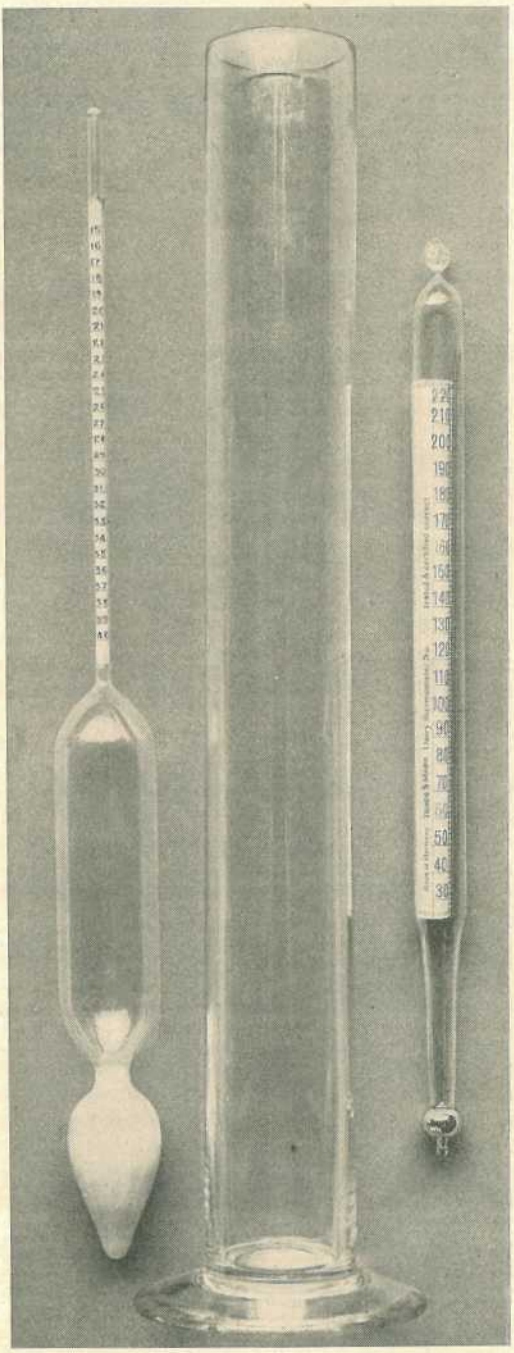


Plate 129.
A QUEVENNE LACTOMETER, GLASS CYLINDER, AND DAIRY THERMOMETER.

(3) *Thermometer.*—If the Quevenne lactometer is used, an ordinary Fahrenheit dairy thermometer will be required. If the density hydrometer is used, a centigrade thermometer is preferable, although not essential.

Making the Readings.

If the milk shows no signs of churning the only precaution to be observed is to adjust the temperature to between 50 deg. F. and 80 deg. F. preferably between 60 deg. F. and 70 deg. F. If the milk has been chilled

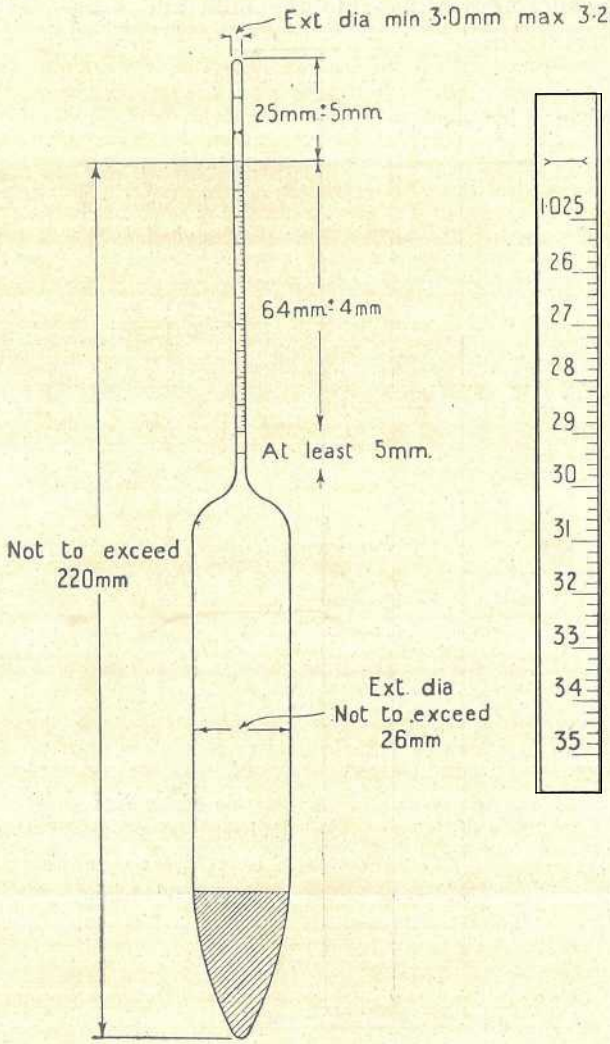


Plate 130.

BRITISH STANDARD DENSITY HYDROMETER FOR USE IN MILK, SIZE NO. 1.—Reproduced by permission from British Standard Specification No. 734—1937.

it is advisable to warm it up to a temperature of about 100 deg. F. and gently but thoroughly mix, then cool to about 70 deg. F. If the fat has been partly churned, it is essential to warm and mix as described. Do not mix so vigorously as to incorporate air bubbles, as this will make the reading incorrect. Sour milk cannot be tested.

Carefully pour the sample of milk into the cylinder so as to prevent the incorporation of air or formation of froth. The cylinder should be nearly filled, so that when the hydrometer is inserted the milk will

overflow. Hold the hydrometer by the top of the stem, lower gently into the milk, and release when in its approximate position of equilibrium. The stem above the liquid should not be wetted with the milk for more than $\frac{1}{4}$ inch, as the weight of the adhering milk will be sufficient to make the hydrometer sink further into the milk and cause an inaccurate

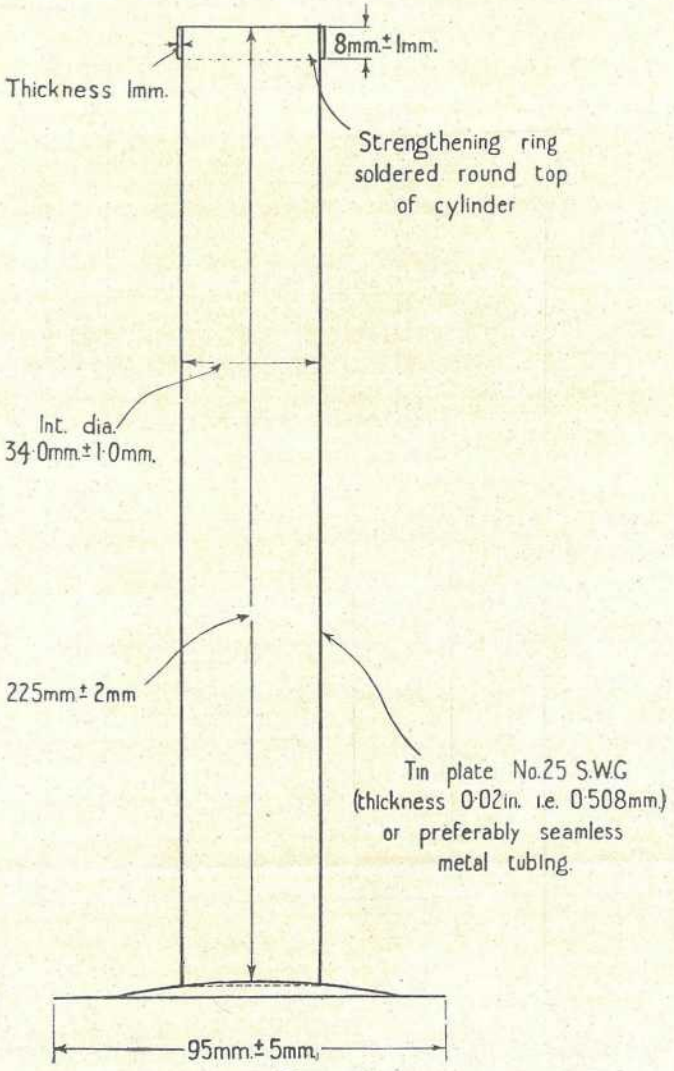


Plate 131.

CONSTRUCTIONAL DETAILS OF A METAL CYLINDER.—Reproduced by permission from British Standard Specification No. 734—1937. The dimensions given are for the British Standard Density Hydrometer, Size No. 1, and would require modifications for other instruments.

reading. When the hydrometer is at rest the scale reading is taken at the level surface of the milk, not at the top of the milk column around the stem of the hydrometer. To make the methods as uniform at possible the readings of the British standard density hydrometer may be recorded by omitting the digit and moving the decimal point three places to the right; for example, 1·0306 becomes 30·6 and so on. The

scale shown in Plate 130 shows that this is easily done. In this way the readings become comparable to the Quevenne lactometer degrees and the calculation of total solids is simplified. For the sake of simplicity they will be called "Density Degrees." Withdraw the hydrometer and immediately introduce a thermometer and record the temperature of the milk.

Corrections for Temperature.

The Quevenne lactometer is graduated to give correct readings at 60 deg. F. If the temperature is not 60 deg. F., a correction must be made to the reading. Table 1 gives the corrections which should be applied at temperatures between 50 deg. F. and 80 deg. F.

TABLE I.

Temp. °Fah.	Observed Lactometer Reading.												Temp. °Fah.
	16.	18.	20.	22.	24.	26.	28.	30.	32.	34.	36.	38.	
50	0·7	0·8	0·8	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·3	1·4	50
52	0·6	0·6	0·7	0·7	0·7	0·8	0·8	0·9	0·9	1·0	1·1	1·2	52
54	0·4	0·5	0·5	0·5	0·5	0·6	0·6	0·7	0·7	0·7	0·9	1·0	54
56	0·3	0·3	0·3	0·3	0·4	0·4	0·4	0·4	0·5	0·5	0·6	0·7	56
58	0·1	0·1	0·1	0·1	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·4	58
	Subtract from the observed lactometer reading.												
60	No corrections at this temperature.												60
	Add to the observed lactometer reading.												
62	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·3	0·3	0·3	62
64	0·4	0·4	0·4	0·4	0·4	0·5	0·5	0·5	0·6	0·6	0·6	0·7	64
66	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·8	0·9	0·9	1·0	1·0	66
68	0·7	0·7	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·2	1·2	1·3	68
70	0·9	1·0	1·0	1·0	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	70
72	1·1	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0	72
74	1·3	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·1	2·2	2·3	2·4	74
76	1·6	1·6	1·7	1·8	1·8	1·9	2·0	2·2	2·4	2·5	2·7	2·8	76
78	1·8	1·8	1·9	2·0	2·1	2·2	2·3	2·5	2·7	2·9	3·1	3·2	78
80	2·0	2·1	2·2	2·3	2·3	2·4	2·6	2·8	3·0	3·2	3·4	3·5	80
	16	18	20	22	24	26	28	30	32	34	36	38	

Corrections to be made to the Quevenne Lactometer readings to convert them to readings at 60° Fah.

The density hydrometer is graduated to give correct readings at 20 deg. C. (68 deg. F.), and Table 2 shows the corrections to be made for different temperatures between 15 deg. C. (59 deg. F.) and 27 deg. C. (81 deg. F.) when the fat ranges from 0 to 10 per cent.

TABLE II.

Temp. °Cent.	Fat Percentage.						Temp. °Fah. (nearest).
	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	
15	1·0	1·1	1·2	1·3	1·5	1·6	59
16	0·8	0·9	1·0	1·1	1·2	1·3	61
17	0·6	0·7	0·7	0·8	0·9	0·9	63
18	0·4	0·5	0·5	0·5	0·6	0·6	64
19	0·2	0·2	0·3	0·3	0·3	0·3	66
	Subtract from the observed reading.						
20	No corrections at this temperature.						68
	Add to the observed reading.						
21	0·2	0·2	0·3	0·3	0·3	0·3	70
22	0·5	0·5	0·5	0·6	0·6	0·6	72
23	0·7	0·8	0·8	0·8	0·9	0·9	73
24	1·0	1·0	1·1	1·1	1·2	1·2	75
25	1·2	1·3	1·4	1·4	1·5	1·6	77
26	1·5	1·6	1·7	1·7	1·8	1·9	79
27	1·8	1·9	2·0	2·0	2·1	2·2	81
..	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	

Corrections to be made to the British Standard Density Hydrometer readings to convert them to readings at 20° Cent. (68° Fah.).

Calculation of Total Solids and Solids Not Fat.

(*a*) From Quevenne Lactometer Readings:—The lactometer reading at 60 deg. F. and the percentage of fat having been determined, the total solids may be calculated by means of the formula of the noted English dairy chemist, H. Droop Richmond.

Total solids = $\frac{1}{4}$ lactometer deg. + $1\frac{1}{5}$ fat + 0·14.

Example:—

Fat = 4·2%
Observed lactometer reading = 30·8 at 68° F.
Correction (from Table I.) = Add 1·1
Corrected lactometer reading = 30·8 + 1·1 = 31·9
Total solids = $\frac{1}{4}$ of 31·9 + $1\frac{1}{5}$ times 4·2 + 0·14

$$= \frac{31{\cdot}9}{4} + \frac{6 \times 4{\cdot}2}{5} + 0{\cdot}14$$

$$= 7{\cdot}975 + 5{\cdot}04 + 0{\cdot}14$$

$$= 13{\cdot}155.$$

Recorded as 13·2%.
The solids not fat (S.N.F.) would be 13·2 − 4·2 = 9·0%.

(*b*) From Density Hydrometer Readings.—The formula used is based on that of H. Droop Richmond, but is slightly different because of the slight difference between density and specific gravity.

Total solids = $\frac{1}{4}$ density deg. + $1\frac{1}{5}$ fat + 0·7.

Example:—

Fat = 4·0%
Observed density degrees = 30·0 at 20° C. (68° F.)
Correction from Table II. = nil
Corrected density degrees = 30·0

$$\text{Total solids} = \frac{30{\cdot}0}{4} + \frac{6 \times 4{\cdot}0}{5} + 0{\cdot}7$$

$$= 7{\cdot}5 + 4{\cdot}8 + 0{\cdot}7$$

$$= 13{\cdot}0\%.$$

The solids not fat in this case is 13·0 − 4·0 = 9·0%

The figures obtained by the above methods may be applied at milk depots, cheese factories and butter factories for the following purposes:—

1. Detection of Watered Milk.

The legal minimum for total solids is 12 per cent. and for solids not fat is 8·5 per cent. This latter figure is lower than the average which is about 8·8 per cent. The formula given below is based on the average figure of 8·8 per cent., and therefore assumes, quite incorrectly, that all milks containing less than 8·8 per cent. of S.N.F. are adulterated with water. It should be clearly understood that milks which contain less than 8·8 per cent. of solids not fat are not necessarily adulterated, but they may be regarded with suspicion, particularly if the milk is from a herd of Jersey of Guernsey cattle, and to a lesser extent, A.I.S. or Ayrshires. If the S.N.F. are below 8·5 per cent. the milk is of illegal composition in any case and should quite correctly be rejected.

$$\text{Added water} = (8{\cdot}8 - \text{S.N.F.}) \times \frac{100}{8{\cdot}8}$$

Examples:—

(*a*) Fat = 4.2 per cent. Total solids = 13.2 per cent. S.N.F. = 9.0 per cent.

The S.N.F. being above 8·8, the milk is not considered to be adulterated with water.

(*b*) Fat = 3·5%. Total solids 12·0%. S.N.F. = 8·5%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}5) \times \frac{100}{8{\cdot}8} = 3{\cdot}4\%.$$

This milk may be genuine, but it is equally possible for it to be adulterated with about 3 per cent. of water.

(c) Fat = 3·8%. Total solids = 12·0%. S.N.F. = 8·2%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}2) \times \frac{100}{8{\cdot}8} = 6{\cdot}8\%.$$

In this case it is more than probable that the milk is from a herd yielding milk with a high percentage of fat, and the supplier has added about 7 per cent. of water, but this was not sufficient to reduce the fat or total solids below the legal minima. The added water has, however, reduced the S.N.F. to below the legal minimum. Such milk should be rejected.

As diseases, mastitis for example, are very conducive to a low solid not fat content, such milks should be regarded with very great suspicion from the quality standpoint as well.

2. Detection of Skimming.

Under this heading is included the addition of skimmed or separated milk, as well as the partial removal of fat. The standard for milk under the Dairy Produce Acts (Reg. 182 (1)) requires that the specific gravity of the milk solids shall be not higher than 1·35. To make this clearer, milk fat has a specific gravity of about 0·93 at ordinary temperatures, and the solids not fat have a specific gravity of approximately 1·62. A mixture of the two, therefore, has a specific gravity between these two limits. The removal of fat increases the proportion of the heavier solids not fat, and thereby raises the specific gravity of the total solids. The addition of separated milk has exactly the same effect. The addition of water does not affect the S.G. of the milk solids as the relative proportions of the fat and the solids not fat remains unchanged. When determined by means of the formula given below, the specific gravity of the milk solids of genuine milks usually ranges from 1·30 to 1·33, sometimes a little lower, but never higher than 1·34. If the specific gravity of the milk solids is from 1·34 to 1·35 skimming must be strongly suspected, while if higher than 1·35, skimming or the addition of skimmed milk has undoubtedly taken place. Such milk cannot therefore be accepted as whole milk, but must be regarded as skimmed milk and treated accordingly.

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - (100\ \text{Sp. Gr.} - 100)}$$

Note:—(100 Sp. Gr. — 100) equals $\frac{1}{10}$ of the lactometer reading, and the formula may be more simply stated as—

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - \frac{1}{10}\ \text{of Lactometer reading.}}$$

Examples—(*a*) A normal milk.

Lactometer reading at 60° F. = 32·0. Fat = 4·0%.
Specific gravity of milk = 1·032
Total solids by previous formula = 12·9%. S.N.F. = 8·9%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}032 \times 12{\cdot}9}{1{\cdot}032 \times 12{\cdot}9 - \frac{1}{10} \times 32{\cdot}0} = \frac{13{\cdot}31}{13{\cdot}31 - 3{\cdot}20} = \frac{13{\cdot}31}{10{\cdot}11} = 1{\cdot}316.$$

(*b*) A partly skimmed milk.

Lactometer reading at 60° F. = 34·0. Fat = 3·3%.
Specific gravity of milk = 1·034
Total solids = 12·6%. S.N.F. = 9·3%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}034 \times 12{\cdot}6}{1{\cdot}034 \times 12{\cdot}6 - \frac{1}{10} \times 34{\cdot}0} = \frac{13{\cdot}03}{13{\cdot}03 - 3{\cdot}40} = \frac{13{\cdot}03}{9{\cdot}63} = 1{\cdot}353.$$

(*c*) A partly skimmed and watered milk.

Lactometer reading at 60° F. = 31·0. Fat = 3·0%.
Specific gravity of milk = 1·031
Total solids = 11·5%. S.N.F. = 8·5%.
Added water by previous formula = 3·4%.
(Actually this is a very conservative estimate of the added water).

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}031 \times 11{\cdot}5}{1{\cdot}031 \times 11{\cdot}5 - \frac{1}{10} \times 31{\cdot}0} = \frac{11{\cdot}86}{11{\cdot}86 - 3{\cdot}10} = \frac{11{\cdot}86}{8{\cdot}76} = 1{\cdot}353.$$

The skimming is shown by the high specific gravity of the solids, and the watering by the low S.N.F. This milk, of course, is also deficient in total solids and fat while the solids not fat are the bare legal minimum.

(*d*) A sample of separated milk.

Lactometer reading at 60° F. = 36·0. Fat = 0·10%.
Specific gravity of milk = 1·0360
Total solids = 9·26%. S.N.F. 9·16%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}036 \times 9{\cdot}26}{1{\cdot}036 \times 9{\cdot}26 - \frac{1}{10} \times 36{\cdot}0} = \frac{9{\cdot}59}{5{\cdot}99} = 1{\cdot}60.$$

3. Determination of Fat Losses in Buttermilk.

A news item entitled "What is a Fair Over-run?" which was distributed to the Press by this Department in April, 1938, contained this statement—"The percentage of the total fat lost is approximately 1 per cent. in the buttermilk. . . . " This has been questioned by more than one factory manager as being an excessively high loss, but actually it is very conservative. It was calculated from the 1934-5 results of about 800 analyses of buttermilks from 37 Queensland factories. It was used along with other conservative losses as a means of demonstrating that the maximum over-run obtainable is in the vicinity of 2 per cent. Since these buttermilks were analysed there have been a large number of modern pasteurisers installed which have undoubtedly raised the fat losses above the 1934-5 figures. McDowall (2) quotes fat losses ranging from 0·96 to 1·73 per cent. for a number of New Zealand factories. The quoted loss of 1 per cent. is, therefore, seen to be as low as can be expected with careful factory methods. This loss should be regarded as unavoidable in the same way as the loss of about 2 per cent. of the fat during separation is unavoidable. Carelessness or rush methods, particularly high churning temperatures, and the churning of freshly pasteurised cream, can greatly increase this loss of fat.

Methods of determining the fat losses in buttermilk involve the determination of total solids by the methods given previously. The preliminary stages are:—

(1) Collect a sample of buttermilk preferably as it is run from the churn. The sample may, with considerable advantage, be a composite sample from every churning of butter made during the day.

(2) Determine the percentage of fat by the normal butyl alcohol method.

(3) Determine the lactometer reading and temperature.

(4) Make the necessary correction for temperature, and determine the percentage of total solids by the methods already given, then determine the solids not fat.

(5) Determine the percentage of fat in the unwatered buttermilk by means of the formula:—

$$\text{Fat in unwatered buttermilk} = \frac{\text{Fat} \times 8{\cdot}8}{\text{S.N.F.}}$$

Example:—

Fat in composite sample of buttermilk = 0·62%
Lactometer reading at 56° F. = 22·0°
Lactometer reading corrected to 60°F. = 22·0 − 0·3
= 21·7.
Total solids = ¼ of 21·7 + 1½ times 0·62 + 0·14 = 6·31%
Solids not fat = 6·31 − 0·62 = 5·69% or 5·7% (to nearest 0·1%)

$$\text{Fat in unwatered buttermilk} = \frac{0{\cdot}62 \times 8{\cdot}8}{5{\cdot}7} = 0{\cdot}96\%.$$

(As an item of interest the percentage of added water may also be determined by the method given previously, and in the above example will be found to be 35 per cent. This water is added in various ways, such as can steamings, water used to standardise the cream to the desired fat percentage, water used to dissolve the neutraliser, rinsings of neutralising and holding vats, steam condensed during pasteurisation with live steam, break water, &c.)

Unwatered buttermilk is really the non-fatty portion of cream as it is received at the factory. The total quantity of cream received is obtainable from the factory books, and, provided the average percentage of fat in this cream is known, the total quantity of unwatered buttermilk received can be found. Unfortunateiy, the 8·8 ml. pipette method of testing cream, which is used in Queensland, does not give the true fat percentage, the test being about 1 per cent. low for a 35 per cent. cream and 2 per cent. low for a 45 per cent. cream. The result is that the quantity of buttermilk apparently received at the factory is overestimated. For example, a cream giving a 35 test would presumably contain 65 per cent. of buttermilk, but actually the true fat is about 36 per cent. and the buttermilk only 64 per cent. The error, introduced by the inaccurate method of testing, can be offset by assuming that less of the buttermilk is lost, that is, that more of the buttermilk is incorporated in the butter than is actually the case. The average curd in Queensland butters is a little less than 0·8 per cent., and is equivalent to approximately 8½ per cent. of incorporated unwatered buttermilk. By assuming that butter contains 10 per cent. of incorporated buttermilk, the original error of the 8·8 ml. method of

testing is largely eliminated. This is an example of a deliberately introduced compensating error allowable only in this case because of the original error introduced by the inaccurate method of testing.

Without going into details of the considerations and calculations involved which have been excellently set out in a recent circular (3) from the Council for Scientific and Industrial Research, the percentage of all fat lost in the buttermilk can be very closely approximated by *multiplying the fat in the unwatered buttermilk by the following conversion factors* worked out by Udy in 1929 in New Zealand and reproduced as Table 2 of the C.S.I.R. circular. These factors are based on butter containing 10 per cent. of unwatered buttermilk.

Fat Test of Cream as Received at Factory.	Conversion Factor.	Fat Test of Cream as Received at Factory.	Conversion Factor.
35	1·73	41	1·32
36	1·65	42	1·26
37	1·58	43	1·20
38	1·51	44	1·15
39	1·44	45	1·10
40	1·38		

Example (Continued).

Fat in unwatered buttermilk = 0·96%
Average fat test of cream as received = 41
Fat lost in the buttermilk = 0·96 × 1·32 = 1·27%.

It is hoped that the methods outlined will enable managers of milk depots and cheese factories to check illegal practices by unscrupulous suppliers. Managers of butter factories should be able to determine the extent of their fat losses in buttermilk and a realisation of their extent should be sufficient to make them realise that other losses require to be kept as low as possible. Possible sources of loss which can be checked are spillage during handling of the cans, waste from the cream samples, leakages, splashing from the coolers, loss of froth, extra butter given away in each box during packing, and most prolific source of loss of all, the extra fat given away by low percentages of water and/or salt in the butter.

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1. BURGESS, L. A. This journal, 1936. 56, 633-645.
2. MCDOWALL, F. H. N.Z. Jour. Sc. and Tech., 1938. 19, 682.
3. WILEY, W. J. C.S.I.R. (Div. of Animal Health and Nutrition). Information Circular No. 2, "Butterfat Losses in Churning," 1939.

A MILK TRAVEL TEST.

As an experiment a can of milk was recently railed from a place 80 miles from Pretoria (South Africa) to Durban and then back to a dairy in Pretoria—a distance of just under 1,000 miles in sixty-three hours. At the end of the long journey to and fro, the milk was declared fit for consumption. When the milk arrived at Durban on the outward journey, it was tested and passed as first grade. At no time was any special care given to the can by the railway people.

The experiment was sponsored to prove that the keeping quality of milk depends, above all, on the method of production and careful attention to cleanliness in the milking and handling.

The Lasting Effects of Molasses used as Fertilizer.*

C. G. STORY.

MOLASSES as a fertilizer has a particular value on potash-poor red volcanic soils, because of the richness of the by-product in this plant food. But it has also been found that molasses applied to such soils, in dry areas, also brings with it another benefit, particularly when weak-rooting canes such as Q. 813 are grown. It would appear that the molasses destroys the influence of root parasites which often exist under such conditions, and the weak-rooting cane gives a normal ratoon yield.

Plate 132.

ILLUSTRATING THE LASTING EFFECTS OF AN APPLICATION OF MOLASSES.—Its influence is shown on a crop of Poona pea planted after the ratoons were ploughed out. *Left*, plant from "no molasses" plot; *right*, plant from "molasses" plot.

The results of an application of molasses to a ratoon field of Q. 813 in the Woongarra area were reported in the Quarterly Bulletin of January, 1939, page 121. The yield figures are particularly interesting, and should be studied by all farmers on soil of this type. It was con-

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

cluded that an application of 5 tons of molasses, together with mixed fertilizer supplying an equal amount of plant-foods, was better than 10 tons of molasses alone.

After this crop of cane had been harvested, the farmer ploughed out the area, and broadcast Poona pea as a cover crop, in October last. Particular notice was taken of the growth of the pea crop to see whether the molasses treatment showed any "carry-over" effect. In every instance it was found that the growth of the legume on the plots which had received 10 tons of molasses a year earlier was far in advance of that on the "no treatment" plots. A comparison of the respective growths is illustrated in Plate 132, the photograph was taken in January, three months after planting. During this growth period 7 inches of rain had fallen.

The benefits enjoyed by the pea crop growth can probably be credited to the abundant supply of potash provided by the molasses, which was not entirely used up by the ratoon cane. It can be expected, of course, that the effect will be seen also in the next crop of cane which is to be planted on the field this year. Therefore, in calculating the value of any beneficial soil treatment, the farmer should consider not only immediate results, but allow also for the more permanent effects as well. On the trial in question, the Q. 813 ratoons showed a gain of 6½ tons of cane per acre where 10 tons of molasses per acre were applied.

A SIMPLE FARM LOADING RAMP.

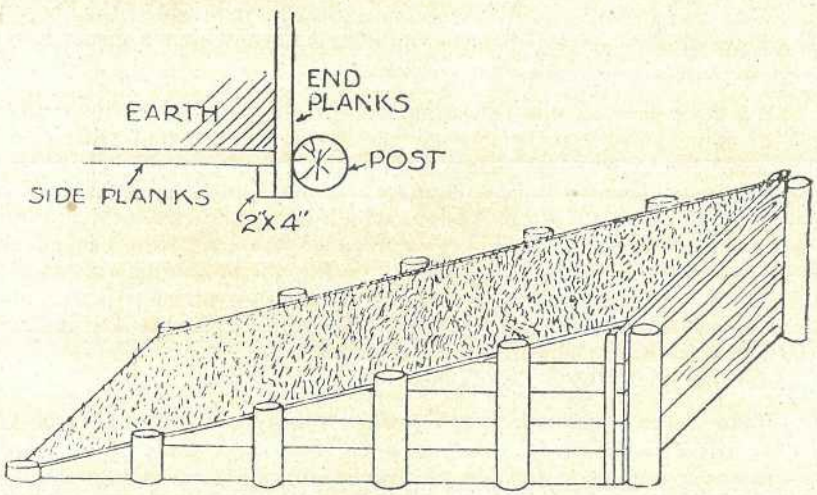


Plate 133.

This drawing gives an idea of how a loading ramp for tractors and other machinery and livestock can be constructed. Reinforced concrete may be used instead of posts and planks. In any case, the side walls should be anchored together with wire, cable, or rods. Even concrete will be broken at the corners if not well reinforced and anchored.

Corn, Downy Mildew, and Cane.*

ARTHUR F. BELL.

OFFICERS of the Bureau have at all times advised against the growing of corn in the vicinity of cane fields on account of the danger of increasing the spread of mosaic disease. This danger arises from the fact that mosaic disease is spread by a small insect, the corn aphis, which breeds prolifically on corn and sorghum, but does not breed on cane. Obviously, then, the growing of corn or sorghum near cane will breed a large stock of these aphids which migrate on to the cane and so spread the mosaic.

Recently there has become evident another and much stronger reason why corn should not be grown in the vicinity of cane, and this particularly applies to Southern Queensland at the present time. The sugar industry in Southern Queensland has been rehabilitated by the growth of varieties which are highly resistant to the once terrible scourge, gumming disease. It so happens that the two most important of these varieties, P.O.J. 2878 and P.O.J. 213, are highly susceptible to downy mildew, a disease which was almost non-existent in the southern districts at the time of their introduction.

Unfortunately the climatic conditions over the past three years have been eminently suited to the continued and late spread of downy mildew in the Bundaberg district, and we now must face the position where the continued cultivation of P.O.J. 213 and P.O.J. 2878 is seriously threatened, at least in the Woongarra area.

Scattered outbreaks of this disease occurred last year. In searching for the origin of these outbreaks it was found that in some cases they had obviously originated from a source of infection carried over in one of the old varieties; in other cases, however, there appeared to be no such source of infection. Closer examination then revealed the fact that near most of the latter fields we could find corn which appeared to be affected with a downy mildew disease.

We then carried out investigations of this aspect of the problem, and we have now found that corn is very easily infected with exactly the same downy mildew disease as cane and that cane can become infected from diseased corn. It might be mentioned here that on cane the spores or "seeds" of the fungus which causes downy mildew disease are produced only on the lower surface of the leaf, whereas on corn they are produced in vast numbers on both sides of the leaves. Because corn grows so much faster than cane the disease develops much more rapidly; a block of even a very susceptible variety of cane will normally take not less than a couple of years to become 100 per cent. infected, but corn becomes 100 per cent. infected in a few weeks.

Even if the corn were healthy when planted, it would still be very dangerous in the event of a single stool of diseased cane being near it. In the absence of corn the disease would gradually spread through the cane from this single stool, but by careful inspection and digging out of diseased stools as soon as they appeared the disease could be brought under control. It would be a different story if there were a block of

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

corn alongside; this would become infected from the single stool of diseased cane and the disease would go through it like wildfire. Then, instead of the cane being exposed to infection from one or two stools of cane, it would suddenly become exposed to infection from hundreds of stools of corn and the rate of spread in the cane would be greatly accelerated.

In view of these findings it appears necessary that steps will have to be taken to prohibit the growing of corn in cane areas and farmers would be well advised to seek some suitable alternative fodder crop. Our experience to date indicates that sorghums are much less susceptible to downy mildew than corn. In the coming season it is proposed to test the downy mildew resistance of a number of grain sorghums. Grain sorghums in the United States yield some remarkable results and leading varieties have recently been imported by the Queensland Department of Agriculture. Should these prove resistant to downy mildew they would make excellent substitutes for corn *in those areas where mosaic disease is not a problem.* Where mosaic disease is likely to be a serious problem, the growing of sorghum of any kind must be condemned, as it always has been.

TO ANCHOR A CORNER POST.

Here is one of the very best ways of anchoring a corner fence post to enable it to stand the strain of tightly stretched wires. The method really anchors three posts at the corner.

Set three sound posts in the usual way—the corner post and one in each fence line running from it. Six or eight feet back of the corner post and in line with each fence direction dig a hole large enough and deep enough to bury a non-decaying deadman, such as a large rock. About 3½ feet from the ground, tie a strong, double wire to each second post and run it to the deadman. Bury the deadman and tamp down firmly. The deadman should be so placed that the stay-wire enters the ground at or near the corner post. Place a strong rail or other timber between the second post and the corner post at about the height of the anchor wires. Then with a stick between the two halves of the double wire, twist until it is tight. Fasten the stick so the wire will not untwist.

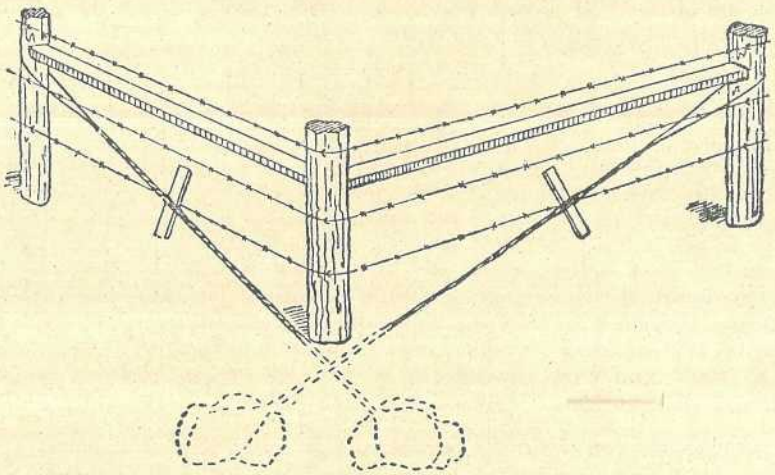


Plate 134.

This method of corner anchoring has the double advantage of giving the corner post anchorage and preventing the tendency to lift out when it is braced to the bottom of the second post, which is so often done. It gives three points of strength —the corner post, the second post, and the deadman.—*New Zealand Farmer.*

A Mound-building Ant Affecting Sugar-cane.*

R. W. MUNGOMERY.

OCCASIONALLY after a period of minor activity, during which time certain pests cause little damage, they suddenly increase and assume pest proportions, over-running larger areas than those previously occupied by them, and they thus cause a certain amount of apprehension. These pest outbreaks are largely governed by varied weather conditions which intimately affect the insect itself, its parasites, or its environment.

This, in effect, is what has happened recently in the case of a mound-building ant which has, for a number of years, been regarded as a cane pest of rather limited activity. During the last year, however, it has caused some concern to growers in the Tully area, and to one or two growers at Mourilyan, and has necessitated control measures being instituted against it.

So far as is known, at least two very similar species of these mound-building ants exist in Queensland canefields, and similar damage occurs in such widely separated districts as Tully, Sarina, and Bundaberg.

The ants in question are medium sized, about one-fifth of an inch in length, and of a pale brownish colour. They live in underground nests, and their small entrance mounds are conspicuous around the base of affected cane stools, but the ants themselves are not so readily seen, since during the daytime they mostly skulk in their underground tunnels and their main mound-building activities are carried out during the night. Frequently a mound that has been destroyed during the day will have its entrance rebuilt during the following night, and the normal functions of the nest will proceed as before. These ants can be readily unearthed with a spade, and then they are seen in different parts of their underground communications.

The chief damage which these ants cause to the cane stools is a severe stunting, brought about by the enormous amount of tunnelling and honeycombing of the soil beneath the cane stool. This causes drying out of the soil, and in addition there is also a certain amount of mechanical injury sustained by the tiny root hairs, thus depriving the plant of a portion of its normal supply of plant foods and moisture. As far as we are aware these ants do not actually eat the root hairs—at least no root debris has been found whenever an examination has been made of their stomach contents. Rather do they colonise very small hoppers and aphids on the cane roots, and in return for this attention the aphids give off a honey dew which is eagerly sought after by the ants, and this appears to be the real reason why these ants construct their nests underneath the cane stools.

Similar mound-building activities are to be seen on some of the uncultivated lands, and exactly the same state of affairs occurs there with the one exception that in this case the aphids colonise on blady

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

grass roots, &c., and it is from these uncultivated lands that the pest frequently makes inroads into the adjacent canefields, and once established there causes the grower considerable embarrassment.

Where these waste lands are extensive, the pest obviously cannot be economicaly eradicated from those areas, but an attempt can be made to keep the cane lands as free as possible. This should begin when the ratoons are ploughed out. Care should be taken not to leave volunteer stools or grasses grow on the ploughed-out fields. Otherwise these become hosts for the aphids and hoppers, with the consequent persistence of the ant pest.

The aim should be either to bare fallow the land, or else it should be sown heavily with a suitable leguminous crop, capable of growing quickly and choking out any foreign weed or grass growth. Later when this crop is ploughed under, the area should be looked over carefully to make sure that no ants' nests remain, and if they do, the ant colonies should be further harassed either by ploughing or by fumigation.

When the ants commence to invade young plant cane or ratoons recourse must then be had to the use of soil fumigants, and in this respect carbon bisulphide, or a mixture of carbon bisulphide and paradichlorbenzene, such as is used for the fumigation of cane crubs, will probably be found the most useful. Since the mounds vary so much in size and depth, the amount of fumigant to be used will necessarily vary considerably, but as the infested stools are mostly honeycombed underneath, they should be fumigated much in the same manner as when fumigating cane grubs, i.e., injections with a Dank's injector using the full charge, and approximately 15 inches apart. Preferably the injections should be made deep. In the case of ants inhabiting large nests with deep ramifications, these are not always destroyed in the first injection, and whenever this happens the survivors will have dumped their dead outside the mound entrance. In such a case it will be necessary to repeat the fumigation.

A HANDY GATE.

This combination gate works almost the same as other gates except that it will open two different ways. It has proved very helpful when separating the calves from

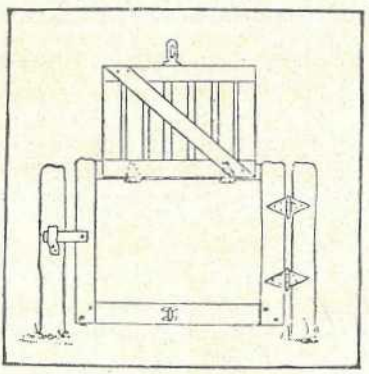


Plate 135.

the cows or trying to run them in the pen with the cows. You can open the top part and the calves can go in, but the cows cannot get out.

The Brisbane Exhibition.

BRISBANE's August Exhibition has such a strong appeal that people come every year from all over the Commonwealth to see it, as well as to bask in the glow and glamour of Queensland's glorious spring. The show is a breeder of optimism, as well as an exemplar of opulence, and a visit to it is one of the best cures for pessimism. To see the work of hand and brain so well displayed is to realise that Queenslanders are, as yet, only on the edge of opportunity, and to confirm a lively faith in the future of the State.

At this year's show was seen the wealth and progress of Queensland in parade, pageant, and panoply. There it was learnt that Queensland's land industries produced more than £50,000,000 worth of new wealth last year, and that enormous aggregate was represented in every form at Bowen Park. But striking as those figures are, they become far more impressive when placed alongside the actual samples of production of farm and grassland—the production of broad acres of untold fertility and of illimitable pastures of richness unsurpassed.

Here are some of Queensland's income figures (approximate):—

	£
Sugar-cane	12,000,000
Wool and other station products	11,000,000
Dairying	10,500,000
Beef cattle	7,250,000
Grain crops	1,600,000
Fodder and other crops	3,000,000

Outstanding Displays.

Among the big pavilion displays were the Court of Agriculture, containing a comprehensive representation of all the agricultural and pastoral activities of the State; the District Exhibits from the North Coast and Tabelands of New South Wales, Wide Bay and Burnett, South Coast and Tablelands, West Moreton and Tablelands, Kingaroy, Mackay and Charters Towers, Oakey, Nanango, Darling Downs, Crow's Nest, and Caboolture; the Forestry Court, with its wealth of Queensland timbers; and the General Post Office display, showing a network of communication covering the world with electric power.

The Meat Industry Hall, the Hall of Dairying, and the Hall of Sugar were grouped in another part of the ground, and each was an exhibition in itself.

The Farm Boys and Farm Girls' Camps were other great features—perhaps, the most important of all, for what finer crop could any country have than its young people—in whose hands is literally the future of the Commonwealth?

Our Wealth in Wool and Sheep.

Merino and crossbred wools, greasy-grey from the shears and snow white from the scour, were piled in fleecy billows to demonstrate how warmly—literally and financially—we are covered with the sheep's overcoat. Australia has one-sixth of the world's sheep, and produces one-fourth of the world's wool—could there be stronger evidence of the success of scientific breeding and sound station management?

Fat lamb raising has made remarkable strides in Queensland. It is a matter of choosing the right classes, the right country, and applying the right methods, particularly in respect of the right way of feeding and the right way of preparing lambs for market and the right amount of care in delivering them.

The show authorities are taking a keen interest in this new industry, and so we had this year classes for British breeds of sheep for the purpose of crossing with the merino for supplying a promising export trade. Corriedales also are used in crossing with merinos to produce the right type of ewe for fat lamb breeding.

The Wool Hall at the show was full of interest. The sheep-shearing contest attracted some of the "gun" shearers of the Woolly West, and the celerity with which they peeled off the "patient's" overcoat with their "mowing machines" was a sight to thrill—and there were no "tommyhawking" or "fribs" or "second cuts" either. In the hall all the processes through which the wool goes from the time it is taken off the sheep's back to the manufactured garment were demonstrated.

If an opinion may be risked on the subject in which mere man must show his gameness in discussing (or is it just foolhardiness?) one of the best ways of increasing opportunties for the wool industry is to ask (we dare not insist!) our womenfolk to wear more wool. The average woman wears less and buys more, but, unfortunately, from the wool man's point of view, new synthetic fibres make up much of the additional purchases. It is a matter of style, perhaps, let alone comfort, but it is supposed that style is the more important.

It so happens that in Europe wool is now worn more than formerly, and in Paris and London woollen fabrics are as chic and smart as those of artificial silk and cotton. There is no reason why Australian women, especially as wool is such an important factor in Commonwealth economy, should not follow such a good example. What is required in all these things is a realisation of the value from the standpoints of fashion, utility, and economy of the home-grown product.

One of the best ways of serving Australia at the present time is to wear more wool.

To-day there are 22½ millions of sheep running on Queensland pastures, and they produce wool to the value—in round numbers—of £10,000,000, to say nothing of the returns from mutton, fat lambs, and other pastoral products.

The Cattle.

There is no finer stock show, in point of quality, than that seen every year at the Brisbane Exhibition. This year the daily stock parades demonstrated in a wonderful way what Queensland breeders have done in stock improvement. There they were—Herefords, big-framed "ballies," sleek to look at, and with hides elastic to the touch; great shorthorns, full-ribbed, broad-backed beauties, square on top and underline; Aberdeen-Angus, round-barrelled and built close to the ground, with beef to the fetlock and without the semblance of a "boxing glove" at the tail butt.

Fatteners provided the best mustering for many years. All classes were even, and showed a general excellence in early maturity, conformation, depth, and evenness of fleshing.

Stock can only be judged on a basis of utility, whether on the hoof or on the hook, and this year's fat cattle entries probably satisfied the hardest-headed judge, whether he viewed them from the top rail or inside the arena.

The cattle industry is worth £7¼ millions to Queensland, and, with improved herds and pastures, Queensland beef will run wool very close in annual value before many years have passed.

Great things come from small beginnings, and that was a square-hitting fact when the display in the Meat Hall was viewed. Since 1934, chilled beef export figures have risen from between 2,000 and 3,000 tons to over 28,000 tons—last year's shipments—a fine achievement in four years. The figures for this year are not yet available, but a possible near-future rise to 40 000 tons is a safe prediction, if present quality is maintained.

Throughout the stud beef cattle stalls there was noticed a trend towards a carcase shorter in the leg, with a deeper selvedge of flesh, and heavier flank and lower thigh. This is the type both butchers and shippers are looking for. In the polled cattle sections, all breeds showed a great improvement in quality.

It is good to think that Queensland graziers are on the road to a strong revival in the cattle industry as a result of planned organisation, and, it is hoped, better economic conditions.

In respect of chilled beef, the present position is that practically every technical difficulty has been overcome, and the chief thing required now is for cattle suitable for chilling to be in continuous supply. The cattle-fattening experiments at present in progress on our tropical coastal country have become, therefore, a matter of first importance. Likewise, fattening on the brigalow country reclaimed in recent years from prickly-pear.

From the beef-cattle camp to the milking-cow yard is only a stride, for, after all, our dairy breeds of cattle were evolved from beef breeds at one time or another.

With the dairy cows of every breed we have in Australia at the show—the A.I. Milking Shorthorn, Jersey, Friesian, Guernsey, and Ayrshire—it was a case of beauty and the bucket, and both were winners, a happy combination of show-ring shapeliness and cream-can value.

There were present teams from all the well-known dairy herds, of which the progeny are paraded in every show-ring in Queensland and at other royal shows in the Commonwealth.

In the ring and in the stalls one was able to learn more about selecting and judging a beast than he would in a long term of text-book study. There was seen the cow that filled the bucket as well as the eye, and it was possible to appreciate the skill of the breeder in combining all the points of a healthy, true-to-type animal with good performance in the milking bail.

"You would not see a better collection of these cattle paraded anywhere else in the world," said Mr. Arthur Snell, of South Australia, judge of the Australia Illawarra Shorthorns at the show.

From Beef to Butter.

The exhibit in the Meat Hall was one of the most attractive of the whole show, particularly to the housewife who prides herself on her ability to choose a chop or a breakfast steak—that was the opinion of a

mere man who knows only enough about butchering to knock a chop off a grid-iron.

From beef to butter was a skate, so to speak, or a slippery slide along a well-greased way. In the Dairy Hall across the road from the Meat Hall, the story of the State's progress was told in butter. It is not so very long ago when it was impossible to obtain enough butter to complete a small cargo to Sydney. During the last twelve months, the dairy industry was worth more than £10,000,000 to Queensland.

The wheels of Queensland industry are lubricated with Queensland butter-fat.

"Queensland knows on which side its bread is buttered"—there was no doubt about the truth of that emblazoned slogan.

From every part of the Queensland dairy country, which extends for more than 1,000 miles along the coast and the near-inland regions from the Tweed to the Daintree, came these tempting boxes of butter in the Dairy Hall, and all of the highest quality.

Pigs on a Pedestal.

Pigs were on a pedestal at the show—figuratively speaking—in all their brilliantined glory. Tammies, Berks, Large Whites, and Welsh Saddlebacks held court continuously in the pens set apart for both pork and bacon classes. In the Berkshire breed there are now two recognised classes, or types rather—one coming from the original British strains, and the other from strains which Canadian breeders have tried to improve by increasing length, depth, and productivity, while still maintaining the recognised colour and utility of the breed.

The Pig Section was outstanding this year. Both porkers and baconers were among the finest specimens of their types, and showed how far our farmers have advanced towards perfection in pig breeding and feeding.

In the pens reserved for litters were seen lusty, stocky, shapely scions of the best pig families, each with a pedigree as long as the handle of a shovel.

In Queensland to-day there are 320,000 pigs. Half a million are converted to bacon and pork every year, and they return to the State rather more than a million pounds a year.

Bathed and barbered like a beauty chorus, "Denis" and his mates earned their show honours. But the fact that was most impressive is that the Queensland pig is a bacon factory on trotters.

Poultry.

And what would bacon be without the breakfast egg?

In its poultry industry, Queensland, like the rooster, has something to crow about. Five million dozen eggs, nearly, the Egg Board handled last year, and that was nowhere near the total production of the State. The net average price (all grades included) returned to the growers for eggs delivered to the board was nearly 1s. 2d. It is something to crow about, and it is not left to the rooster to do all the crowing.

And it was not all fuss and feathers in the poultry pens at the show. Anyone with an eye to avian grace and beauty would have found a lot of satisfaction in studying the types and classes of all the breeds—whether utility backyarders or fancy fowls—in the Poultry Pavilion.

In round figures, the poultry industry lays more than three hundred thousand pound notes every year for Queensland.

The "Cream" of the Countryside.

The District Exhibits might be likened to the cream of the countryside, for each was replete with the best samples of production from a rich region, and each was an epitome of the whole show.

These exhibits demonstrated strikingly how the town depends on the country and the country on the town. Side by side with the products of the farm were the products of the factory, all eloquent of the enterprise of every section of the community. The importance of the farmer as a producer is admitted, but these regional displays also emphasised the importance of the farmer as a consumer as well. There is no finer example of the wedding and the welding of primary industry with secondary industry as presented by these annual district displays.

West Moreton and Tablelands won the A Grade competition for the eleventh time in the last twelve years. South Coast and Tablelands was second again, and, for the third time, North Coast and Tablelands of New South Wales took the tertiary honours. Wide Bay and Burnett was fourth. Included in the products—and all came up to the highest standards of farming and manufacture—were pastoral and field products, foods raw and processed, fruits and vegetables in almost bewildering profusion, minerals and building materials, manufactures and examples of trade skill, and, in each exhibit, the wine of the country —and, of course, Bundaberg and Beenleigh rum came under that category (though there was no sample of "Banyan" rum, which is said to be the best bait for the big-game fisherman!)

In the B Grade competition, Northern Downs won the trophy from Mackay and Charters Towers, with Kingaroy third.

In the District Farm Competition, Crow's Nest beat Caboolture. Woombye won the honours for the District Fruit Display.

The richness and range of productivity of Queensland, of which these district exhibits were representations in miniature and the "cream" of the countryside, were demonstrated strikingly in every display.

The show this year was remarkable from a farmer's point of view for the deepening interest in fodder cropping and conservation. Every district exhibit had a hay and ensilage section which compelled attention, both for quality and presentation.

Everywhere farmers are planning to reduce seasonal risks and storing stock food in one form or another. They know that the best results are to be obtained from grazing and dairy herds by conserving valuable natural foods for a dry time. They realise that a silo combines more profitable points than any other building on a farm. They appreciate the fact that ensilage can be made without weather worries.

Reviewing the astonishing array of farm crops, and looking beyond to the displays of wider range, and thinking of the men and women who produced them, it is realised that this great show serves two great ends—the stimulation of increased efficiency and the bringing to the people of the city a broader knowledge of the resources of the State in which all have a share, and in the development of which all have at least some responsibility.

In the Court of Agriculture.

What the Brisbane Show is to Queensland, the Court of Agriculture is to the Brisbane Show. The first thought on entering the Court was the predominant productivity of our soils.

The farmer is the only man who takes the elements God put on earth and turns them into new products. The sunshine and the soil, the dew drops and the rain drops, and seeds containing a little germ called life—these, with his plough, are his raw materials. Food, clothing, and shelter for mankind are the results. Who can resist the miracle of, say, the transmutation of sown pastures, green and lush in the flush of growth, into minted gold?

In the court were displayed native and sown pastures from which comes 80 per cent. of Queensland's living,

The dictum of the psalmist—All Flesh is Grass—learnt by heart at Sunday School, came vividly to mind when looking over the livestock exhibits at the Show. Nor was it allowed to be forgotten in a survey of the exhibits in the pavilion—the displays of the farming districts and the court of the Department of Agriculture. There was seen the whole range of our grasses—both native and introduced—in great array, and which form the basis of national prosperity.

At one time farmers looked on grass simply as a cheap stock food provided by bounteous Nature for their benefit, and not a crop that called for cultivation and care of any kind. To-day, thanks to science, we are better informed. Grass is now regarded as our most important crop, and that was evident by the prominence given to native grasses—such as Mitchell, Flinders, blue, and kangaroo grasses—and sown grasses—like paspalum and Rhodes—in every agricultural exhibit, both small and large. And that accounts, too, for a growing "grass consciousness" in every part of the State, which is remarkably fortunate in the variety, nature, and nutritional value of its native pastures. Grass is the best and cheapest food for the milking herd—it is grass and the quality of the cows that count in terms of butter fat.

Wool in crimpy staple with the yellow of the "yolk" glistening on its fibres, topped with scoured fleeces ready for the manufacturer, was eloquent testimony of the wonderful wealth of those pastures.

In an illuminated alcove were illustrations of the eternal war against animal diseases and pests; and adjoining was pictured the never-ending fight against the elusive microbe in the milk can.

Then was set out Queensland's harvest in miniature from her great grainlands, from which 8,500,000 bushels of wheat and millions of bushels of other cereals were garnered last season, and which were worth, in the aggregate, £3,000,000 in the bag.

Two models—one showing how soil is lost, and the other how soil is saved—were object lessons on the vital importance of conserving the top layer of the earth's surface.

Next was seen a demonstration of the practical side of fodder conservation with scale models of silos—trench, pit, stack, and tower—to show how it is done. All was framed with cocoa-coloured sheaves of grain sorghums—substitutes for maize in the drier areas with 90 per cent. of maize's nutritive value. Maize gets weak in the knees during a dry spell, and gives up the ghost rather easily when there is no rain at cobbing and tasselling time. The grain sorghums, on the other hand, take any amount of punishment, and return heavy yields of food for farm animals.

Then there was a tobacco section illustrating the importance of an industry which returns approximately £200,000 to growers every year. Queensland leaf is equal to the best that Australia produces.

In the cotton alcove was represented every phase of an industry which is increasing yearly in importance. Cotton brings in well over £450,000 annually to Queensland, and, like tobacco, this industry is only yet in its infancy. The value of a cotton-grass land rotation is recognised in every cotton-growing district.

Many uses have been found for the by-products of cotton, and these were shown in oils, meals, and other derivatives. The display was a fine example of the progress made in the industry and the value of cotton in our commerce and manufactures.

It was easily appreciated what sugar means to Queensland and the Commonwealth in the Sugar Hall. More than a tenth of the population of this State depends on sugar for bread and butter. An industry, worth annually about £12,000,000 to Queensland, has naturally a far-reaching economic and social influence, and, apart from the excellence of every section of the exhibit, that fact accounted to a large extent, probably, for the denseness of the daily throng in the Sugar Hall. There were seen a model sugar mill, with turning cogs and revolving rollers, and the whole process of sugar making from the green cane to glistening crystals, and all its other products. What do we not owe to the sugar industry? For national defence, every sugar mill in the North means a brigade of potential Diggers permanently garrisoned. The industry keeps ten thousand farmers in reasonably profitable production; it keeps more than 20,000 white Australian workers in constant employment. Estimate what it means to us socially, economically, and nationally—and then let us acknowledge our debt to the giant grass called sugar-cane.

In another alcove in the court, the continual war against vegetable pests and diseases was fitly represented. The question as to whether man or bug will inherit the earth may not yet be fully answered, but, judging by effective campaign and combat the bug is sure to be beaten.

In the Departmental Court, as well as in the Fruit Hall, fruits of all kinds make up the finest exhibit every staged at the Brisbane Show. And that is as it should be, for Queensland sells yearly the harvests of her orchard lands for £1,500,000. All the temperate, sub-tropical, and tropical fruits grown in the State were represented in the display—yellowing bunches of bananas, luscious pineapples, citrus fruits in pyramids of scarlet, gold, and amber, and rosy-cheeked apples from Stanthorpe, and all the other fruits for which Queensland is renowned throughout the Commonwealth.

Every exhibit in the Machinery Section was a pointer to agricultural prosperity along the modern mechanised road. They were striking examples of farming on wheels which add to the leisure, the income, and the culture of the farmer and his family.

Generally, a whole world of activity revolved around the Exhibition ground, and behind it all was the work of the farmer and his family. Beyond it all was the personal equation—the man in productive industry and the woman, too. It is their part in national service which makes up the wholesomeness, the attractiveness, and completeness of our national well-being.

The Brisbane Exhibition goes on from achievement to achievement, breaking yearly every record of entry and attendance. This Queensland institution, for it is nothing less, is one of the most impressive evidences of progress that could be presented to an appreciative community.

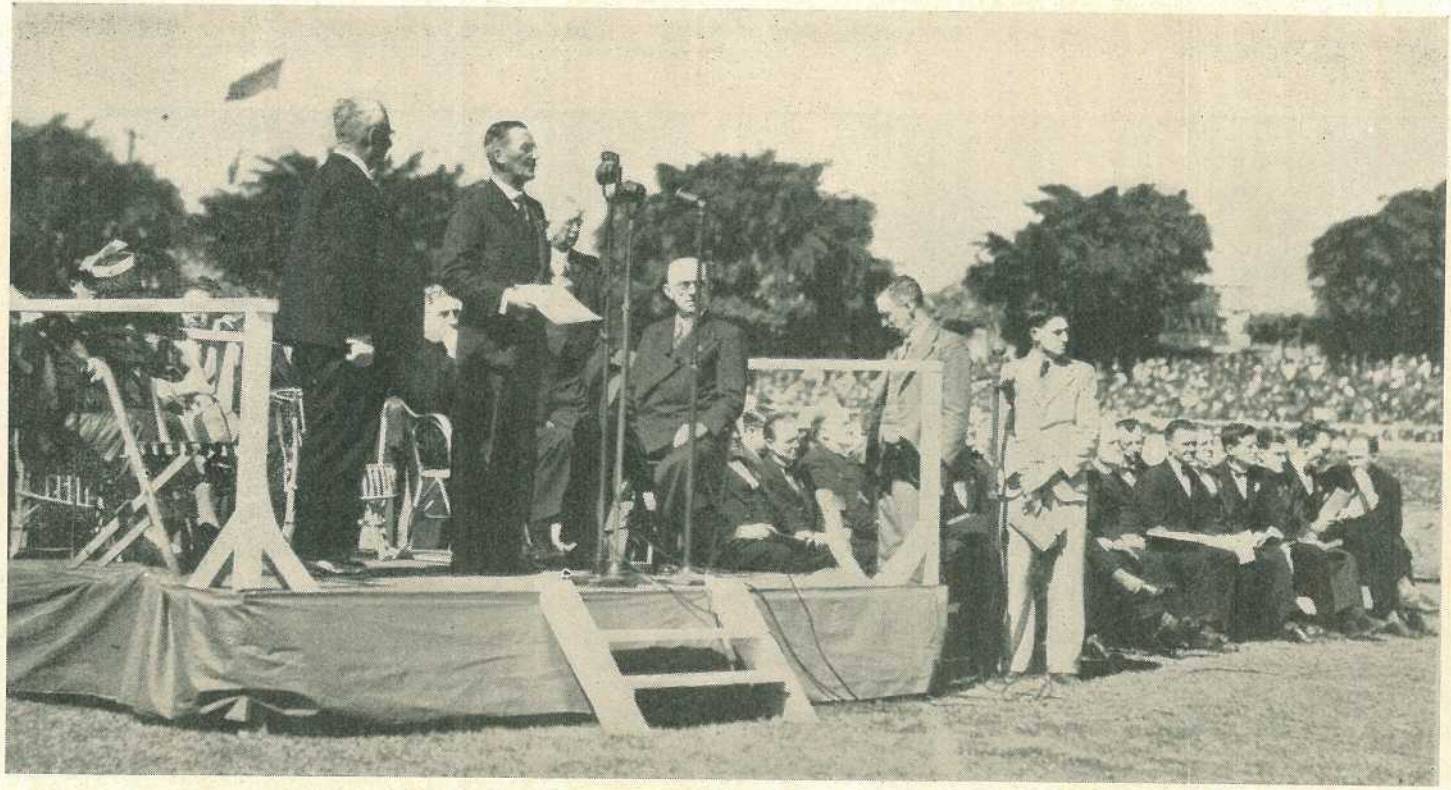


Plate 136.

His Excellency the Governor (The Right Hon. Sir Leslie Orme Wilson) Opening the 1939 Brisbane Exhibition. Seated on the Dais Towards the Right is the Premier (Hon. W. Forgan Smith).

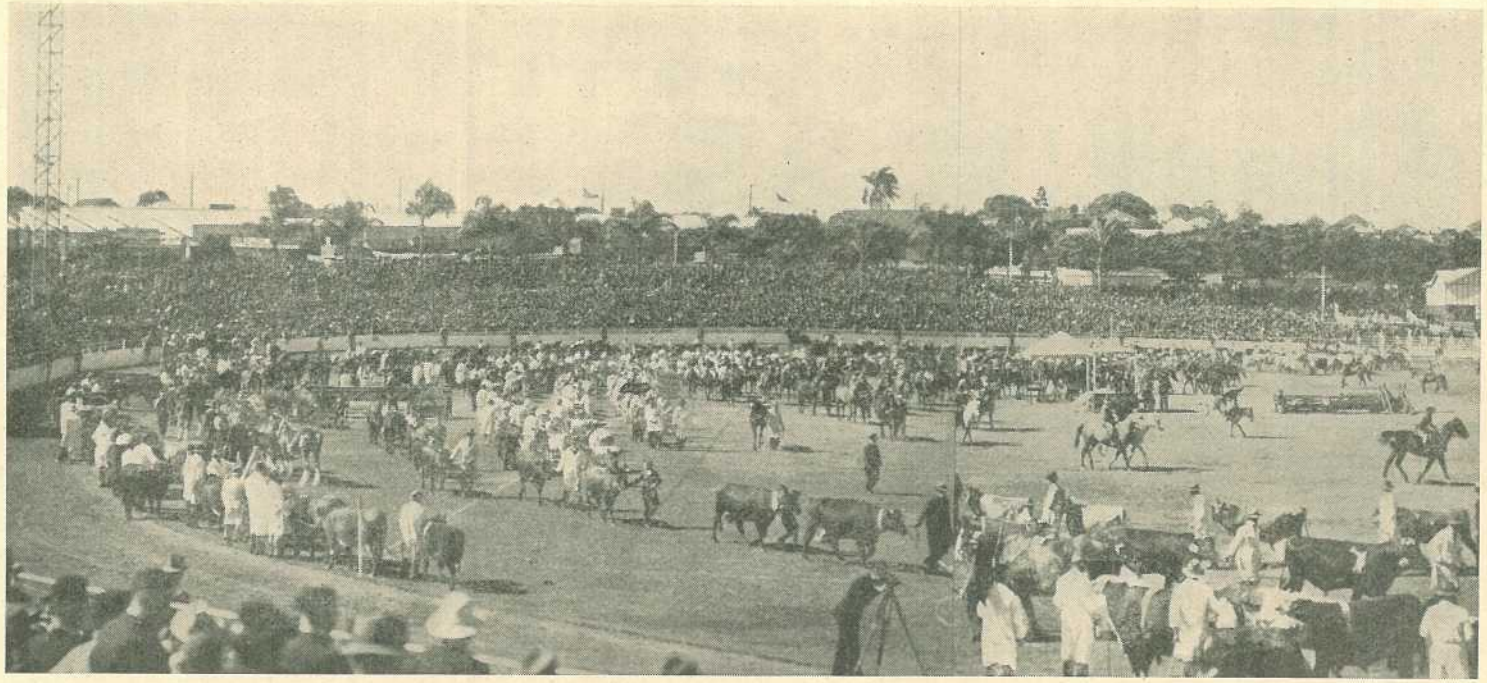


Plate 137.

THE GRAND STOCK PARADE AT THE 1939 BRISBANE EXHIBITION.—The high standards attained by Queensland stock breeders was demonstrated admirably in the arena.

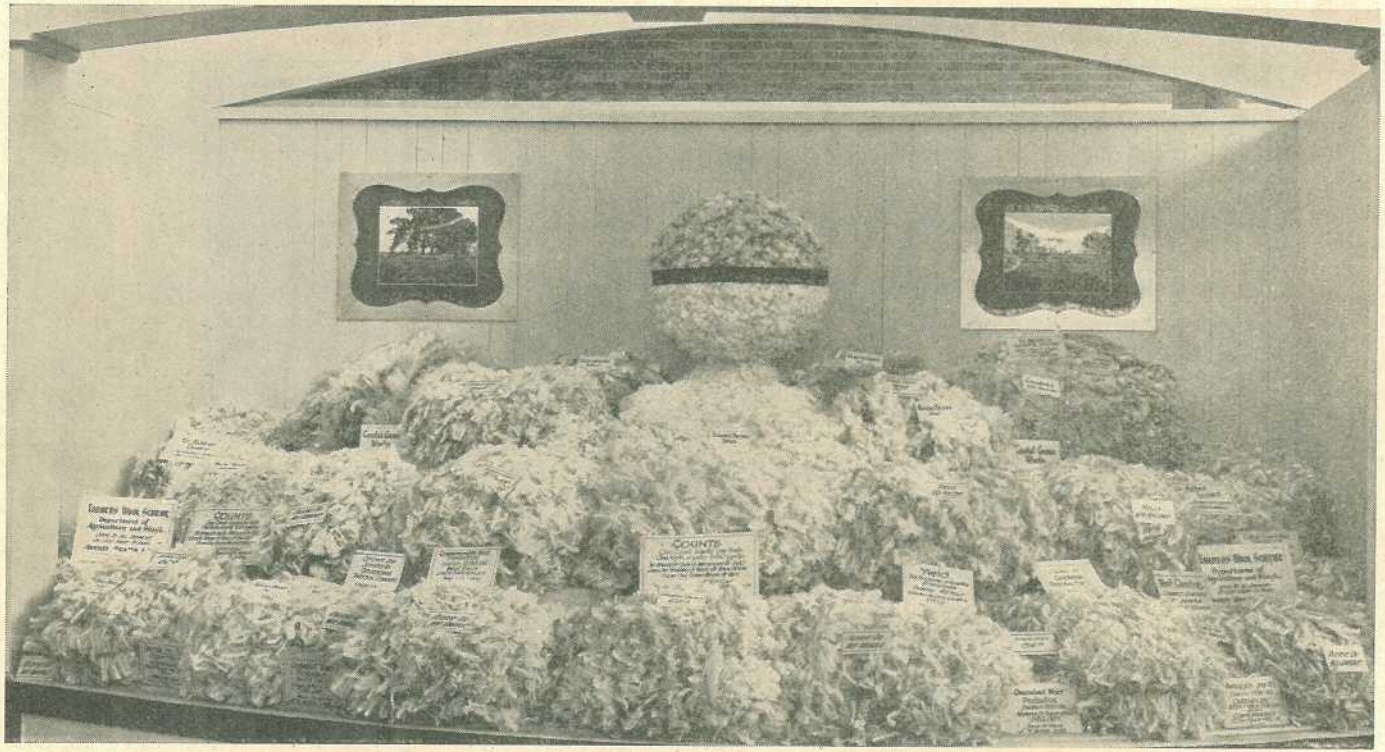


Plate 138.

WOOL IN CRIMPY STAPLE WITH THE YELLOW OF THE "YOLK" GLISTENING ON ITS FIBRES, TOPPED WITH SCOURED FLEECES READY FOR THE MANUFACTURER, WAS ELOQUENT TESTIMONY OF THE REMARKABLE RICHNESS OF QUEENSLAND'S PASTORAL COUNTRY.

Plate 139.

FROM BOLL TO BALE, LINT FOR AUSTRALIAN LOOMS.—In the Cotton Alcove, every phase of the industry and all its by-products were effectively represented.

Plate 140.

In the Agricultural Court were Displayed Native and Introduced Grasses, from which is derived Eighty Per Cent of Queensland's Annual Income.

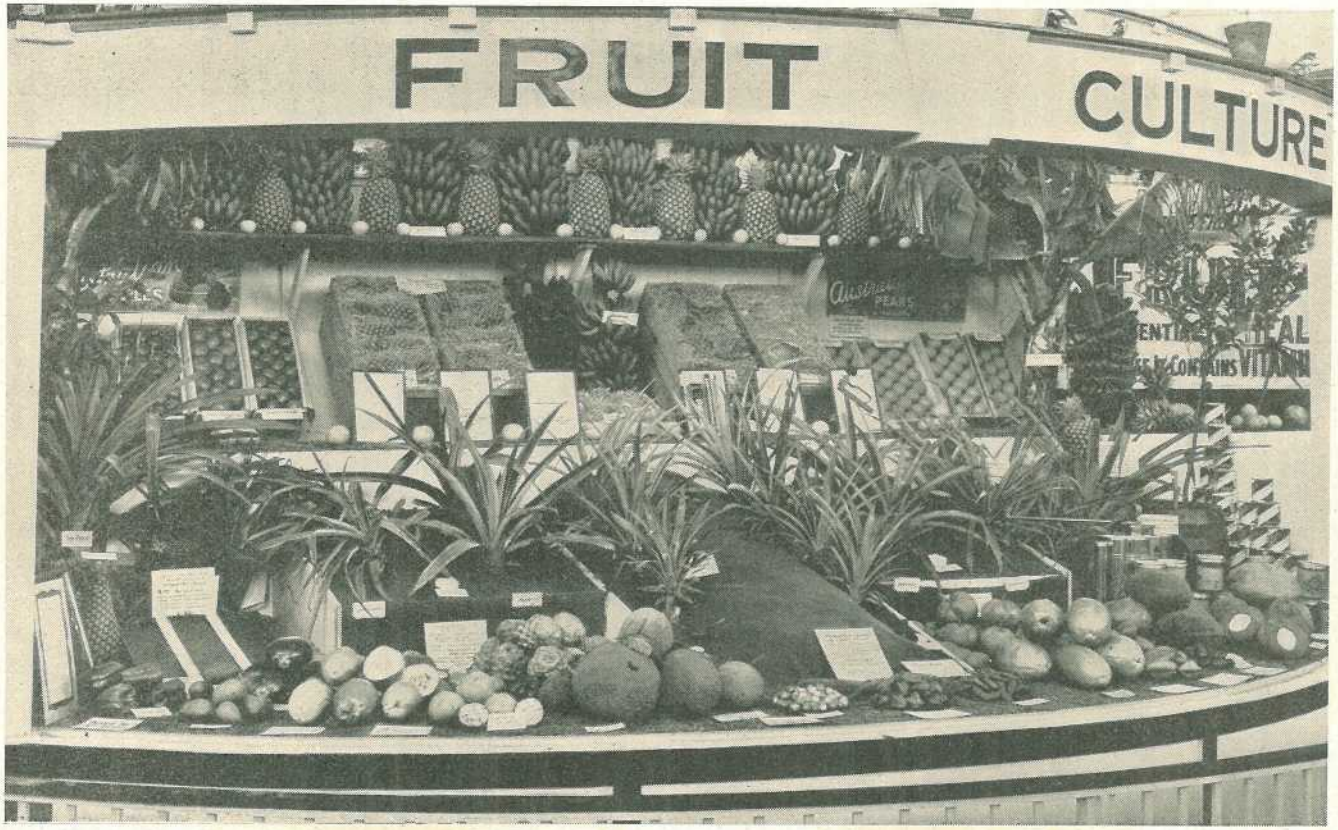


Plate 141.

ORCHARD PRACTICE AND ITS PRODUCTS.—New cultural methods as well as every variety of fruit grown in Tropical and Sub-Tropical Queensland were represented in this impressive exhibit in the Court of Agriculture.

Plate 142.

The Winning "A" Grade District Exhibit.—This remarkable array of farm and factory products showed how closely the country and the town are linked in industry.

Plate 143.

A Cereal Story in Sheaf and Grain.—This array of Queensland wheats was the central theme of a display arranged by field officers of the Agricultural Branch. The work of the wheat breeder was represented strikingly in the numerous grain varieties which have been evolved to suit seasonal conditions in Queensland.

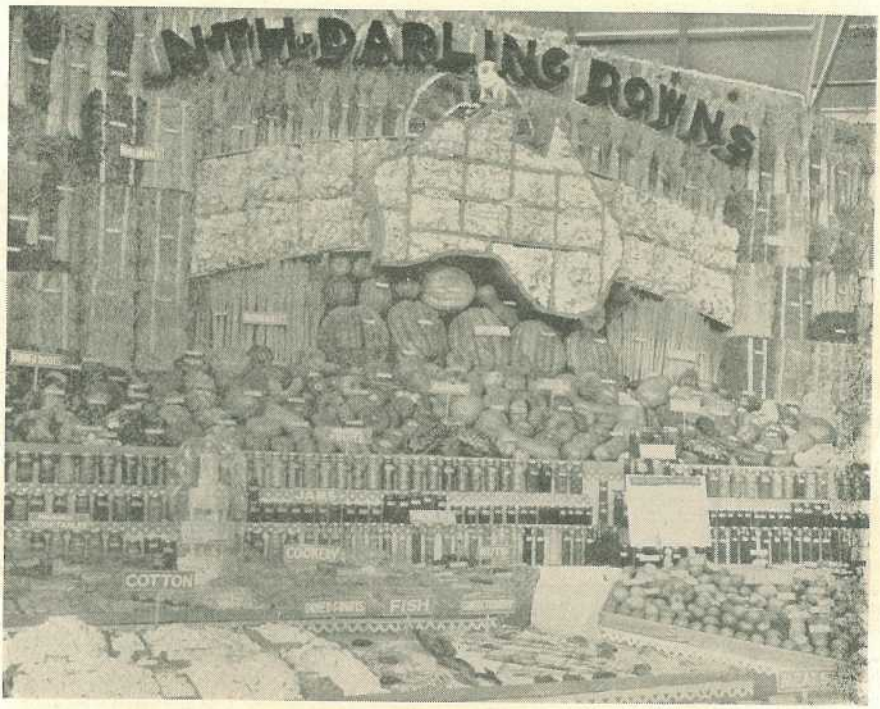


Plate 144.
THE PRODUCTIVITY OF THE DARLING DOWNS.

Plate 145.
FROM THE FRUITFUL COASTAL LANDS.—A section of the Woombye winning exhibit.

Plate 146.

FROM THE FRUITFUL GRANITE.—The wealth and health of Stanthorpe apple lands arrayed arrestingly and in striking colour contrasts.

Plate 147.

A "CORNER" IN AGRICULTURAL SCIENCE.—Effective field work was the dominant note in this year's display of the Research Division.

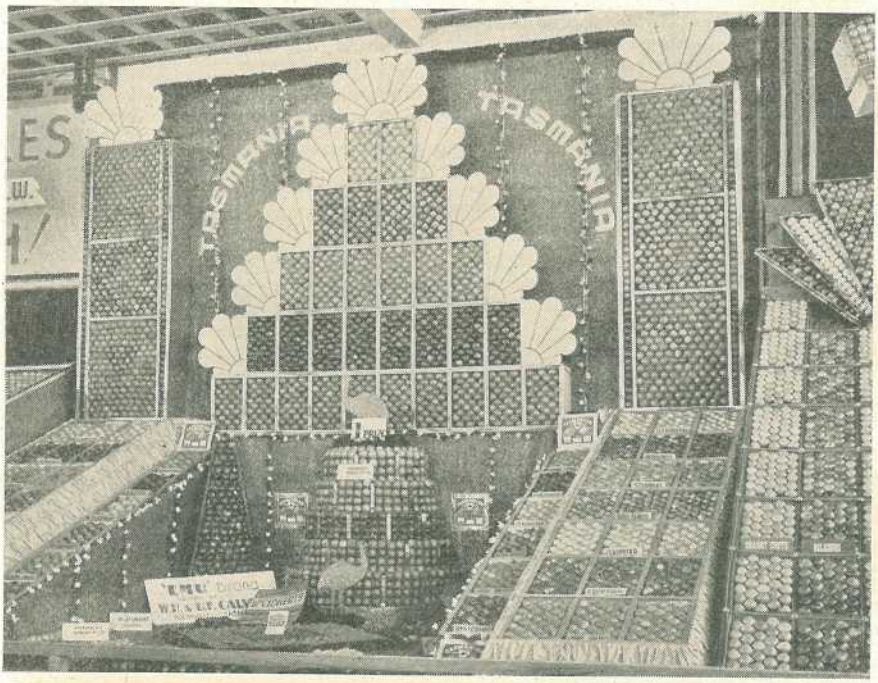


Plate 148.
A WINNING FRUIT EXHIBIT.—A luscious harvest from Tasmanian apple lands.

Plate 149.
THE EXHIBIT OF QUEENSLAND TOBACCO ATTRACTED THE KEEN INTEREST OF VISITORS TO THE COURT OF AGRICULTURE.

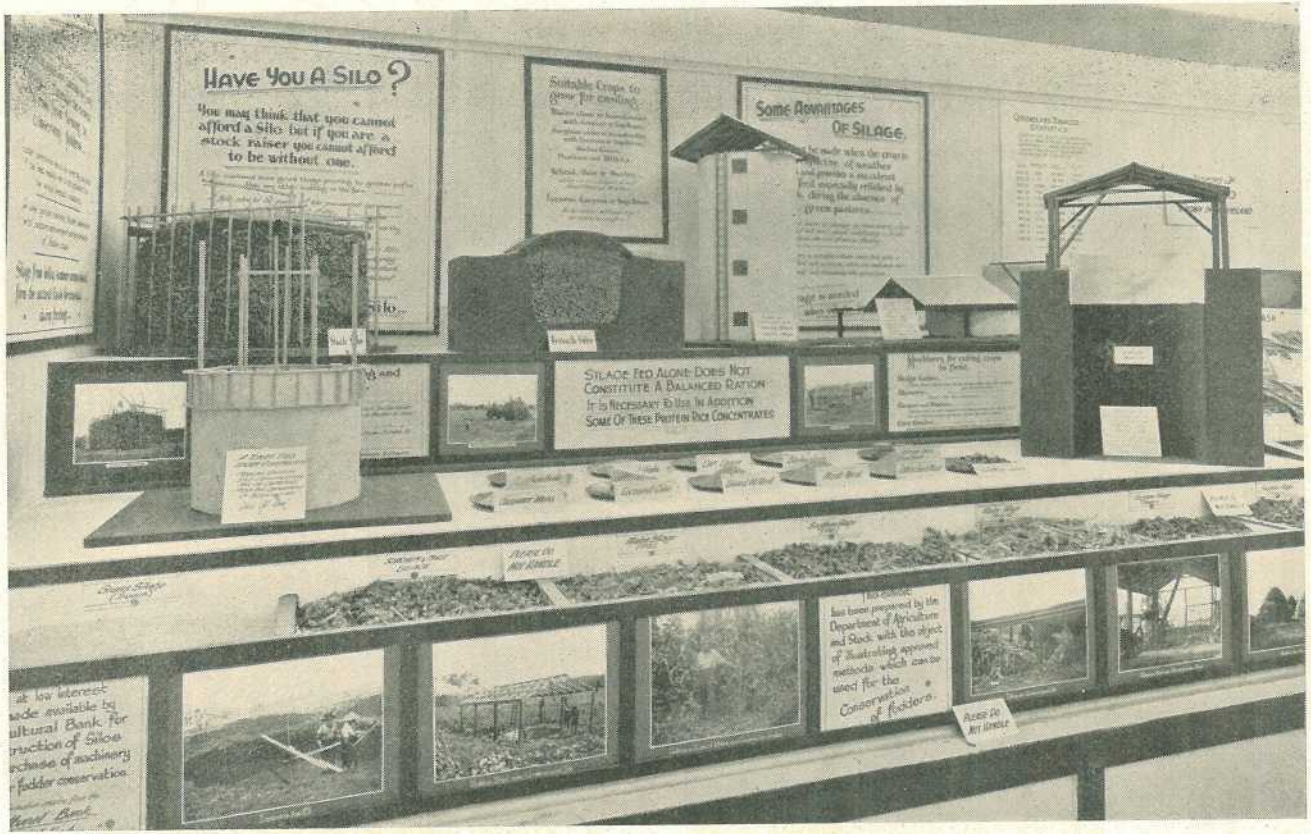


Plate 150.

FODDER CONSERVATION.—This fine display, arranged by the Agricultural Branch, was a feature of the Departmental Court. Scale models of silos—tower, pit, trench, and stack—and samples of silage formed the chief themes of an excellent educational exhibit.

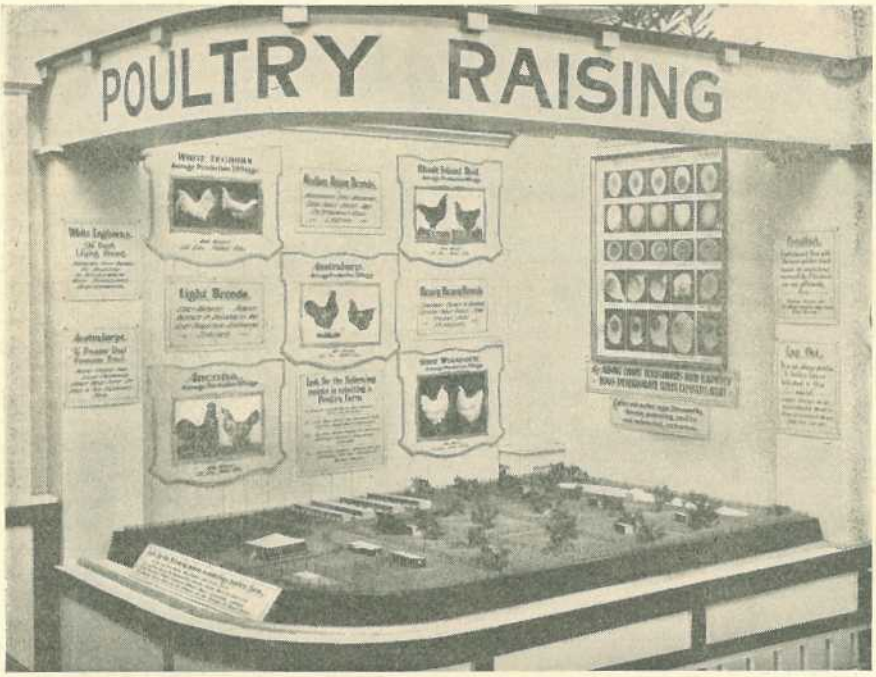


Plate 151.

THIS DISPLAY, WITH A MODEL POULTRY FARM AS ITS CENTRAL FEATURE, WAS A CENTRE OF INTEREST IN THE COURT OF THE DEPARTMENT OF AGRICULTURE.

Plate 152.

LESSONS IN DAIRY MANAGEMENT.—This educative exhibit arranged by Departmental dairy research workers attracted great public interest at the Show.

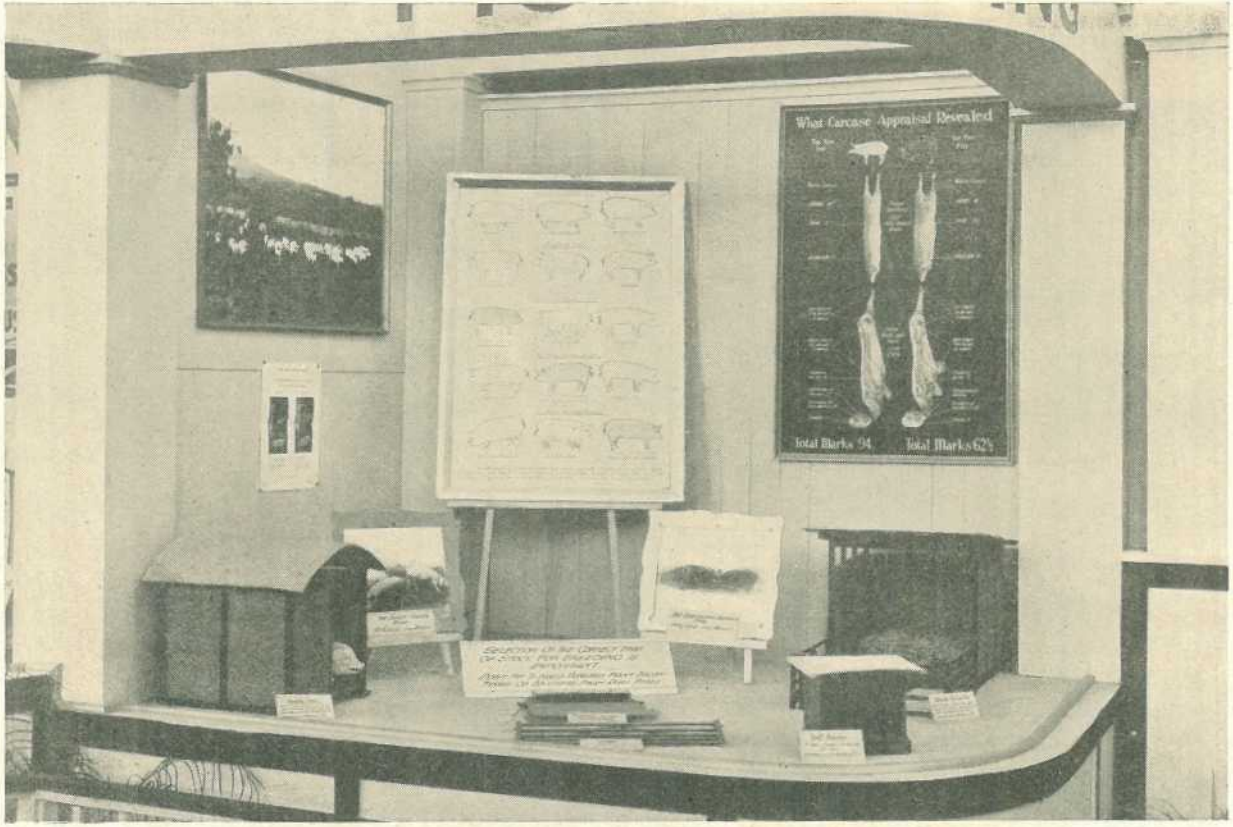


Plate 153.
POINTERS TO PROSPERITY IN THE PIG INDUSTRY WAS A CORNER FEATURE IN THE DEPARTMENTAL COURT.

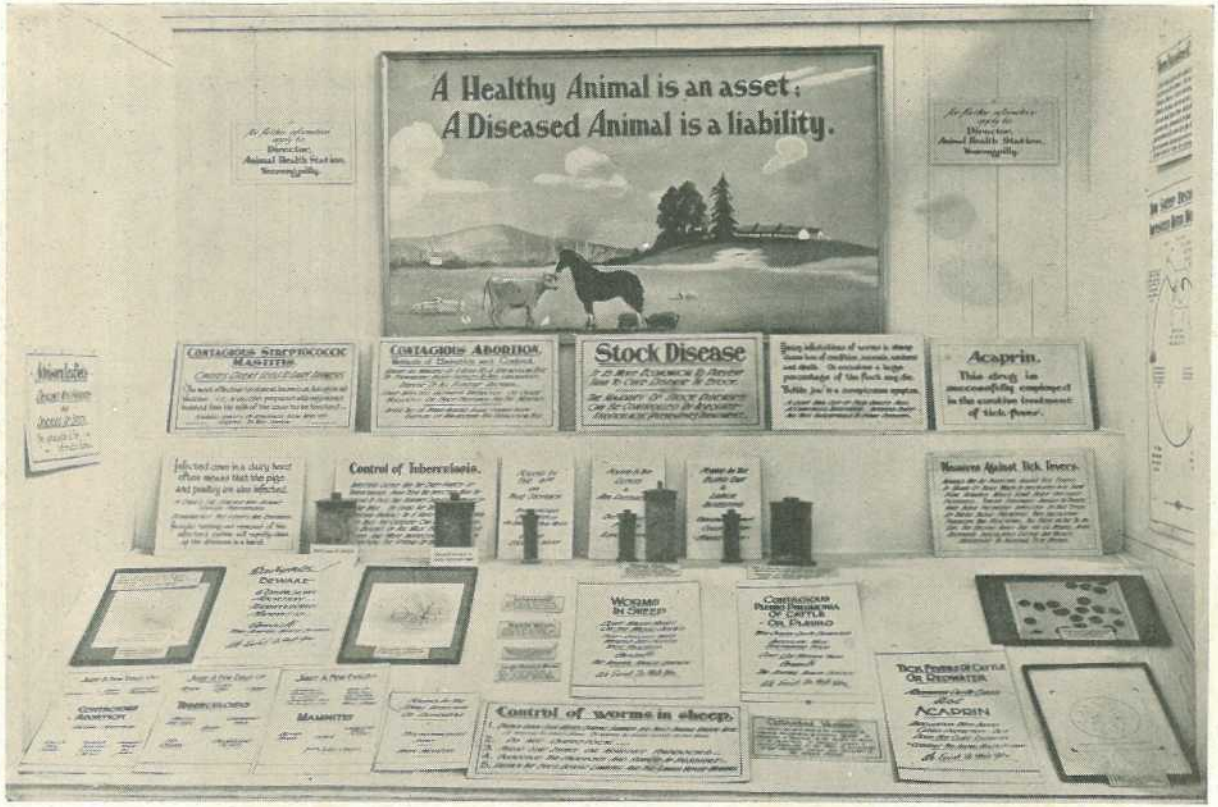


Plate 154.

DEPARTMENTAL WORK IN STOCK DISEASE CONTROL WAS WELL ILLUSTRATED IN THIS ALCOVE IN THE DEPARTMENTAL COURT.

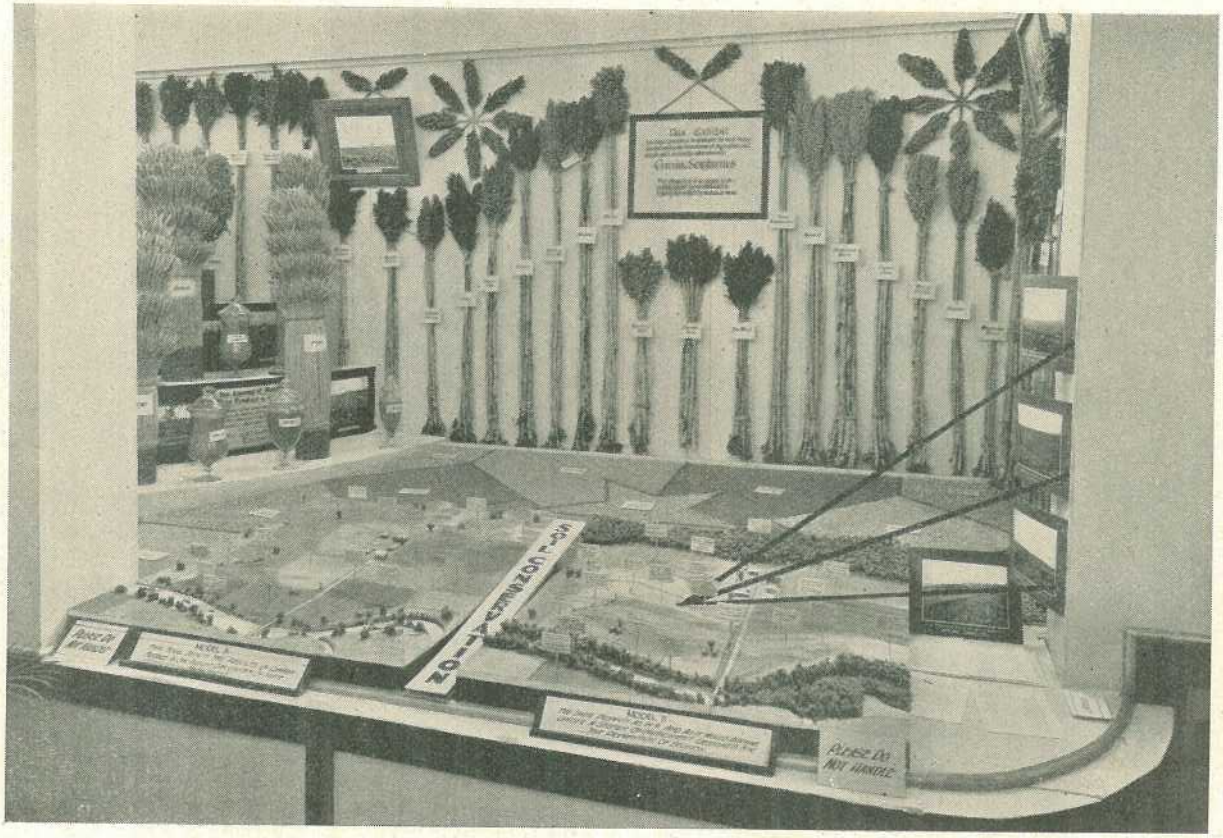


Plate 155.
A Panel in the Court of Agriculture.

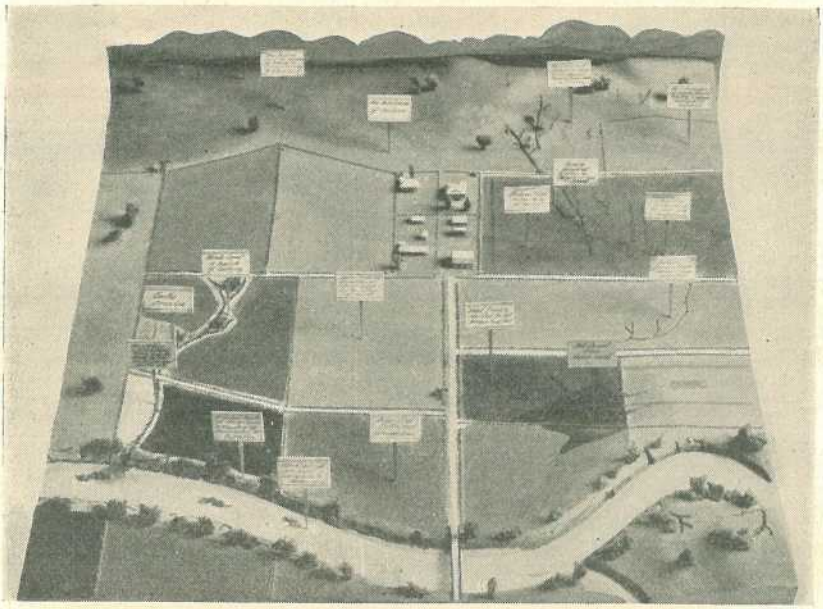


Plate 156.

HOW SOIL IS LOST.—This scale model in the display of the Agricultural Branch illustrated how easily and rapidly erosion reduces farm fertility.

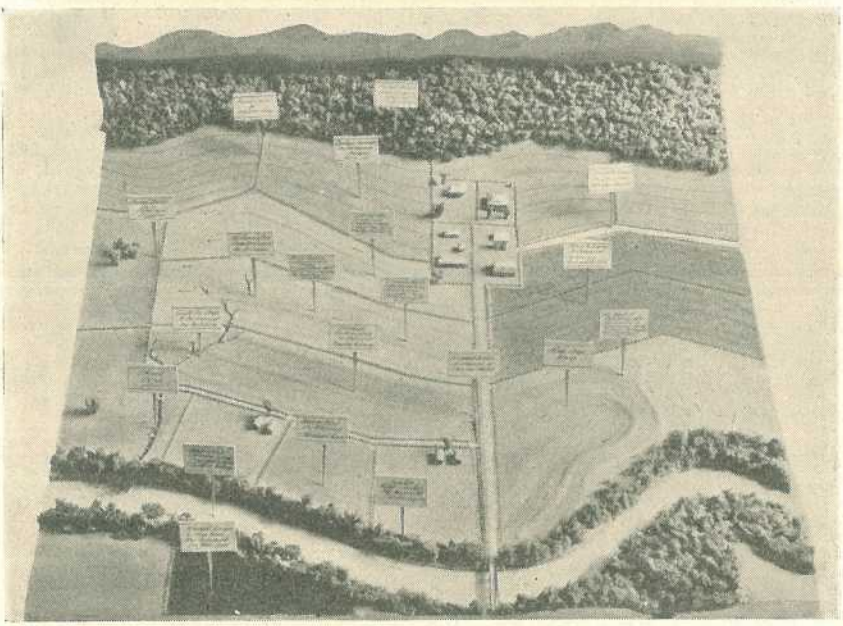


Plate 157.

HOW SOIL IS SAVED.—Another model of the same farm was an object lesson on the importance of conserving the top layer of the earth's surface, and showed how it may be done by strip cropping and improved methods of cultivation.

Plate 158.

THE JOURNAL ALCOVE IN THE COURT OF AGRICULTURE.—A "clearing house" for information on Departmental activities and services. Messrs. Jim Marley (right) and Laurie Muller were the officers in charge. Officers from every branch of the Department of Agriculture and Stock were in daily attendance in the Court to explain exhibits to Show visitors.

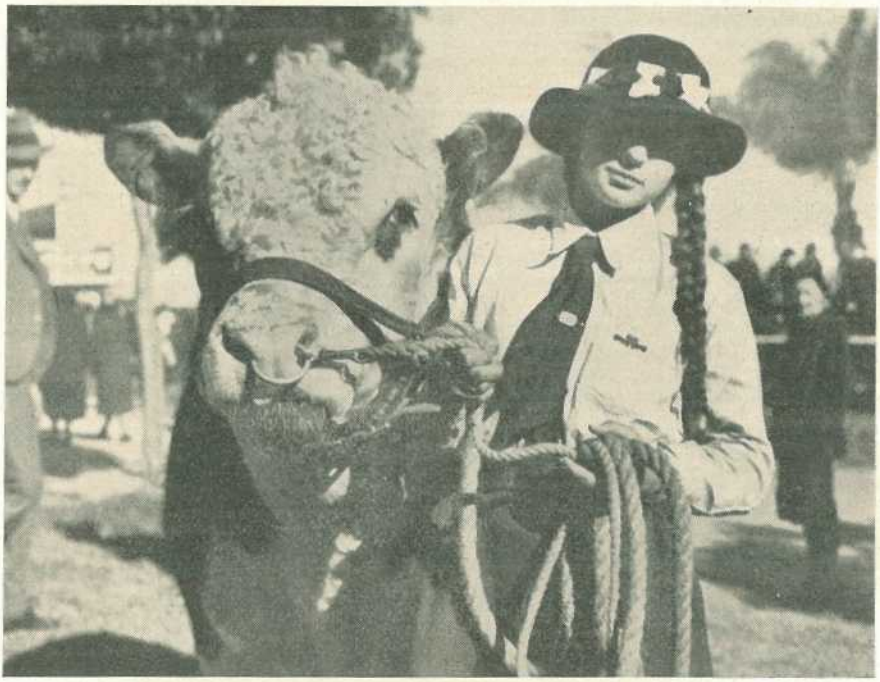


Plate 159.

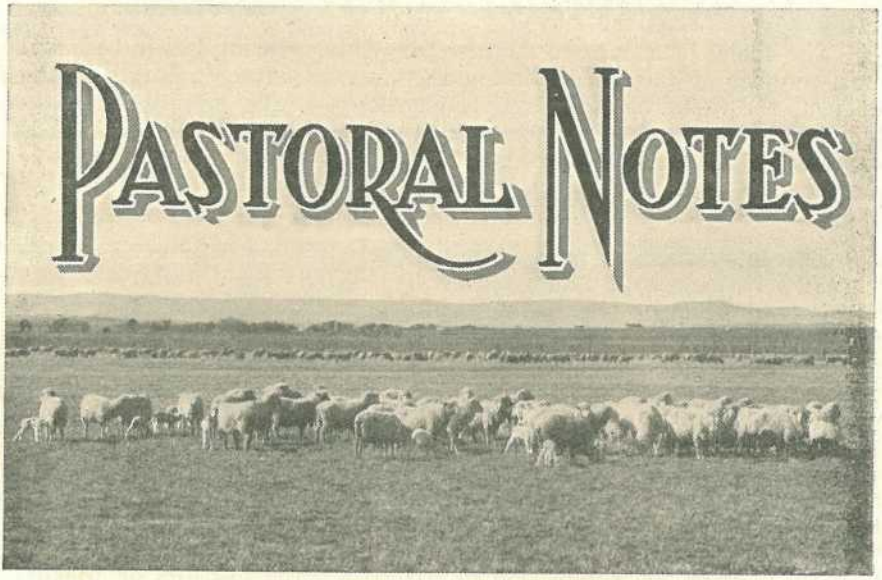
THE CHAMPION POLLED HEREFORD.—Miss Mary Dixon leading Mr. J. Sparkes's Park Prime Anxiety IV. from the judgment arena.

USE DEPARTMENTAL SERVICES.

When they have trouble with their cows—such as failure to breed, vaginitis, abortion, mammitis—many farmers say nothing about it. Others ask their neighbours, and generally end up by doing nothing, or else buy expensive remedies. When the disease has become serious and the financial loss heavy, some then decide to seek the advice of the dairy inspector or the Government veterinary surgeon; and when the officer arrives at the farm he is expected to perform a miracle and remedy the trouble immediately.

Officers of the Department are in the district for the farmers' benefit, and farmers are advised to communicate with them at the first sign of trouble.

Contagious abortion and mammitis are notifiable diseases under "*The Dairy Produce Acts,* 1920 *to* 1935."



Lung Worms in Cattle and Sheep.

Lung worms in cattle and sheep may become serious during late winter and spring. As a rule only the young animals are affected, and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters, and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given plenty of nourishing food to build up the animal's strength.

In very severe cases, an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

MANAGEMENT OF WINTER PASTURES.

The choice of a pasture mixture for winter grazing has to be based on a number of factors, including the average winter rainfall of the district, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, and the aggressiveness of weeds. Once a suitable mixture has been established it must not be considered "fool-proof," but should be managed with due regard to the pasture itself.

The temptation to over-stock paddocks during winter when the "broad acres" are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in milk, for breeding ewes, or for fattening stock. The pasture should not be stocked too early in the growing season, but should be allowed to make good growth before grazing. When a paddock is ready for grazing, the animals should be permitted to graze on it for about an hour each day and they should be removed sooner if they begin to lie down. Camping on the area should be prevented, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be put on to eat a paddock down within ten days or so, but the pasture must not be too closely grazed. "Flogging" a pasture of winter grasses and clovers will certainly be harmful. After the completion of a grazing, the harrows or wooden drag should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good growth before being grazed again. Sufficient paddocks of winter pasture should be provided to permit rotational grazing and to supply green, nutritious feed continuously throughout the cooler months of the year.

Certain of the annual winter pasture plants—e.g., Italian ryegrass, Wimmera ryegrass, and prairie grass—are self-seeding, and towards the end of the growing season pastures of these grasses must be left unstocked in order to permit the seed to ripen and shed. Areas which have been so treated should be lightly harrowed in early autumn to make a seedbed for the establishment of seedlings produced by the self-sown seed.

TWO WEEDS POISONOUS TO STOCK.

On the Darling Downs, in the Maranoa district, and in some other parts of Queensland, a very common weed may be seen in cultivation and along watercourses. It is upright in growth, about 3 feet high, with white flowers followed by a spiny seed pod, splitting at the top into four parts, and containing a large number of blackish seeds. In the districts mentioned, it generally goes under the name of castor oil, and the question is often asked if it is the true castor oil of commerce.

The fact is that the true castor oil is a different plant. The seed pods are superficially alike, but the plant is very much larger. Instead of being a small weed of cultivation, it is a shrub, or even a small tree, up to 10 feet high. It is very common around vacant allotments in coastal towns, and along creek and river banks in the near coastal districts. The seeds of the true castor oil are also poisonous, and have sometimes been eaten in the mistake that they would have the same

effect as a dose of castor oil. People who have accidentally or intentionally eaten the seeds have become violently ill, and it is said that in some cases even death has ensued. When the oil is expressed from castor oil seeds, the residue contains a poisonous principle, and this precludes the use of castor oil cake as a stock food.

The other plant is stramonium or thorn apple, and all parts of this plant are poisonous. It possesses a nauseating odour and flavour, and, because of this, the standing plant is rarely eaten by stock. On several occasions, however, the seeds and parts of the dried plant have been found as an impurity in chaff, and have caused the deaths of working horses and town cows. The seeds of this plant are the most poisonous part, and poultry should not be allowed to run where the plant is growing.

POLLED CATTLE AND THE CHILLED BEEF TRADE.

The need for hornless stock in the chilled beef trade has been stressed repeatedly by every section of the beef cattle industry.

In any programme of breeding or of grading up existing herds, the introduction of polled stock must be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. Increased numbers of polled bulls of both these breeds are being imported. The polled Shorthorns and Herefords are a comparatively recent development, and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called "natural polls," the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not well represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, conformation, and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them are hornless.

FOOD REQUIREMENTS IN A MAINTENANCE RATION.

All livestock rations are divisible into two parts—the part used for maintaining the body in a healthy condition, and the part used for production, whether it be for hair, wool, fat, meat, milk, or progeny. Under severe winter or drought conditions, the livestock owner is more concerned with a maintenance standard of feeding, and it becomes important to know where economies may most effectively be introduced.

A short consideration of an animal's reactions to starvation will supply the answer. Take the dairy cow in full lactation: the first defence which nature attempts is a conservation of material and the milk yield falls rapidly. Supplies to the body covering are restricted, and a dull, shaggy, lustreless coat develops. The body reserves of fat

are called on and the animal becomes thinner. Horns and hooves become brittle. As starvation advances, some encroachment is made on the last defences—the muscles and vital organs. At this stage, the animal weakens rapidly and collapse followed by death results. It is, therefore, clear that the last defences of the body—i.e., the muscles and vital organs—must be protected. For this purpose, the animal must be supplied with protein. In other words, drought feeding should centre round protein-rich foods. Where the stock are close to the source of such foods, the relative merits of each should determine which is to be fed, but on distant properties where freight charges are high it becomes important to buy the most concentrated and most digestible preparations.

Producers often remark that nature gave the sheep a commodius intestinal tract which must be filled, and they usually buy roughage of only moderate protein content. The argument is fallacious when the question is one of maintenance for limited periods only. It is surprising how well sheep can keep their condition on as little as two ounces of cotton seed meal and four ounces of maize daily.

The mineral requirements of stock should be provided for, but the excessive quantity of salt in many licks is unnecessary. Animals are capable of retaining enough salt for normal body functions from a very restricted intake, but lime and phosphate are continuously excreted and must be supplied in greater quantities. More than 30 per cent. of salt in a lick is rarely necessary, and in most cases it could well be less. Lime and phosphate are supplied in a number of forms, but on current prices well prepared sterilized bone meal containing about 20 per cent. protein is, apparently, the best.

SHEEP LAND FOR SELECTION AT CHARLEVILLE.

A resumption from Bulgroo and Kaffir Holdings has been surveyed as portion 1, parish of Bulgroo, and will be opened for Grazing Homestead Selection at the Land Office, Charleville, on Friday, 13th October, 1939. The portion, which has an area of 47,015 acres, is situated about 48 miles north-westerly from Quilpie.

The term of lease will be 28 years at an annual rental of $\frac{3}{8}$d. per acre for the first period of seven years.

A condition will be that the selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within the first three years.

The portion is described as good, sweet, fattening and breeding country, nicely shaded with gidya and boree, fairly well grassed with Mitchell, Flinders, button, blue, mulga, and other good grasses and herbages. It is watered by three earth tanks.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Charleville, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

OMMISSION.

In the August issue of the "Queensland Agricultural Journal" the following should be added to Plate 85, page 182; Plate 86, page 183; Plate 89, page 188; and Plate 90, page 189:—"(Magnification x 1200.)"

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale ..	White Leghorns and Australorps
E. J. Blake, Rosewood ..	Sunnyville ..	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
G. Grice, Loch Lomond ..	Kiama	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

INCUBATION HYGIENE.

It has been proved conclusively that some poultry diseases are transmitted within the incubators. Having this knowledge, it is recommended that every incubator operator should do all in his power to minimise the possibility of the spread of disease.

There is little or no difference in the hatching results of dirty and clean eggs, but the filth on eggs may act as a vehicle in carrying disease, whereas clean eggs minimise such possibilities. Therefore, the first thing to do in incubation hygiene is to clean all eggs before placing them in the incubator.

After the chickens have been taken from the incubator the trays should be scrubbed, using disinfectant in the water, and the interior of the machine washed out with a similar disinfectant solution.

The fumigation of the incubator after washing is another precautionary measure which will considerably minimise the possibility of disease being transmitted within the machine.

Fumigation is a very simple process, and the method recommended is both cheap and efficient. Formalin (40 per cent.) and permenganate of potash are used, the quantities varying in accordance with the cubic capacity of the incubator. The following quantities are recommended: Formalin two teaspoonfuls, permanganate of potash one teaspoonful (scraped level with the edge of a knife), to each 20 cubic feet. Put the container in which the permanganate of potash has been placed in the incubator and pour on the formalin, closing the doors immediately. The doors should be kept closed for at least ten minutes.

REARING OF CHICKENS.

The successful rearing of chickens is one of the most important points in poultry-farming. Any setback which chickens receive, especially during the brooding stage, will be reflected in their development. Too much trouble cannot be taken to ensure that the chickens are reared under the most satisfactory conditions that circumstances will permit.

A reliable brooder is one of the first considerations—one that will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm; and, at the same time, provide for plenty of fresh air. The brooder should be so constructed that the chickens can move away from the heat if the temperature is too high, and get back again without any obstruction. Much of the wastage of chicken life could be avoided if due regard were paid to these fundamental factors in brooding.

Suitable Cotton Varieties for the 1939-40 Season.

THE rapid expansion of the Australian cotton textile industry along certain lines of manufacture makes the growing of suitable varieties of cotton to supply the requirements of the spinners of the utmost importance to the cotton-growing industry in Queensland. The following recommendations of varieties capable of producing the required types of cotton are, therefore, made to assist farmers to choose the most dependable variety for their particular soil types and districts.

The most suitable variety for producing the $\frac{7}{8}$ to $\frac{15}{16}$ inch cottons on the alluvial soils of medium to good fertility in the southern district and in the South and Upper Burnett districts appears to be the Half and Half variety, which has yielded particularly well in these districts over a number of years. Some success has also been experienced with this variety in the Callide Valley, on the best of the fertile alluvials under good seasonal conditions, and also in the coastal areas. Half and Half reacts to droughty conditions, however, and should therefore never be planted on infertile soils or soils of low moisture-holding capacity. This variety produces medium-sized bolls, is generally a heavy yielder, is moderately early in maturity, picks well when grown under favourable conditions, and has the highest lint percentage of any cotton grown in Queensland.

Another most promising variety of the shorter-stapled cottons is New Boykin, which over a number of years has produced good yields of very uniform fibre. It appears to be more drought-resistant than Half and Half, and for that reason has a much wider range of adaptability, having been grown on the alluvial soils in all the main cotton-growing areas.

Several other medium-bolled, short-stapled cottons are also being investigated, but these cannot be released for commercial plantings until more information is collected regarding their behaviour on the various soil types of the different cotton-growing districts.

The requirements of the Australian spinning and manufacturing industries, in addition to $\frac{7}{8}$-inch cotton, at the present time demand a large proportion of $1\frac{5}{16}$-in. to 1-inch, with considerable $1\frac{1}{16}$-inch staple cotton, and it is obviously necessary that a considerable acreage be planted annually to varieties capable of producing these staple lengths. The varieties producing these requirements fall into the class of cottons known as the hard-bodied, big-bolled types, which are grown mostly on the forest slopes and on the scrub areas, particularly those soils originally under brigalow and brigalow-belah scrub.

The Lone Star variety appears to be very suitable for most of the clay loams of the lower slopes originally covered by ironbark and box trees of the forest series, and brigalow, brigalow-wilga, and brigalow-belah of the scrub series. For a long period this variety has yielded satisfactory returns on such soils in the Maranoa, the South, Central, and Upper Burnett. It is rather a vigorous grower on fertile, loamy soil and should therefore not be planted on alluvial loams in districts likely to experience heavy mid-seasonal rains. It produces large, well-opened bolls, chiefly 5-locked, that pick easily and contain good-charactered lint of from $1\frac{5}{16}$ to $1\frac{1}{16}$-inch staple lengths, according to soil and climatic conditions. It yields around 35 per cent. lint for the bulk stocks and considerably higher in some of the newer developed strains. Lone Star is undoubtedly a variety well suited for many of the districts, and should be grown wherever possible, as the lint is in great demand by the spinners.

Another big-bolled variety that is fast becoming a close competitor to Lone Star in some districts and one which should be grown to the fullest extent where conditions are suitable is the Miller variety, which has given excellent results on the clay loam soils of the lower forest and scrub slopes, as well as on the alluvial clays of moderate fertility in the Wowan, Callide Valley, Upper and South Burnett, and southern areas. It is somewhat earlier fruiting than Lone Star, and can therefore be planted on more fertile soil, but requires more moisture than does the latter variety, thus making it a better cotton for the heavier soils of the slopes in the coastal areas. The variety has proved to be jassid-resistant to a much greater degree than most other varieties, and is therefore recommended for planting in areas where this insect causes damage, such as the scrub areas of the South Burnett, Upper Burnett, and the Callide Valley. In the lastmentioned area, it is recommended for all areas except the more fertile alluvials. The bolls are large, and are very easily picked particularly on cultivations following grassland. The fibre is the fullest-bodied of any of the varieties being grown, and averages an inch in staple length, with a lint percentage of around 34. As a rule, rather high grades of lint are obtained from Miller, for the fibres clean up particularly well in the ginning process.

It will also be necessary to produce a substantial amount of the $1\frac{1}{8}$-inch staple cotton, and farmers who have obtained satisfactory yields of high-grade cotton with the Indio Acala variety should continue to grow this variety, particularly if it can be planted following grassland. It is advised, however, that there is little demand for the softer or yellow spotted grades of these longer cottons, and where growers of Indio Acala have received much of these grades it is recommended that the Miller or New Boykin varieties be tried.

It is stressed, though, that there is a bigger factor of safety for obtaining satisfactory yields of cotton of good quality from all varieties during the first three or four seasons following the breaking-up of grassland. After that, the changes in the chemical and physical condition of the soil that occur with further cotton cultivation make it necessary that the varieties be very carefully selected to suit the soil and climatic conditions. It is highly desirable, therefore, to practise cotton-grassland rotation in order that the most suitable land for growing cotton will always be available.

It is strongly recommended, however, that the farmer should apply to the field officer of the cotton section of the Department of Agriculture and Stock stationed in his district for advice as to the best variety for his conditions. Where there is no officer stationed, application should be made direct to the Department of Agriculture and Stock, Brisbane, for a large amount of evidence has been collected from experiments over a series of seasons as to the merits of the different varieties, which would be of assistance in determining the best variety, if the soil type and the age of cultivation are described by the inquirer.

CANE DISEASE INFESTED AREAS.

The amending clauses of "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," provide for the declaration of cane disease infested areas, and the subsequent creation of Cane Disease Control Boards, on lines similar to those which have obtained for many years in respect of cane pest infested areas and Cane Pests Boards.

In view of the serious potentialities of gumming disease in the Mulgrave district, downy mildew at Mackay, and Fiji and downy mildew diseases in Southern Queensland, the following areas have been declared to be cane disease infested:—

1. Mulgrave (comprising the Mulgrave Mill area).
2. Mackay (comprising the Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, and North Eton Mill areas).
3. Bundaberg (comprising the Bingera, Fairymead—excepting that portion lying within the Parish of Gregory—Gin Gin, Millaquin, and Qunaba Mill areas).
4. Isis (comprising that portion of the Isis Mill area lying within the Parishes of Childers, Gregory, and Booyal).
5. Maryborough (comprising the Bauple and Maryborough Mill areas and that portion of the Isis Mill area lying within the Parishes of Vernon and Urangan).
6. Moreton (comprising that portion of the Moreton Mill area lying north of the Brisbane River).

Steps have now been taken to constitute Disease Control Boards for the above areas, and it is anticipated that the operation of these Boards will bring about a distinct improvement in the disease situation.

—A.F.B., in "The Cane Growers' Quarterly Bulletin."

Cultivating New Banana Land.

THE benefit to be derived from a thorough breaking up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need of improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus

content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased, or at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

THE FARM TRUCK AND TRACTOR.

Running the tyres at an incorrect inflation pressure is the most common form of tyre misuse. Under-inflation causes excessive flexing of the outer cover, which results in the canvas walls cracking and ultimately collapsing. Excessive flexing of the tyre also distorts the tread, which abrades on the road surface.

A low-inflation pressure, on the other hand, allows the tyre to be trapped against the wheel rim, leading to concussion bursts. Excessively distorted twin tyres rub against one another.

The correct inflation pressure for the load carried should be found out from the vehicle or tyre manufacturer's representatives, every care being taken to maintain them and checking with an accurate gauge at frequent intervals. Tractor tyres are run at extremely low pressures to get a grip on soft or uneven ground, but such pressures should be used only when conditions demand them.

Tractor tyres last longer when run at maximum possible pressures, provided 30 lb. per square inch is not exceeded. Loss of pressure may be due to perished valve seatings or inner tubes; the former should be replaced at least once a year, and new inner tubes should always be fitted with new outer covers. Constant use of valve caps further ensures a safe air seal.

Over-inflation of tractor tyres causes rapid wear at the centre of the tread, and concussion bursts will be more likely as a result of higher strains thrown on the canvas of the outer cover when striking obstacles.

Road camber, too, tends to impose greater load on the inner tyre of a twin wheel, which should, therefore, be run at a pressure of 5 lb. per square inch below normal.

Regular removal of sharp objects from the tyres and stopping up the cuts with a special "tread-filling" compound do most to prevent rapid deterioration. When front, rear, and spare tyres are of the same size and type—but only then—even wear can be obtained by periodically exchanging their positions.

If tyres run out of true the tread will suffer seriously from abrasion. The sources of such trouble are loose wheels and bearings, and play in steering connections and swivel pins. Another cause is misalignment, which usually results from minor collisions and driving over kerbs, &c.

Damage is frequently caused by front tyres fouling chassis parts when the steering is locked hard over. The "toe in" of front tyres should be between nil and $\frac{1}{8}$ inch (this is obtained by adjusting the track rod). Rusty and distorted rim flanges damage the beading and break up the base of the tyre wall, while brake grab causes skidding and heavy tread wear.

Much as care in maintenance does to reduce tyre costs, this can be offset by careless driving. High road speed and violent acceleration and braking cause excessive tyre wear—especially on rough roads. Overloading has the same effects as under-inflation and a short period of excessive overloading.

Oil plays havoc with rubber, and a hot sun on a stationary tyre is equally bad. It is essential for all tyre repairs to be effected as soon as possible, for all types of damage rapidly become worse. This is especially so where cover lacerations expose the canvas to the weather.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions have continued to be satisfactory with payable prices prevailing for all fruits. With warmer weather the demand for good quality fruit should be maintained, with prices on a satisfactory basis. Winter troubles such as black heart in pineapples and rubbery bananas should soon disappear.

The Brisbane Exhibition provided a great display of quality fruit, covering a wide range of variety. Tropical and temperate fruits were all shown in a display which, possibly, has never been bettered. Judging by the interest shown by visitors from New Zealand and Southern States it would be safe to assume that displays of this kind give far better advertising results than most other methods used. In the Court of the Department of Agriculture and Stock many interesting observations were made of the condition the different fruits maintained in their various containers. For the second year in succession strawberries kept better in boxes, no waste being apparent, while a high percentage of waste developed in the trays used for Southern export. This result was obtained from two different supplies of berries. The first picking was four days after heavy rain, while the second seven days after. The tomatoes displayed were also an object lesson to those growers who persist in picking green tomatoes to send to Southern markets. The fruit shown had been harvested on the Thursday before the Exhibition and all showed one quarter colour. When examined on the Monday after the Exhibition no waste was found. This was eleven days after harvesting, and the fruit was still in a saleable condition.

Considering the warm conditions prevailing during the display all fruits kept well, being a silent tribute to those who so carefully handled and prepared it for exhibition.

By making careful handling a habit, coupled with the observance of sensible maturity standards, the supply of quality fruit to the public can be considerably expanded.

Prices during the last week of August were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 10s. to 11s. 3d.; Sixes, 11s. to 13s.; Sevens, 13s. to 15s. 6d.; Eights and Nines, 14s. 6d. to 16s. 6d.

Sydney.—Cavendish: Sixes, 10s. to 14s. 6d.; Sevens, 14s. to 17s.; Eights and Nines, 17s. to 20s.

Melbourne.—Cavendish: Sixes, 12s. to 14s.; Sevens, 13s. to 16s.; Eights and Nines, 15s. to 18s.

Adelaide.—Cavendish: 18s. to 21s. per case.

Some lines on Southern markets showing squirter.

Lady's Finger, 2d. to 10d. per dozen. Inferior lower.

Pineapples.

Brisbane.—Smoothleaf: 4s. to 7s. case. Ripley, 4s. to 6s. case; 1s. to 3s. 6d. dozen.

Sydney.—Smoothleaf: 6s. to 10s. case.

Melbourne.—Smoothleaf: 7s. to 10s. case.

Adelaide.—Smoothleaf: 11s. to 15s. case.

Green fruit hard to place on Southern markets.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. to 4s. 6d. bushel; Locals, 1s. 6d. to 3s. bushel.

Sydney.—6s. to 14s. tropical case.

Melbourne.—8s. to 12s. tropical case.

Custard Apples.

Brisbane.—4s. 6d. case. The season for this fruit is now drawing to a close. Prices throughout the season have been satisfactory.

Monstera Deliciosa.

6s. per dozen.

Avocados.

Brisbane.—8s. to 12s. case.

Passion Fruit.

Brisbane.—Firsts, 8s. to 10s.; Second Grade, 5s. to 7s. 6d.

Sydney.—5s. to 9s. Special Grades higher.

CITRUS FRUITS.

Oranges.

Brisbane.—Valencias and Commons: Howard, 6s. to 9s. bushel; Locals, 5s. to 8s. 6d. bushel Southern Navels, 8s. to 11s. bushel.

Mandarins.

Brisbane.—Ellendale, 12s. to 16s. case; Emperor, 9s. to 12s. case; Glens, 12s. to 16s. case. Inferior lines lower.

Grape Fruit.

Brisbane.—6s. to 9s. bushel case.

Lemons.

Brisbane.—5s. to 9s. bushel case. Specials higher.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 6s. to 13s.; Sturmer, 6s. to 8s.; Granny Smith, 8s. to 13s.; Democrat, 7s. to 10s.; Cleopatra, 8s. to 11s.; French Crab, 5s. to 8s.; Yates, 10s. to 13s.; Scarlets, 8s. to 10s.

Pears.

Brisbane.—Josephine, 8s. to 13s.; Parkham's Triumph, 6s. to 11s.; Winter Nelis, 9s. to 13s.; Winter Cole, 9s. to 15s.

Strawberries.

Brisbane.—4s. 6d. to 8s. box. Some Specials higher.

Sydney.—Trays, 2s. to 4s.; boxes, 6s. to 11s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 4s. to 8s.; coloured, 4s. to 9s.; green, 3s. to 7s.

Sydney.—Cleveland, 8s. to 16s.; Local hothouse to 19s.

Cape Gooseberries.

5d. to 6d. lb.

MISCELLANEOUS VEGETABLES, &c.

Cucumbers.—Melbourne: 14s. to 16s. case.

Pumpkins.—4s. 6d. to 5s. 6d. bag.

Marrows.— 1s. 6d. to 3s. 6d. dozen.

Lettuce.—6d. to 1s. 6d. dozen. The improvement in quality of lettuce packed in boxes is most noticeable.

Cabbages.—1s. 6d. to 5s. dozen.

Cauliflowers.—5s. to 9s. dozen; smaller lower. Stanthorpe, 8s. to 12s.

Beans.—Brisbane, 8s. to 12s. sugar bag; inferior lower. Melbourne, 6d. to 9d. lb. Sydney, 8s. to 11s. case.

Peas.—Brisbane, 7s. to 9s. case; inferior lower. Melbourne, 4d. to 7d. lb.

Beetroot.—3d. to 9d. dozen.

Chokos.—9d. to 1s. 6d. dozen.

Carrots.—3d. to 9d. bundle.

Celery.—Local, 9d. to 2s. bundle; South Australian, 15s. to 17s. crate.

Rhubarb.—9d. to 1s. 6d. bundle.

TOOL SHARPENING.

Few "amateurs" make a success of sharpening chisels and plane-cutters, yet the conditions for success are only a suitable stone and lubricant, and a correct grip on the tool. The latter can be acquired only by constant practice, after expert demonstration, but the problem can easily be avoided with the appliance shown.

The device is for use on a circular stone. Correct angle is obtained by varying the distance between cutting edge and roller.

This matter of bevel angle is of some importance. The more orthodox type has two bevels, one made by the grindstone, at an angle of 25 degrees, and a sharpening bevel of about 35 degrees. Irons of exceptionally tough steel, such as are used in

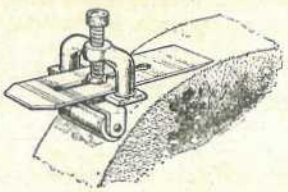


Plate 160.

all-metal planes, need less support at the edge, and are sharpened to a single bevel of 25 degrees. As a guide, this angle is often engraved on the cap iron.

Fine carborundum is a good general-purpose type of stone, and if found too fast-cutting, may be toned down by soaking in a tin of molten vaseline.

Use non-gumming oil, and wipe the stone clean after use. Neatsfoot is regarded as best, but many craftsmen use a highly refined lubricating oil. An uneven stone may be levelled by rubbing on a large flat stone with sand and water.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of July, 1939. (273 days unless otherwise stated.)

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard 350 lb.).				
Laguna Venus II.	F. G. Lamkin, Kaimkillenbun	11,478·78	463·461	Morden Marcus
Senior, 4 Years (Standard 330 lb.).				
Rosemount Doreen 42nd.	Rex Tweed, Kandanga	8,746·2	369·597	Springdale Jupiter
Junior, 4 Years (Standard 310 lb.).				
Fairvale Ethel	J. H. Anderson, Fairvale, Southbrook	9,117·69	397·006	Blacklands Stately Major
Senior, 3 Years (Standard 290 lb.).				
Palmeto Model	Rex Tweed, Kandanga	7,947·7	357·579	Glengallon Major
Junior, 3 Years (Standard 270 lb.).				
Happy Valley Model's Empress	R. R. Radel, Happy Valley, Coalstoun Lakes	8,117·15	338·336	Burradale Emperor
Croydon Fedora	T. Knopke, Summer Holm, Laidley	7,774·48	302·703	Mount Blow, Mikado
Senior, 2 Years (Standard 250 lb.).				
Bri Bri Cherry 13th.	A. T. Paull, Bowenville	6,836·02	339·704	Bri Bri Royal Prince
Bri Bri Angeline 9th.	A. T. Paull, Bowenville	6,441·81	300·653	Radford Patrol
Alfa Vale Gwen 8th. (257 days)	F. G. Lamkin, Kaimkillenbun	7,729·91	290·852	Reward of Fairfield
Happy Valley Ailsa	R. R. Radel, Coalstoun Lakes	6,041·65	279·098	Sunnyview Artist
Bri Bri Sunray II.	A. T. Paull, Bowenville	5,762·33	265·83	Radford Patrol
Calrossie Model	D. L. Lithgow, Calrossie, Jandowae	6,550·45	260·884	Sunnyside Major

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Star 5th of Alfa Vale	W. H. Thompson, Alfa Vale, Nanango	10,169·5	424·379	Reward of Fairfield
Glenroy Betty	W. F. Kajeswki, Glenroy, Glencoe	10,093·7	410·147	Parkview Glider
Glenroy Bluebell 2nd.	W. F. Kajewski, Glenroy, Glencoe	9,539·6	400·02	Blue Boy of Glenthorn
Glenroy Millie 2nd.	W. F. Kajewski, Glenrov, Glencoe	8,547·7	381·71	Blue Boy of Glenthorn
Daisy of Happy Valley	R. R. Radel, Happy Valley, Coalstoun Lakes	8,457·11	346·483	Molly's Hero of Glenthorn
Springleigh Primrose 5th.	H. F. Moller, Springleigh, Boonah	7,728·25	314·543	Burradale Ronald
Happy Valley Buddy	R. R. Radel, Happy Valley, Coalstoun Lakes	6,363·15	304·058	Sunnyview Artist
Calrossie Dolly	D. L. Lithgow, Calrossie, Jandowae	7,053·96	289·878	Sunnyside Major
Mountain Home Violet 2nd.	M. C. Lester, Laidley Creek West	7,505·12	236·423	Sunnyview Alert

JERSEY.

MATURE COW (STANDARD 350 LB.).

Retfords Bracken Snowdrop	W. S. Conochie, Sherwood	9,036·55	508·404	Retford Brown Victor
Brooklands Desert Majesty (223 days)	W. S. Conochie, Sherwood	9,262·65	440·315	His Majesty of Dalebank
Lyndhurst Peerless	W. Semgreen, " Tecoma ", Coolabunia	6,912	436·921	Retford's Brunettes Noble
Westbrook Tulip 44th.	Farm Home for Boys, Westbrook	8,429	403·563	Westbrook Prince
Trecarne Rosella 4th.	T. A. Petherick, Lockyer	8,260	401·313	Trinity Officer

JUNIOR, 4 YEARS (STANDARD 310 LB.).

Brooklands Royal Rosina	W. S. Conochie, Sherwood	9,770·1	441·807	Retford Earl Victor
Oxford Remus Syria	R. J. Crawford, Inverlaw, Kingaroy	7,168·15	406·734	Overlook Nancy's Remus

SENIOR, 3 YEARS (STANDARD 290 LB.).

Hamilton Fancy	A. H. Steiler, Lanefield	6,765·25	345·755	Retford Mays Victor
Woodbine Bessie	J. Williams, Woodbine Stud, Wondai	6,786·5	326·955	Brooklands Royal Gift
Westbrook Tulip 67th.	Farm Home for Boys, Westbrook	6,959·45	293·085	Oxford Gem's Ambassador

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Lermont Golden Gem	J. Schull, Lermont, Oakey	6,230·35	294·379	Woodside Golden Volunteer
Westbrook Bells 3rd.	Farm Home for Boys, Westbrook	5,388·3	286·903	Oxford Golden Dreamer

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Hamstead Olivette 3rd	J. H. C. Roberts, 230 Herries Street, Toowoomba	6627·4,	298·035	Kelvinside Ellerson
Hamilton Bangle	H. H. Steiler, Lanefield	5,558·65	295·916	Retford May's Victor
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Glenview Rayon	Geo. Harley, Childers	7,342·7	401·258	Trinity Governor's Hope
Inverlaw Golden Belle	R. J. Crawford, Inverlaw, Kingaroy	6,018·3	323·548	Oxford Royal Lad
Inverlaw Patsy	R. J. Crawford, Inverlaw, Kingaroy	5,973·72	322·253	Oxford Royal Lad
Westbrook Sultane 3rd	Farm Home for Boys, Westbrook	6,347	311·354	Oxford Gem's Ambassador
Glenmoore Silver Belle	L. J. Comiskey, Warra	5,620·4	290·659	Glenmoore Vile King
Oxford Snowflake 2nd	Farm Home for Boys, Westbrook	5,352·8	251·514	Oxford Peer
Ashview Grace	C. Huey, Ashview, Sabine	4,940·8	250·787	Martinville Duke
	FRIESIAN.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Cressbrook Chloe Regina 2nd	F. C. Noller, Kumbia	8,315·42	345·79	Burnbrae Rex
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Cressbrook Glorie Star 2nd	F. C. Noller, Kumbia	8,695·14	332·005	Burnbrae Gulvallis Starlight
	GUERNSEY.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Laureldale Lola	W. A. Cooke, Laureldale, Witta	7,307·25	345·17	Linwood Favour
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Laureldale Velvet	W. A. Cooke, Laureldale, Witta	5,805·1	252·046	Laureldale Ranie Prince
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Laureldale Calm	W. A. Cooke, Laureldale, Witta	5,935·35	272·348	Laureldale Resident

General Notes

Staff Changes and Appointments.

Miss E. M. O'Sullivan has been appointed assistant cane tester for the remainder of the sugar season at the Mulgrave mill.

Constable H. D. Vohland (Mount Molloy) has been appointed also an inspector under the Slaughtering Act.

The following members of the Noosa Shire Council has been appointed honorary protectors under "*The Fauna Protection Act of* 1937" in respect of the sanctuary for fauna recently declared in part of the Noosa Shire:—Messrs. W. I. Ferguson, (Cooroy), J. M. McKane (Cooran), W. B. Grady (Kin Kin), J. F. P. Walker (Kin Kin), A. E. W. Cooper (Pomona), D. H. Uhlmann (Pomona), J. J. Galloway (Pomona), W. Cambage (Cooroy), F. T. Bryan (Cooroy), R. J. McAnally (Cooroy), and R. T. Read (Tewantin).

Mr. A. T. Sewell (Emerald) has been appointed an honorary protector under the Fauna Protection Act in connection with the fauna sanctuary declared last week, and embracing portion of the Nogoa River, near Emerald.

Mr. J. D. Stevens (Albany Creek) and D. Herron (Dalrymple Heights, via Mackay) have been appointed honorary protectors under "*The Fauna Protection Act of* 1937" and honorary rangers under "*The Native Plants Protection Act of* 1930."

Constable A. A. Anderson (Nerang) and Constable G. Beikoff (Chillagoe) have been appointed also inspectors under the Slaughtering Act.

Constable A. D. McPhail (Mackinlay) has been appointed also an inspector under the Brands Acts.

Mr. J. J. Banks (Northam avenue, Bardon) has been appointed an honorary protector under the Fauna Protection Act.

Messrs. J. H. Schmitz (Wave Hill, Gin Gin) and H. J. Hampstead (Kilcoy) have been appointed honorary protectors under the Fauna Protection Act and honorary rangers under the Native Plants Protection Act.

Mr. A. J. McRobbie, South Johnstone, has been appointed millowners' representative on the South Johnstone local sugar cane prices board, vice Mr. F. Martinez, resigned.

Messrs. E. A. Davies, F. T. Adkins, H. J. House, F. Pragnell, K. Curtis, C. J. Payne, N. Stanley, L. Wehlisch, G. Stringfellow, G. Flesser, and J. Hempsall, of Canungra, have been appointed honorary protectors under "*The Fauna Protection Act of* 1937," and honorary rangers under "*The Native Plants Protection Act of* 1930."

Wild Life Preservation—A Proserpine Sanctuary.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937," declaring Funnel Bay and Jubilee Pocket in the Proserpine District to be a sanctuary for the protection of fauna. Mr. J. E. Langford, of Proserpine, has been appointed an honorary protector for the sanctuary and also an honorary ranger under the Native Plants Protection Act.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" declaring the property of Mr. F. Hungerford, near Biloela, to be a sanctuary, and that Mr. Hungerford has been appointed an honorary protector for the sanctuary.

Canary Seed Hail Insurance.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts, providing that the canary seed hail insurance regulations shall have no force or effect in respect of canary seed planted during the year 1939.

Isis Mill Quarantine Area.

A Proclamation has been issued under the Sugar Experiment Stations Acts declaring portion of the Isis mill area to be a quarantine area in respect of Fiji disease of sugar-cane. The nature of the quarantine to be imposed therein shall be the prohibition of the removal of sugar-cane of any variety (except for milling at Isis mill) from one plantation to another within the quarantine area unless permission in writing for such removal shall have first been granted by an inspector.

Fruit Marketing—Sectional Group Committees.

Certain regulations under the Fruit Marketing Organisation Acts have been re-issued, and provide that every qualified member of a local association within the electorate concerned shall be eligible to vote for the return of a member or members to the banana, pineapple, citrus, other fruits, and deciduous sectional group committees, and that where partners are owners, part owners, or tenants, those persons who are working partners shall be allowed to vote.

Hail Insurance.

The Barley Board hail insurance scheme regulations issued in 1930, and amended in 1934, have been further amended and added to. These amendments bring the Barley Board scheme into line with the State Wheat Board, and provide, briefly, that crops of barley, either fully or partially out in ear, shall be covered only during the period in each crop year commencing on the 16th August and continuing until the 31st January following. No compensation shall be payable in respect of hail-storm damage, unless a return in the prescribed form, or similar notification in writing, has been lodged with the board on or before the 30th September, 1939, in respect of the crop of that year, or before a date to be determined by the board from time to time, but not later than 15th September in any other year.

Notifications shall be made to the board within 48 hours after damage to barley by hail. The board shall appoint assessors for the purpose of assessing losses.

Compensation payable under the scheme shall be by advances determined by the board as being the value of the barley on the stalk at the time of harvesting, but compensation payable from the hail insurance compensation fund in the aggregate in any one year may not exceed 7½ per cent. of the total value of the barley insured in the same year, and shall be apportioned *pro rata* on the losses sustained.

Moreton-Mapleton Cane Quarantine Areas.

Two proclamations have been issued under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," declaring the Moreton mill district and an area embracing Mapleton to be quarantine areas under the Acts because of the presence of Fiji disease of sugar-cane. The nature of the quarantine shall be the prohibition of the removal of sugar-cane of any variety (except for milling at Moreton mill) from any plantation within such quarantine areas, and the prohibition of the planting or transplanting of sugar-cane of the variety P.O.J. 2878.

North Eton Mill Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the North Eton Mill Suppliers' Committee to make a general levy for administrative purposes on growers of sugar-cane who are suppliers to the North Eton mill at the rate of ½d. per ton on cane delivered by each grower allocated to the No. 1 Pool. The committee is only desirous of collecting the levy on cane required to fill the mill's peak quota, and each grower will be given a proportion of his estimated deliverable cane for delivery into the Pool.

Canary Seed Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Canary Seed Board from 1st June, 1939, until 30th June, 1940.

Messrs. S. J. Gilmour (Cambooya), W. A. Ross (Macalister), and the Acting Director of Marketing have been appointed members of the Board until the 30th June, 1940.

Plywood and Veneer Board Levy.

The Plywood and Veneer Board levy, the proceeds from which are used to provide for the administrative expenses of the Board, has been extended for the period from 3rd May, 1939, to 2nd May, 1942. The levy is at the rate of 3d. per 100 feet face measurement on plywood three-sixteenths of an inch or less in thickness and on veneer three-sixteenths of an inch in thickness, and on plywood or veneer of a greater thickness than three-sixteenths of an inch and on veneer of a lesser thickness than three-sixteenths of an inch at the rate per 100 feet face measurement which bears the same proportion to 3d. as the thickness of the plywood or veneer bears to three-sixteenths of an inch.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

A Native Rosemary.

D.G.McA. (Clifton)—

The native rosemary (*Cassinia lævis*) is a shrub with very narrow, fine leaves, and a peculiar resinous smell. Its name is derived from this smell, which is somewhat like that of rosemary.

In the Inglewood district, several graziers have complained that their lambings have dropped, and they considered that native rosemary was the cause of the shrinkage. It appears that the lambs died a day or so after birth. Before these complaints from Inglewood, we had never heard of this plant being harmful to stock. It has been suggested that the oil which gives the plant its peculiar smell may be the cause of the trouble. In some of the Inglewood country, after ring-barking, the native rosemary, at times, overgrows a large part of the flat country. It eventually kills the grass out, and makes mustering of the sheep difficult.

We shall be glad to identify any samples of plants that you care to send along.

Broad-leaved Carpet Grass.

J.H. (Ormeau)—

The specimen is the broad-leaved carpet grass, *Axonopus compressus*. It is a native of North America. This grass is not such a menace to pastures as the narrow-leaved carpet grass (*Axonopus affinis*). Stock eat the broad-leaved kind much more readily than the other. The narrow-leaved species is often called mat grass, and is the species which is threatening paspalum pastures.

If your pastures consist principally of paspalum and water couch, it might be worth your while to eradicate the broad-leaved carpet grass before it gets a strong hold.

Plants from Ingham District Named.

E.L. (Project Club, State School, Long Pocket, via Ingham)—

Your specimens have been determined and are reported on as follows:—

11. Giant spear grass, *Heteropogon triticeus*. A tall, coarse, grass of very limited feed value.
12. Bunch spear grass, *Heteropogon contortus*. A coarse grass of very limited feed value, except when very young.
13. Giant Couch, *Brachiaria mutica*. An introduced grass, with a high reputation as fodder, especially in tropical localities. It is partial to damp situations, such as river flats.
14. *Ischæmum australe*. Generally considered to be a fairly good grass in poor, sandy, coastal soils.
15. Ditch millet, *paspalum orbiculare*. Nutritionally, an inferior grass.
16. Rice grass, *Leersia hexandra*. A fairly good grass.
17. *Paspalidium distans*. Mostly assumed to be a fairly nutritious grass, but is often sparsely distributed.
18. Crow's foot grass, *Eleusine indica*. Very common about yards where there is traffic. Often eaten by stock when there is a scarcity of other finer grasses.
19. Red Natal grass, *Rhynchelytrum repens*. Introduced here from South Africa. Stock are fond of it, but it is fairly easily pulled out by the roots by grazing stock .
20. River grass, *Chionachne cyathopoda*. Reputed to be a fairly good fattening grass, although rather coarse.

A Flinders Grass.

J.B. (Jimbour)—

The specimen is *Iseilema membranacea*, one of the Flinders grasses, of which there are about ten species. The Condamine-Surat district is on the eastern margin of Flinders grass country, and it becomes more prevalent and does better further west. It is not reputed to stand heavy stocking, and tends to be eaten out in that district. The seed germinates very rapidly after a little rain, and the grass reaches maturity sometimes within a couple of months. The seed heads are numerous and nutritious, being licked up from the ground by cattle in some districts. This accounts for its dying out, but where cracks occur in the soil much of it is then retained for the following year.

Rather conflicting reports have been received as to its palatability, but, on the whole, it generally seems to be eaten both green and dry in the drier districts. Where rain falls on the dried grass, however, it soon goes mouldy, and is generally left alone then, although we have heard of a case where horses were said to relish it in this condition.

It is doubtful whether the grass would be of much use as a winter one, although good stands of it have been seen in late autumn and early spring. Its occurrence seems to be mainly controlled by the time of rainfall.

Although it is regarded as a good fattening grass, actual nutritive comparisons with Mitchell grasses are difficult to make, since the analyses of grasses at different stages of growth and in different districts show quite a wide variation. It must also be remembered that, whereas Flinders grass is an annual and only lasts a few months, the Mitchell grasses are perennial and last a number of years.

Poisonous Plants and Some Others.

G.R.S. (Biggenden)—

1. A daisy burr, *Calotis cuneifolia*.
2. Barbed-wire vine, *Smilax australis*.
3. Common lantana, *Lantana camara*.
4. Yellow-wood, *Vitex acuminata*.
5. White passion vine, wild passion vine, *Passiflora alba*.
6. Berry saltbush, *Rhagodia hastata*.

Of these plants, Nos. 3 and 5 are known to be poisonous. The remainder are not known to cause trouble in stock. A pamphlet on the lantana and its poisonous properties has been posted to you, and it will give you an idea whether it is the lantana which is the cause of the trouble.

We are referring your letter to the Director, Animal Health Station, Yeerongpilly, for an account of the symptoms caused by wild passion vine, *Passiflora alba*.

Peach leaf poison bush (*Trema aspera*) occasionally develops a prussic acid forming substance, and is then poisonous.

Cestrum Parqui.

J.R. (Yeerongpilly)—

The specimen is from *Cestrum parqui*. The plant is poisonous. It contains parquine, a poisonous alkaloid, the action of which is similar to that of strychnine and atropine. The species is a native of Chili. We have noticed that the odour of the flowers changes during darkness. In the daytime is is faint and disagreeable, resembling that of the crushed leaves. At night, however, the odour is very pleasant and spice-like, and much stronger than in the daytime.

Narrow-leaved Carpet Grass.

D.T.A. (South Johnstone)—

The specimen is narrow-leaved carpet grass, *Axonopus affinis*. It is generally regarded as quite a useful fodder on poorer sandy country where better grasses will not thrive, although it is not so good as another species, broad-leaved carpet grass, *Axonopus compressus*. Both grasses have caused a good deal of controversy in Southern Queensland and the northern New South Wales dairying districts, where it is said of them that they enroach on the better-class paspalum pastures and lower their carrying capacity.

Rural Topics

Eggs in the Balance.

Should eggs be sold by number or weight? Eggs of the domestic hen have been regarded for untold centuries as one of the most nourishing and palatable of foods. Eaten raw or cooked in any one of a hundred ways, they formed a staple article of diet long before men of science discovered their vitamin content. Their abundance or scarcity has ever been a matter of moment to housekeepers and cooks.

One aspect of egg production which has always been a source of complaint to the shrewd housewife is the varying sizes in which eggs are laid. A suggestion has been made by an influential deputation to the Minister for Agriculture in Victoria that eggs should be sold retail by weight and not by number. The Minister, who expressed a well-founded belief that eggs had been sold by the dozen for at least 2,000 years, thought the proposal "pretty revolutionary." He was promptly given figures which were claimed to prove that the present way of selling eggs is no good to either the poultry farmer or the housewife. Weights quoted by the deputationists showed that many eggs sold weighed less than two ounces, while larger eggs were picked out by retailers and sold at a higher price, of which the poultry farmer got no benefit. It was further claimed that producers should be paid for what they sold, and consumers should get exactly what they paid for. The suggestion is "under consideration."

Offences Against Good Marketing.

What amounts to "courts of correction," with chairmen possessing legal qualifications and experience, will be set up to deal with offenders against the agricultural marketing schemes, if proposals made by a departmental committee are adopted by the British Government.

This committee was appointed by the British Treasury to consider the powers of marketing boards to impose and recover fines from offending farmers. The committee points out that the marketing boards in Great Britain have had to build up their procedure without statutory precedents to guide them, and expresses the view that the boards have done their best to carry out their difficult task of maintaining marketing discipline with dignity and justice.

Lawn Clippings as Silage.

In Wiltshire, England, the question of disposing of grass clippings from lawns and fields has been profitably solved. When grass is cut continually during the growing season, the clippings on one property, estimated to amount to about 40 tons, are converted to ensilage. Two low silos were built at a cost of about £4 each. The cut grass was evenly spread, trodden, and uniformly sprayed with a 2 per cent. solution of molasses. The temperature aimed at was 80 deg. Fahr. The grass was analysed before and after six months' treatment, and was fed to cattle as a supplement to hay. The 45 tons of silage actually obtained led to a saving of at least 20 tons of hay. There is an idea worth considering in that report.

Stock Food from Sharks.

In England, 80 per cent. of the concentrated feed to stock and poultry comprises fish meal. In an endeavour to introduce fish meal and fish oil obtained from sharks on the Australian coast, a southern fishery firm has bought sufficient plant for installation at a Blacktown piggery, near Penrith, New South Wales, to exploit shark by-products, which, at present, are dumped as waste.

Although pigraising is only a sideline to the firm's trawling activities, the farm is run on strictly practical lines with some of the best blood stock procurable.

A new machine will be one of the first, if not the first, of its kind in Australia. It cooks the shark and turns it out as fish meal in one operation. Only the head, liver, and fins are removed, the balance being taken by the machine, which, after cooking it for four hours, grinds it fine. The heads of the sharks have to be rejected because of their high glue content, but nothing else is lost. The fins are dried and supplied to the local Chinese community, who take as many as can be supplied. From the shark liver comes the valuable fish oil, extracted under great pressure. All the pigs shown by the owners of the enterprise at the last Sydney Show were in the award list.

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown raw crops in order to eradicate weed growth and maintain a surface mulch, for much of the summer rains falling on a caked surface soil will not penetrate to any great depth. To check losses of soil during summer storms, all raw crops should be sown at right angles to or athwart the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, may be continued and sweet potatoes planted out.

Increased attention may be given to the sweet sorghums such as "Saccaline," both in the coastal areas and on the Downs. On the Downs the crop has been profitably fed to cattle, horses, and sheep.

For the western Downs and Maranoa, farmers are advised to make sowings of sudan grass, which has proved outstanding in recent years as a summer crop, being utilised for grazing, hay, or silage.

An endeavour should be made to reduce the tonnage of feedstuffs annually brought in from the Southern States, for with the exception of oat grain, and possibly small quantities of prime oaten chaff, local growers should be in a position to provide State requirements of lucerne, wheaten and oaten chaff, sudan chaff, millet, and panicum chaff, stover, and other fodders.

Some interest is also being taken in the cowpea as a summer growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum). Suitable varieties are groit, poona, brabham, and black. October is an opportune month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub burns or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed per acre, adding white clover seed at the rate of 2 lb. per acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed.

No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub "burn," as it is essential to plough or renovate sufficiently to provide cover for the seed. From 4 to 6 lb. of tested seed per acre will usually provide a good stand.

In the wheat areas, hay-making will be in progress where crops are not too far advanced for this purpose. Crops cut a few days after the flowering stage will contain the maximum nutritive value, the nutriment being then spread evenly throughout the plant.

A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour.

As harvesting becomes general during November, all necessary machinery should be given a thorough overhaul, in order to avoid stoppages at a critical period.

THE VALUE OF FARM EXPERIMENT PLOTS.

An experiment plot on a farm in any district is valuable to all the farmers in the district, as it gives a definite guide as to local crop needs. Take a fertilizing experiment, for example; soil conditions vary in different localities, and, consequently, a fertilizer which gives good results in one place may show nothing like similar results in another. Therefore, it is suggested that a point should be made of visiting any experiment plot which has been laid down in a farmer's own neighbourhood, and see for oneself the results obtained from the different fertilizers used in the plot. The same principle applies to any other kind of experiment plot.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is usually a dry month over the greater part of Queensland, consequently the advice given in the notes for August and September on the necessity of thorough cultivation to retain moisture may be again emphasised. Thorough cultivation of all orchards, vineyards, and plantations is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch.

All newly planted trees should be watched carefully and if they show the slightest sign of scale or other pests they should receive attention at once.

Bananas.

In the warmer districts, banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done, before the winter, young plantations planted the previous season should be desuckered without delay. Those desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of Paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation will be several years during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care should be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. per acre. Keep down weeds wtih the Dutch hoe; but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are cut or disturbed with horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus prevent much fungus trouble in the summer pack.

THE GRANITE BELT SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment the orchard and vineyard get the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards should be kept loose. In the western districts, irrigation should be given whenever necessary, but growers should not rely on irrigation alone, and should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch to prevent surface evaporation.

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

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

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

THE BRANDING OF STOCK.

The attention of stockowners is directed to the necessity for following the rules of branding, especially in regard to re-branding.

The Brands Act provides that the second or subsequent brander must, if there is room, imprint his brand on his stock at a distance of not less than 1½ inches nor more than 2½ inches from and directly underneath the previous brand.

If there is not room, the re-branding must be done on the next succeeding position, *and on the same side of the animal as the preceding brand in the case of cattle*, thus confining the branding of cattle to one side.

The size of all brands is restricted to not less than 1¼ inches in length, or more than 2½ inches in length for horses and cattle.

Owners are advised to note their obligations in these matters, the observance of which will help to lessen the present unnecessary deterioration of hides through excessive and incorrect branding.

Our Babies.

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

FATHERCRAFT.

MOST people are familiar with the word "Mothercraft" and understand in a general way that it has to do with the preparation for motherhood and with the correct methods of feeding, care, and management of the child after he arrives. With the word "Fathercraft" people are not so familiar. The fathercraft movement has been in existence in certain countries for some years, and came into being in order to interest and educate fathers in maternal and child welfare. In these countries fathers meet and discuss problems associated with welfare work, and lectures are given by specialists on its various activities. Opportunities are provided for personal interviews in regard to children whose nutrition or management has proved difficult. Experience has shown that these interviews are of greater value than lectures given to a large audience.

Child's Physical and Mental Welfare.

Fathercraft deals not only with the physical, but also with the mental welfare of the child. While much of the actual care and handling of the young child is necessarily in the hands of the mother, the training of the child's mind is shared by both parents, even from the earliest days. Certain activities come entirely within the province of the father and others within the province of the mother. It is necessary that the father should understand the responsibilities of motherhood, and should appreciate the mother's outlook in order that he may give her the support which is necessary for the harmonious working of the household.

Fitness for Fatherhood.

Naturally one of the first questions a man who contemplates marriage should ask himself is whether he is fit to become a father. If any doubt exists, he should not hesitate to seek medical advice. Such advice may reassure him.

When Should Fathercraft Begin?

The responsibility for the child's upbringing begins with conception. What a husband does for his wife during the expectant period is not only for her own sake but for the sake of the unborn child. As was pointed out in our article last month, the husband must see that his wife has not only sufficient food, but food of the right kind, that she has regular exercise, recreation, sleep, fresh air, sunshine, and freedom from worry.

The Newly-made Father.

The newly-made father must learn the advantage of breast feeding in order that he may be able to advise and encourage his wife to feed baby naturally. Too often it is found that the child is taken off the breast shortly after the second week of life. This coincides with the return of the mother to her home with its added responsibilities. In other words the mother who has had almost everything done for her in the hospital resumes her household duties, and at the same time assumes the care of the young baby before natural feeding is fully established in some instances. If she becomes over-anxious or worried her supply of milk will diminish, and consequently her difficulties will increase. It is then that the husband should encourage his wife to obtain the assistance of a welfare trained nurse or seek advice at the nearest clinic, either personally or by letter.

It is not intended to convey the impression that it is only when she gets into difficulty that a mother should consult the clinic nurse. On the contrary she should obtain advice while the child is well, in order that she may be saved from falling into errors and that her child may be kept well. The father will be playing his part if he encourages the mother to attend the clinic regularly. "Prevention is better that cure" is the motto of the Maternal and Child Welfare Service.

The emotions have considerable influence on the secretion of milk, as many mothers are aware from actual experience. Consequently the father should do what he can towards creating an environment which will promote a feeling of quiet, calm, confidence in his wife.

The Toddler.

As the toddler stage is reached, the father's interest usually increases. He should encourage his wife to continue her visits to the clinic, in order that the child's feeding and management may be supervised. This is done with the object of keeping him fit and well, and in order that any departure from a normal state of health or behaviour may be detected at a time when its correction is relatively easy. Periodic visits to the dentist should be arranged.

New accomplishments mark the child's progress—new words learned, new acts performed, all indicating the development which is proceeding steadily. In regard to his behaviour, much will depend upon the extent to which companionship and goodwill exist in the house. If the parents, by intelligent handling and sympathetic understanding in the

early years, have gained the confidence of the child, co-operation will be readily established, and problems associated with his upbringing later will be more easily solved.

It comes within the father's province to entertain his child by various forms of play—by reading or telling stories—and in other ways.

As companionship with children of his own age is important in his development, the child should be given an opportunity of mixing with them under supervision. The valuable part played by nursery schools and kindergartens in this respect has been referred to in previous articles.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N. 1, Brisbane.

IN THE FARM KITCHEN.

APPETITE TEMPTERS.

For the 'Flu Convalescent.

Beef Tea.

Take 1 lb. shin beef, 1 pint cold water, salt.

1. (NOT COOKED.)

Remove the fat, if any, then scrape the meat into shreds and put into an earthenware jar or basin. Add the water and a little salt, and leave to soak until the goodness is drawn out of the meat, then strain and serve.

2. (QUICK METHOD.)

Prepare meat as above and put into a basin with the water and salt. Leave to soak for about forty minutes, then turn into a saucepan and bring very slowly almost to boiling point. Stir it up, then strain, and press the meat well to extract all the gravy; re-heat and serve with fingers of dry toast.

3. (SLOWLY MADE.)

Prepare the meat as above or cut it into small pieces, and put into a jar with the water and salt. Let it soak for a time, then stand the jar in a saucepan of water or in the oven. Cover it securely and cook slowly for three hours, being careful not to let it boil.

Chicken Broth.

Take some chickens' feet, cold water to cover well, salt, pepper, ½ onion, and carrot. To 1 pint of broth allow 1 egg.

Scald and skin the chickens' feet, then put them into a saucepan with cold water to cover them well, and a little salt. Bring slowly to the boil, then remove any scum there may be on top. Peel the onion, scrape and wash the carrot, and add both, not cut up, and simmer gently for three or four hours, then strain. Measure the broth, allow the eggs in proportion, beat them well, and mix with it. Turn into a jug, and cook in a saucepan of hot water until the broth thickens, being careful not to let it boil. Season to taste and serve.

Steamed Fillets of Whiting.

Take 2 whiting fillets, white sauce.

Have the whiting filleted and the fillets skinned. Roll them up, place on an enamel plate, and stand over a saucepan of boiling water. Cover the fish with a buttered paper and a basin and steam. When cooked the flesh will be quite white. Serve with plain white sauce.

Egg and Milk.

When preparing an egg and milk for an invalid never omit to remove the little white "tread" before whisking the egg. Whisk it well—then stir in hot or cold milk. Add a little castor sugar, if liked. A dash of brandy is a great improvement, or a spoonful of port wine may be added.

Fish Scallops.

Take 1 cupful cold fish, 2 medium potatoes, 1 oz. butter, 1 dessertspoonful anchovy essence, pepper, ½ tablespoonful chopped parsley, ½ gill milk.

Wash, peel, and boil the potatoes. Chop the fish, first removing the skin and the bones. When potatoes are tender drain off the water and put the pan over a low gas. Mash the potatoes with a fork and stir in the fish, anchovy, milk, pepper, and half the butter. Beat this mixture till smooth, put it into greased scallop shells with dabs of butter on top. Brown the scallops under the griller and sprinkle with parsley. Serve with thinly-sliced brown bread and butter.

Steamed Chop.

Take 1 mutton chop, ½ oz. butter, a little chopped parsley, seasoning, teaspoonful lemon juice. Cream butter and seasoning and chopped dry parsley. Add lemon juice drop by drop. Form into little pats. Trim off any superfluous fat. Place on a buttered plate, cover with another plate, and steam as for fish. Season and serve on a hot plate with the liquid poured round, and with a small pot of maitre d'hotel butter.

Fricassee of Tripe.

Take ½ lb. cooked tripe, 1 teaspoonful cornflour, a small piece of cooked onion, 1 gill milk, 1 egg-yolk seasoning.

Cut up the tripe in small pieces. Chop the onion and put them both in a pan with the milk. Simmer gently for ten minutes. Add the seasoning and blended cornflour. Cool slightly and add the beaten egg-yolk. Serve with strips of toast.

Poached Egg on Toast.

Toast a slice of bread, butter it, and keep it warm. Break the egg carefully into a cup, being careful not to break the yolk. Put some water into a small frying-pan, add a little salt and lemon juice, and boil; then draw aside. Pour in the egg and cook gently over a low burner for a few minutes until the white is set, keeping the pan slightly tilted at first. Lift up with a fish slice, and drain off the water, then serve on the toast.

Plain Omelet.

Take 2 eggs, ¾ oz. butter, pepper, and salt.

Separate the yolks from the whites of the eggs. Beat up the yolks and season with pepper and salt. Add a pinch of salt to the whites and whisk them to a very stiff froth, then fold lightly into the yolks. Melt the butter in an omelet pan. When hot, pour in the egg mixture. When it begins to set round the edge, fold the edge over and draw the omelet towards the handle of the pan, keeping the latter tilted that way. Continue to cook for a few seconds, then put under the hot griller and lightly brown on the top. Turn on to a hot dish and serve at once.

Invalid Egg Jelly.

Take 2 eggs, ½ oz. gelatine, 3 oz. lump sugar, 2 lemons or oranges.

Put into a saucepan the well-beaten eggs, gelatine, sugar, sliced lemon (or orange) rind, and one pint of liquid consisting of the juice of the two lemons (or oranges) and water. Stir continuously over a gentle heat until mixture thickens. On no account allow it to boil. Strain when hot and allow to cool a little before putting into a mould which has been rinsed out with cold water.

A Cold Sweet.

Separate the yolk and white of an egg. Add one teaspoonful of castor sugar to the yolk and whisk until thick and creamy. Dissolve one sheet separately. Fold the white into yolk and add leaf of gelatine in a tablespoonful of water and strain into the yolk, then, when beginning to set, whisk the egg-white to a stiff froth and fold in lightly. Add a few drops of vanilla or orange essence, then turn into a small glass dish to set. Before serving place a cherry (glace) in the centre.

Sponge Tart.

Take 1 apple, slices of sponge cake, 2 teaspoonfuls sugar, 1 egg, 1 gill milk, 1 teaspoonful castor sugar.

Bake an apple till very soft. Take out all the fruit and place in a small dish. Put some slices of sponge on top. Make a custard with milk, egg-yolk, and a little sugar. Pour over the sponges. Whisk up the egg-white with one teaspoonful castor sugar and put on top of the pudding. Place in a cool oven and bake till set and slightly brown. Serve hot or cold.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1939.	July, 1938.		July.	No. of years' records.	July, 1939.	July, 1938.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	1·14	38	0·91	2·85	Gatton College ..	1·40	40	..	1·32
Cairns	1·58	57	0·53	2·03	Gayndah	1·48	68	2·75	2·67
Cardwell	1·39	67	0·47	2·66	Gympie	2·09	69	2·81	2·44
Cooktown ..	0·96	63	0·58	0·71	Kilkivan	1·60	60	2·00	2·35
Herberton ..	0·90	53	0·32	2·37	Maryborough ..	1·95	68	2·89	3·98
Ingham	1·69	47	1·33	4·58	Nambour	2·70	43	3·41	3·99
Innisfail	4·80	58	3·78	8·17	Nanango	1·68	57	1·81	3·39
Mossman Mill ..	1·34	26	..	2·20	Rockhampton ..	1·77	68	0·45	2·05
Townsville ..	0·66	68	0·07	3·68	Woodford ..	2·34	52	2·37	2·64
Central Coast.					*Central Highlands.*				
Ayr	0·72	52	..	3·30	Clermont ..	1·06	68	1·42	2·80
Bowen	0·94	68	0·10	2·61	Gindie	1·10	40	1·33	0·95
Charters Towers ..	0·66	57	0·26	1·91	Springsure ..	1·21	70	1·20	0·71
Mackay P.O. ..	1·69	68	0·32	3·03	*Darling Downs.*				
Mackay Sugar Experiment Station	1·50	42	0·15	2·43	Dalby	1·73	69	2·17	2·19
Proserpine ..	1·58	36	1·85	2·68	Emu Vale ..	1·59	43	1·94	1·50
St. Lawrence ..	1·38	68	0·20	1·68	Hermitage ..	1·69	33	..	0·88
South Coast.					Jimbour	1·53	51	1·48	1·91
					Miles	1·64	54	1·66	1·47
					Stanthorpe ..	2·03	66	1·50	1·74
Biggenden ..	1·41	40	2·64	3·24	Toowoomba ..	2·09	67	2·14	2·30
Bundaberg ..	1·88	56	1·47	4·29	Warwick	1·83	74	1·50	1·34
Brisbane	2·21	87	2·00	1·43	*Maranoa.*				
Caboolture ..	2·15	52	2·80	2·04					
Childers	1·73	44	2·18	2·98	Bungeworgorai ..	1·37	25	..	0·45
Crohamhurst ..	2 95	46	3·80	3·21	Roma	1·45	65	1·64	0·34
Esk	1·97	52	2·37	2·86					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·99	78	63	82	4, 10	55	12	58	7
Herberton	..	71	48	77	1, 8	30	13	32	7
Rockhampton	30·10	71	52	81	2	43	14	45	5
Brisbane	30·13	66	49	76	18	40	26	200	9
Darling Downs.									
Dalby	30·16	63	39	71	17	27	26	217	7
Stanthorpe	..	56	32	65	30	21	26	150	8
Toowoomba	..	59	43	69	6	30	26	214	5
Mid-Interior.									
Georgetown	30·02	79	51	87	1	33	13	21	2
Longreach	30·11	69	46	79	29	37	12	96	4
Mitchell	30·15	61	41	72	16, 17 31	28	26, 27	207	8
Western.									
Burketown	30·05	79	54	85	1, 3, 17	42	6	5	1
Boulia	30·15	65	48	80	29	37	9, 10	250	6
Thargomindah	30·13	62	43	74	17	34	24	76	6

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1939.		October, 1939.		Sept., 1939.	Oct. 1939.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					p.m.	p.m.
1	6·7	5·37	5·33	5·51	7·37	8·12
2	6·6	5·37	5 31	5·51	8·30	9·7
3	6·5	5·38	5 30	5·52	9·23	10·3
4	6·4	5·38	5·29	5·53	10·16	11·0
5	6·3	5·39	5·28	5 53	11·11	11·52
6	6·2	5·39	5·27	5·54	..	..
					a.m.	a.m.
7	6·0	5·40	5·26	5·54	12·5	12·24
8	5·59	5·40	5·25	5·55	1·4	1·33
9	5·58	5·41	5·24	5·56	2·0	2·21
10	5·57	5·41	5·23	5·56	2·53	3·6
11	5·56	5·42	5·22	5·57	3·43	3·51
12	5·54	5·42	5·21	5·57	4·29	4·35
13	5·53	5·43	5·20	5·58	5·16	5·19
14	5·52	5·43	5·19	5·58	6·2	6·4
15	5·50	5·44	5·18	5·59	6·46	6·50
16	5·49	5·44	5·17	5·59	7·30	7·41
17	5·48	5·45	5·16	6·0	8·15	8 31
18	5·47	5·45	5·15	6·1	9·2	9·23
19	5·45	5·45	5·14	6·1	9·50	10·17
20	5·44	5·46	5·12	6·2	10·42	11·9
21	5·43	5·46	5·11	6·3	11·33	p.m.
					p.m.	12·3
22	5·42	5·47	5·10	6·3	12·26	12·51
23	5·41	5·47	5·9	6·4	1·17	1·44
24	5·40	5·47	5·8	6·5	2·10	2·36
25	5·39	5·48	5·8	6·5	3·0	3·25
26	5·38	5·48	5·7	6·6	3·51	4·17
27	5·37	5·49	5 6	6·7	4·37	5·11
28	5·36	5·49	5·6	6·7	5·32	6·6
29	5·35	5·50	5·5	6·8	6·24	7·2
30	5·34	5·50	5·4	6·8	7·18	7·57
31			5·3	6·9		8·53

Phases of the Moon, Occultations, &c.

7th	Sept.	☾ Last Quarter	6 24	a.m.
13th	,,	● New Moon	9 22	p.m.
20th	,,	☽ First Quarter	8 34	p.m.
29th	,,	○ Full Moon	12 27	a.m.

Perigee, 13th September, at 4.0 a.m.
Apogee, 25th September, at 7.0 p.m.

On the 24th of September at 9 a.m. our Vernal Equinox will occur. The Sun will cross the equator from north to south, and on this day rise due east and set due west.

In our Luminary's apparent motion we see as in a mirror the real motion of the Earth, and this our planet has arrived at a point in its orbit midway between the Winter and Summer solstice. Each hemisphere receives the same amount of light, and as our globe, fortunately for us, turns on its axis, the same amount of darkness also—which is to say that day and night are of equal length all over the world.

On the 27th Jupiter will be in "Opposition," and being nearest the Earth will seem larger and brighter than at any other time during this year.

Mercury rises at 5.15 a.m., 52 minutes before the Sun, and sets at 4.17 p.m., 1 hour 20 minutes before it on the 1st; on the 15th it rises at 5.37 a.m., 13 minutes before the Sun, and sets at 5.13 p.m., 31 minutes before it.

Venus rises at 6.7 a.m., with the Sun, and sets at 5.31 p.m., 6 minutes before the Sun on the 1st; on the 15th it rises at 6.1 a.m., 11 minutes after the Sun, and sets at 5.55 p.m., 11 minutes after it.

Mars rises at 2.3 p.m. on the 1st, and sets at 4.3 a.m. on the 2nd; on the 15th it rises at 1.19 p.m., and sets at 3.21 a.m. on the 16th.

Jupiter rises at 7.43 p.m. on the 1st, and sets at 7.43 a.m. on the 2nd; on the 15th it rises at 6.40 p.m., and sets at 6.44 a.m. on the 16th.

Saturn rises at 9.30 p.m. on the 1st, and sets at 8.58 a.m. on the 2nd; on the 15th it rises at 8.31 p.m., and sets at 8.1 a.m. on the 16th.

A total eclipse of the Sun will occur on 12th October in the Antarctic Circle. Of a partial eclipse the greatest phase will be seen about sunrise on the east coast of Australia from Melbourne to Maryborough, and the end through South Australia to near Townsville.

6th	Oct.	☾ **Last Quarter**	3 27	p.m.
13th	,,	● **New Moon**	6 30	a.m.
20th	,,	☽ **First Quarter**	1 24	p.m.
28th	,,	○ **Full Moon**	4 42	p.m.

Perigee, 11th October, at 11 a.m.
Apogee, 23rd October, at 9 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

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

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