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Back-Rubbers to Kill Buffalo Fly

By D. F. MAHONEY, Divisional Veterinary Officer.

Trials indicate that back-rubbers can be used successfully for the control of buffalo fly in the coastal cattle country of north Queensland.

In 1952, W. M. Rogoff of the South Dakota State College described the use of cable-type back-rubbers impregnated with DDT for the control of horn flies on cattle in the U.S.A. He stated that this method of horn fly control had been popular in America for a number of years. The horn fly (*Siphona irritans*) is closely related to the buffalo fly (*Siphona exigua*) which infests cattle in northern Australia and has similar habits and life cycle. Therefore the possibility of using back-rubbers for buffalo fly control on cattle runs in north Queensland was considered.

The labour-saving qualities of this method were most impressive. For years, spraying or dipping with DDT has been adequate for buffalo fly control in Australia, but this often entails a special muster in wet weather with attendant labour costs and loss of beef. The success of back-rubbers in tropical Queensland would eliminate much mustering at times when conditions are least suitable for "working" cattle. In 1956, trials were commenced to find out the effectiveness of back-rubbers for buffalo fly control, and two summers' observations are recorded here.

The First Trial.

In November, 1956, a trial on a small scale was commenced on the Tropical Cattle Company's property, "The Orient," near Ingham, north Queensland. The object of the trial was to

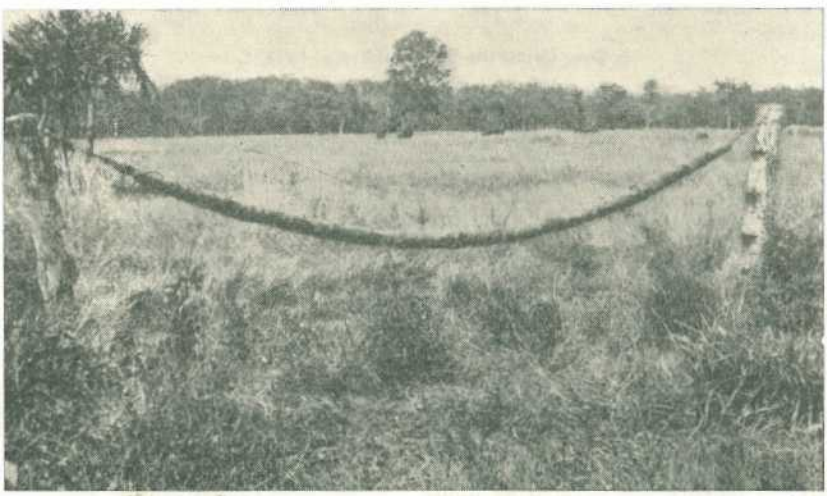

Plate 1.

The First Back-Rubber Installed at "The Orient".

find out if buffalo flies could be controlled by the use of DDT-impregnated back-rubbers and to compare this method with periodic spraying or dipping with DDT.

Two groups of Zebu type cattle were selected because a trial involving these animals was not likely to be upset by treatment for tick infestation and moreover they are just as attractive to buffalo flies as are animals of the British breeds. The two groups ran in small adjoining paddocks. One group of 10 cows and one bull had access to a back-rubber and the adjacent group of 19 cows was sprayed with 1.0 per cent. DDT for buffalo fly control when necessary.

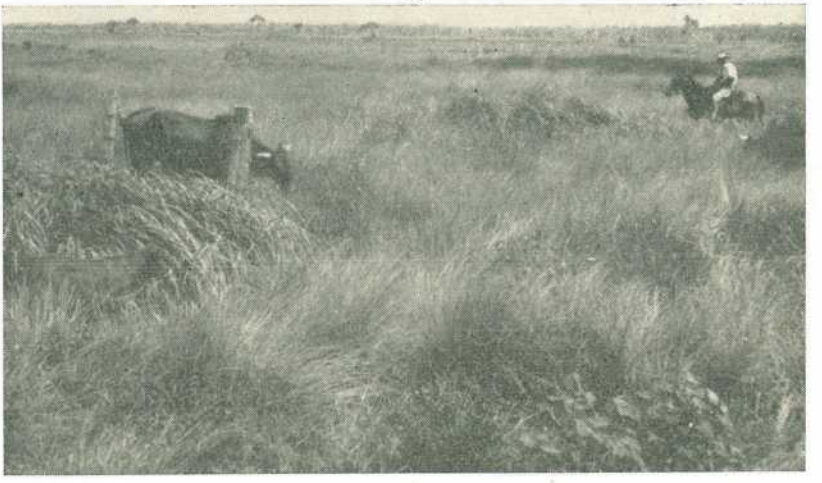

Plate 2.

A Cow Using the Back-Rubber at "The Orient".

How to Make and Charge.

Details of the construction and charging of the back-rubber are as follows:

A core of wire approximately 16 ft. long was made by taking three strands of No. 8 plain wire and binding them together with closely wound barbed wire. This core was covered by binding with sacking to a thickness of 6 in., making sure that the first turn of sacking was securely fixed by the barbed wire. The sacking was tied with light gauge wire every 6 to 9 in. as it was placed in position. Twenty-six pounds of sacking were used to complete the rubber. This was hung between two posts, 16 ft. apart, which were set in the ground at an angle to avoid the necessity of bracing them. Rings 4 ft. 6 in. above the ground were used to attach the ends of the rubber to the posts. The middle of the back-rubber was then about 15 in. above the ground.

A 20 per cent. oil soluble concentrate of DDT was used to charge the rubber. This was diluted with dieselene to make a 5 per cent. solution of DDT and 1 gal. of this was poured evenly over the back-rubber. Subsequent recharging was carried out every fortnight with half a gallon of the 5 per cent. solution.

The trial lasted from November 29, 1956, to March 1, 1957, and during that time the animals which had access to the back-rubber did not require any other treatment for fly infestation. It was placed near the water trough and

they commenced to use it on the day it was erected. Their technique was to commence scratching their heads and then gradually work their way under it until it was draped over their backs. The sprayed group required treatment on December 4, 1956, January, 10, 1957, and February 8, 1957.

During February, 1957, a comparison between the number of flies carried by each group was made. The results of this are recorded in Table 1.

rubbers, and they were placed in shady "camps" which cattle were known to favour in the wet season.

Their construction was similar to that already described, but they were erected between trees in the manner shown in Plate 3, namely, 5 ft. from the ground at one end, and 1 ft. from the ground at the other. Preference was given to trees which bore evidence of constant rubbing by animals.

As dieselene was suspected of causing some irritation to the cattle in the

TABLE 1.

Back-rubber Group.			Sprayed Group (1·0% DDT.)	
Date of Observation.	No. of Animals Examined.	Av. No. of Flies/Side.	No. of Animals Examined.	Av. No. of Flies/Side.
8–2–57 ..	10	1	9	15
27–2–57 ..	10	14	10	24

Comparison of buffalo fly counts on the two adjacent groups during February, 1957.

At the time these counts were recorded, the buffalo flies on other animals on the property which had not had access to treatment were too numerous to count.

This trial showed that while cattle are regularly using a DDT impregnated back-rubber, control of buffalo fly is as effective as with periodic spraying with DDT. However, circumstances under which the trial was run were not typical of north Queensland cattle management. Therefore another trial was arranged for the 1957-58 season under more normal paddock conditions.

The Second Trial.

This trial was conducted on "Laudham Park" near Townsville, owned by Mr. J. Kelso. Four back-rubbers were made and placed in a 3,000 acre, well-timbered paddock running 200 bullocks. Great care was taken in choosing the location of the

trial at the "Orient" the previous year, the diluent for the DDT concentrate was changed to fuel oil. Apart from this, the charging routine described was adhered to. No inducement such as a salt lick was used to bring the cattle around the back-rubbers. The trial commenced on January 16, 1958, and ended on April 23, 1958, when the bullocks were mustered for dipping for tick control. The paddock was ridden every two weeks to re-charge the back-rubbers and inspect the animals. Under these circumstances, no actual counts of flies were possible; only the degree of infestation could be noted. Three of the four rubbers were frequently used, and the animals remained in the paddock throughout the period without requiring additional treatment for buffalo fly. Infestations were seen in the paddock at each inspection but these were light and did not appear to be worrying the animals. On the same property, severe infestations occurred on untreated cattle during the January-March period, and the cattle in a paddock adjacent to the

trial were dipped on February 10, 1958, and March 27, 1958, for buffalo fly control.

The concentration of DDT on the back-rubbers was chemically analysed. Torrential rain often falls during the buffalo fly season, and the possibility of DDT being mechanically washed from the sacking was investigated.

TABLE 2.

Date.	Mgms p.p. DDT. sq. in. sacking.	Rainfall for period.
28–2–57	62·9	
11–3–57	57·0	20 in.
18–3–57	58·8	3½ in.
25–3–57	58·8	1 in.

Showing the negligible leaching effect of heavy rain on the DDT in a back-rubber.

On February 28, 1957, after the back-rubber at the "Orient" had been charged seven times, a study of the leaching effect of rain was commenced. A series of samples of sacking were submitted for analysis for DDT content over a period during which heavy rain fell. During the period, the back-rubber was not replenished. The results are shown in Table 2.

TABLE 3.

Date.	Mgms p.p. DDT. per sq. in. sacking.
13–1–58*	65·5
28–1–58	75·5
10–2–58*	72·9
25–2–58	92·5
12–3–58*	87·7
25–3–58	112·4

* Dates of Charging.

Table 3 shows the effect of monthly re-charging on the DDT levels of the "Orient" back-rubber. Up to January 13, 1958, it had been re-charged fortnightly since the previous October. After that date, it was replenished at monthly intervals with one gallon of 5 per cent. DDT. This system of re-charging would be more

Plate 3.

Mr. A. Kelso Recharging a Back-Rubber with 5 Per Cent. DDT in Fuel Oil on "Laudham Park". Note the hanging strips of sacking which had been rubbed off by cattle.

attractive to most people if satisfactory levels could be maintained. Results of the analysis are shown in Table 3.

All cattle were removed from the paddock between February 10, and February 25, 1958, hence the sharp rise in DDT level on the sacking. On every occasion, samples were removed before re-charging.

Cost Less Than £3.

The trials indicate that back-rubbers can be used successfully for the control of buffalo fly in the coastal cattle country of north Queensland.

They are simple to make and erect, particularly if suitable trees can be found. The units of "Laudham Park" cost less than £3 each in the paddock. In these trials no ruses were used to induce the animals to use the units. They were placed on recognised cattle "camps" or near watering points or attached to recognised rubbing trees and the animals used them naturally. However, it is felt that more efficient use of them may result, particularly in large, well-timbered paddocks, by placing salt licks in strategic places. This aspect is being investigated.

They have practical use on the many properties in coastal and subcoastal areas of north Queensland where cattle ticks are not troublesome during the height of the wet season and the buffalo fly is then the chief source of worry to cattle. Any device which saves mustering at this time is certainly worthwhile. Those owners who do not use insecticides for tick control which are also effective against buffalo fly will, of course, find them useful throughout the whole summer.

Some care is necessary in the choice of the type of DDT preparation used for charging. Water soluble DDT compounds are not suitable, as they wash out with the rain. Satisfactory DDT levels can be maintained on the units, in all weather, by replenishing the back-rubbers with ½ gal. of 5 per cent. DDT solution in fuel oil every fortnight. Chemical analysis of samples from a back-rubber indicated that re-charging once a month with a gallon of the solution was likely to be sufficient for fly control, although this was not tested in a trial.

As Effective as Spraying.

Summary of the trials shows that:

1. DDT-impregnated back-rubbers have been used successfully for buffalo fly control in north Queensland. They were as effective as periodic spraying with DDT.

2. Their advantage is to save mustering cattle for buffalo fly control in the wet season when that parasite is the chief source of worry.

3. Units were placed near watering points and camps where cattle congregate in the wet season. In these situations animals used them naturally.

4. The back-rubbers were charged with a 5 per cent. solution of DDT, first in dieselene and then in fuel oil. Fuel oil was preferred as dieselene was suspected of causing irritation to the animals. The oily solutions of DDT did not wash out with the rain and were therefore used in preference to water soluble preparations.

Be Water Wise.

The most instantaneous and effective of all water reservoirs is the soil.

The best way to use water is to use it wisely where the raindrop falls.

Stock Gazette

LOSSES of pigs from swine erysipelas have occurred in Queensland recently. But deaths are not the worst feature of erysipelas, for chronically affected pigs are much more costly to the warmer.

Farmers should have any sudden deaths investigated by a veterinary surgeon, and they should also watch for pigs that do not thrive under favourable conditions. Swollen joints, lameness and an unexplained loss of tails may all be pointers to chronic erysipelas. Panting and exhaustion after a little exercise may also be signs of infection in older pigs.

Don't overlook things like these, but have them investigated. Your veterinary surgeon can treat acute erysipelas successfully, and can help you to decide what to do with the chronic cases.

—K. M. GRANT, Assistant Director of Veterinary Services.

LEUCOSIS may be causing losses among the last spring crop of chickens. There's no treatment for leucosis, but good poultry run hygiene greatly reduces the disease risk. It is a virus disease that only becomes evident when the birds are more than half-grown. Cases can continue as long as the birds are kept. The disease comes in different forms affecting the blood or the pupil of the eye or causing paralysis of the wings or legs or growths in the internal organs.

The virus can pass through the egg to the newly hatched chick, so that infection can occur in the incubator. This is a strong case for incubator fumigation. Most infections occur, however, during the brooding period. Therefore, the best means of prevention lies in rearing young chicks well away from older chickens or adult fowls, many of which are carriers of leucosis.

—P. D. RANBY, Veterinary Officer.

STRAIN 19 vaccination is a sure method of dealing with brucellosis. It should be a routine part of handling cattle, just like branding and dehorning. Best age for vaccination is from four to eight months.

Brucellosis causes major losses to dairymen and graziers. Because of it cows give less milk and breeding troubles are common. It's not the only cause of breeding trouble, but it's a major one and can be prevented.

Cost of vaccination is about 5s. a head. Regarded as an insurance covering the active years of a cow's milking life, this works out at less than 1s. a year.

W. R. RAMSAY, Veterinary Officer.

The Irish Horse

Comprehensive information on Irish racehorses and racing events of 1957 is given in the new edition of *The Irish Horse*. In addition there are summaries of the year's events in other racing countries of the world, including Australia. There are chapters on race statistics, bloodstock sales, horse shows and so on. The book is well illustrated, with action shots as well as close-ups of prominent racehorses.

The Irish Horse, Official publication of the Bloodstock Breeders' and Horse Owners' Association of Ireland. Cahill and Co. Ltd., Parkgate Printing Works, Parkgate Street, Dublin (358 pages, ill., price, £2 stg.).

Poultry Feed Is Too Costly To Waste

By F. N. J. MILNE, Senior Poultry Husbandry Officer.

Poultry farmers can increase profits on eggs by reducing wastage of feed.

Since the end of the war, the margin of profit between returns from egg sales and cost of feed has fluctuated. The margin of profit for this year may be well down even on last year because of greatly increased feed costs and shortages associated with drought conditions. Poultry farmers are well aware of the need for greater productivity per farm to counter decline in profitability, but many have paid little attention to their methods of storing and distributing feed.

Every pound of mash which is spilt or otherwise wasted costs at least fourpence, and all these fourpences in terms of food wastage can add up to a goodly sum at the end of a year.

One cause of wastage on farms is the unsuitability of feed troughs or hoppers in use. Too often feed

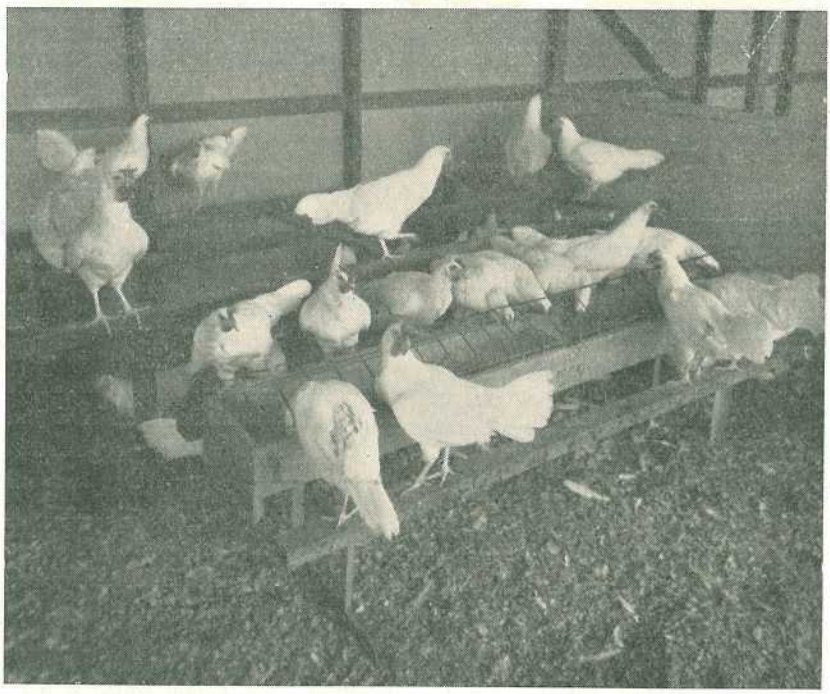

Plate 1.

This Flock Feeder with Grill, at the Poultry Section, Rocklea Animal Husbandry Research Farm, is Raised off the Floor.

hoppers are improvised. Old motor car tyres cut in half, lengths of house guttering, and even sheets of galvanised iron are used as makeshift feed hoppers.

On some farms, some attempt has been made to provide "box type" feed receptacles. This type of feed hopper is a large box, some 4 to 6 ft. long, 2 ft. wide and 1 ft. or more deep. The container probably holds two bags of mash—enough to last 200 birds for a week. Its obvious advantage, of course, is the saving of labour. The pullets hop into the box, and scratch away to their hearts' content. Should they feel like a dust bath, mash makes a good substitute for litter, and it also serves as good nesting material. This is not an exaggeration!

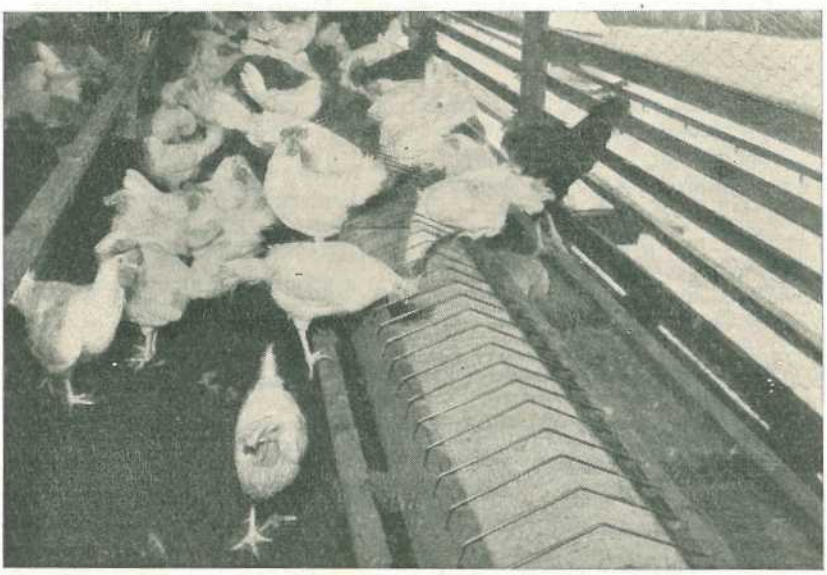

Plate 2.

Flock Feeders with Grills on Mr. W. E. Badcock's Farm at Wandal Road, Wynnum. These feeders also are raised off the floor.

Wastage can be Staggering.

The constant wastage due to scratching, and dust bathing can be staggering. Wastage in the litter often passes unnoticed, for the mash spilt outside the hopper is soon mixed in with the litter, and is hard to detect because of similarity in colour. Of even more importance is the fact that such hoppers are potent sources for the spread of diseases such as coccidiosis, both intestinal and caecal type, round worms, and salmonellosis, for the food becomes contaminated with infected droppings.

A knowledge of the feeding habits of birds is essential in designing any food hopper. Fowls rake and pile mash with their beaks in their search for selected particles of mash. Have you ever noticed how the mash is always piled up in a heap towards the sides of the hopper after a few hours feeding?

The pile of mash will reach a certain height for a given width at the base. To attempt to pile more onto it only causes it to flow back to its original position. The height which it reaches is known as the "angle of flow", and this angle for mash is about 45 degrees. With this in mind, you will

realise that the width and height of the hopper are most important in preventing mash from being raked out.

Recommended Design.

Generally, a hopper with a concave bottom, 10 in. wide, and at least 7 in. deep, will prevent this source of wastage, provided the trough is not filled to the brim. The general design recommended is depicted in Plates 1 and 2. The hopper should be fitted with wire grills to prevent birds contaminating the mash, and it should be raised off the floor. Preferably such a hopper should be made of fairly heavy gauge galvanised iron. Galvanised iron is preferred to timber because, as wooden feed hoppers age, wastage begins to occur through cracks in the woodwork due to shrinkage of timber. Nails holding the sides together become loose, leading to further wastage. Wooden food hoppers also provide convenient hiding places for poultry ticks and redmite.

It is suggested that the hopper should be raised off the floor for three reasons; firstly, it allows the more timid pullet a better chance to feed without frequent molestation from others; secondly, it prevents litter being scratched into the feed hopper, and thirdly, it doesn't take up valuable floor area.

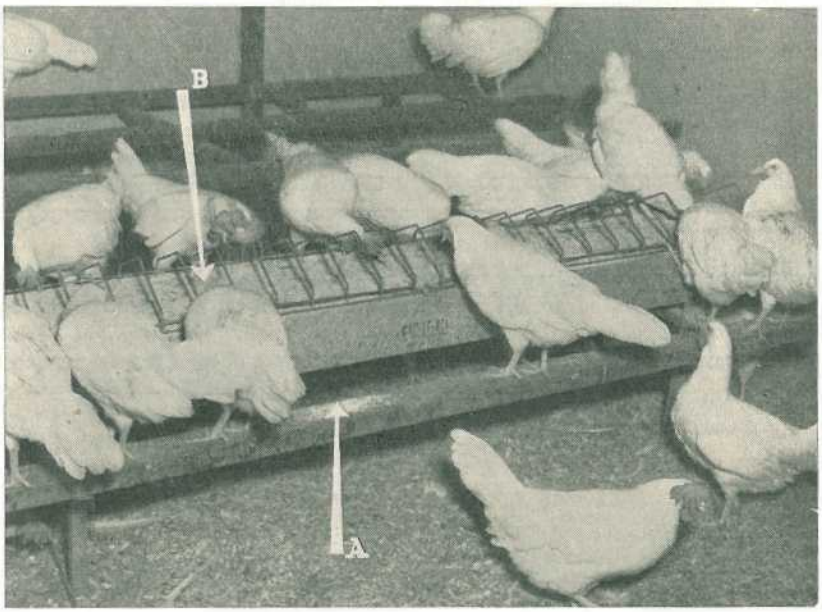

Plate 3.

Pullets, Even Though Debeaked, and Feeding from the Recommended Type Food Hopper, Can Waste Food, if the Trough is Too Full. This photograph was taken 10 min. after the trough had been filled to the brim, and the mash levelled off. Spilled mash is already visible on the alighting perch of the hopper (A). Mash is being piled (B).

Although faulty feed hoppers are responsible for wastage, even the best designed feed hopper can still be wasteful, if it is filled to the brim.

Part of your profits can be literally "poured" into the litter if a poultry man gets into the habit of filling hoppers too full as shown in Plate 3.

45 Per Cent. Wastage.

Some two years ago, the Ralston Purina Company, one of the largest feed manufacturers in Canada, investigated the actual loss of feed from troughs at their research farm in Manitoba. The studies involved some 4,000 broiler chickens. Two breeds were used, New Hampshires and White Leghorns. The troughs were of good design with wire grills to prevent the chickens scratching in the feed.

With these troughs kept full, a 29 per cent. wastage occurred in the New Hampshire groups, whilst with the more active and more nervous White Leghorns, 45 per cent. mash was wasted.

With hoppers kept two-thirds full, the wastage was reduced to 7.4 per cent. The wastage, when hoppers were kept half full, was just over 2 per cent.

To make your feed purchases go further, feed hoppers should be inspected two hours after they've been replenished to see how much wastage is taking place. Ask yourself: Is the mash hopper at fault? Is it too full? It may pay in the long run to only partly fill them at more frequent intervals.

Debeaking shows promise of not only controlling cannibalism but also helping to reduce food wastage. Debeaked birds, although they will attempt to rake and pile the mash, cannot do it so effectively. However, irrespective of whether or not debeaking is practised, wastage will still occur if the feed troughs are too full.

Rats cause considerable wastage. It is not so much the feed they eat as the feed they spoil. Effective rat proofing of the poultry house is most desirable.

This Actually Happened.

A report from a southern State tells of a boy of six years who was standing at the back of the driver's seat on a semi-mounted trailer mower. His clothing was caught in an unprotected power-take-off shaft. Before the boy had time to call to the driver of the tractor, he was wound down by the revolving P.T.O. shaft, and crushed fatally.

This accident was caused by:

(1) Unsuitable clothing.

(2) Unguarded P.T.O. shaft.

(3) Allowing children on tractors.

DON'T LET THIS HAPPEN TO YOU!

Nitrite Kills

By D. F. MAHONEY, Divisional Veterinary Officer.

Nitrite poisoning will kill animals rapidly. Treatment with methylene blue will often save lives, even in late stages of the condition.

Nitrite poisoning chiefly affects cattle, sheep and pigs. It is recognised by the brown colour of the blood, which remains for a while after death.

Cattle and sheep obtain this poison from plants, such as mint weed, which are sometimes prevalent on stock routes. Cooked offal or vegetable soups are nearly always the cause in the case of pigs.

After reading the title of this article, some will ask "What is a nitrite?" The nitrites form a group of chemical substances which are closely related to another group called nitrates, of which saltpetre is a well known member. Saltpetre can easily be converted to a nitrite by heating.

Nitrites have a variety of uses in everyday life, for example, in butchers' pickling fluid and for the relief of pain in some cases of heart disease. However, when a large amount of nitrite is eaten, it acts as a poison by preventing the blood from absorbing oxygen in the lungs. Death occurs from suffocation.

Chemical Change in Paunch.

How do animals obtain sufficient nitrite to harm them? With cattle and sheep, the nitrite is formed by the digestive process inside the paunch from nitrates which are normally present in some plants. The common mint weed which grows in central Queensland and the Darling Downs contains a large quantity of nitrate and has caused losses in cattle and sheep from time to time. Hungry travelling stock are most likely to be affected.

Variegated thistle is another plant which often contains enough nitrate to be dangerous. The quantity of plant required to kill an animal is small. About 2 lb. of mint weed will poison a steer.

With pigs, the story is a little different. Nitrite is formed from nitrate—naturally present in the feed—by cooking. Piggeries where soups are fed are therefore liable to have this trouble.

Some years ago, nitrite poisoning created a problem in piggeries at Beaudesert and Pittsworth. In both cases the well water used to cook offal contained a high concentration of saltpetre.

More recently, losses occurred in a piggery at Townsville after boiled beetroot and turnip tops had been fed. A nitrate was present in the vegetable tops and a poisonous soup was produced by boiling them. Mangels are another vegetable which may contain enough nitrate to be dangerous when boiled.

What to Look For.

Once the symptoms of nitrate poisoning appear, animals often die quickly, so you must recognise it immediately to have a chance of saving them. The blood turns a chocolate colour and this is easily recognised.

Look at the colour of the small blood vessels underneath the eyelids and around the eyeball. They will be quite brown and they remain so for a few hours after death.

An ear vein can often be punctured to observe the colour of the blood. Be careful to look where the blood is flowing from the vein, as it does revert to its normal red colour after exposure to the air for a while.

Other symptoms shown by cattle and sheep are rapid breathing and twitching of the muscles.

The inside of the mouth turns a bluish colour.

Pigs usually vomit and squeal as though in pain. This is followed by staggering, rapid breathing, and then collapse.

The time between eating the poisonous material and the appearance of sickness varies. Remember that the poisonous nitrite forms in the paunch of cattle and sheep during digestion, and this takes time. At least 12 hours elapse after eating the plants before symptoms appear.

Some cattle have taken as long as three days to become affected. Pigs, which eat the nitrite already formed, usually commence to show symptoms one and a half to two hours after feeding.

Treat with Methylene Blue.

Nitrite poisoning can be treated. A very weak solution of the dye known as methylene blue injected into the blood stream is an effective antidote. Some spectacular recoveries have been observed after this treatment. You would be wise to have this carried out by a veterinary surgeon or a stock inspector as it requires skilful administration, particularly in pigs, and the dye solution must be used at the correct strength.

Watch out for nitrite poisoning in cattle and sheep travelling over stock routes where mint weed grows. This is the main plant to beware of in Queensland. It is unpalatable, and the stock eat it only when driven by hunger. Some stock routes may contain little else but mint weed and you would be advised to give sheep supplementary feed while passing over them.

This may not be practicable with cattle and you might be forced to look for an alternate route for them.

Nitrite poisoning is often hard to avoid in pigs as the composition of offals or vegetables is not always known. If you are feeding cooked offals or vegetables, always be on the alert for a sickness in which the blood goes brown. The main things are to recognise it and save the affected ones with timely treatment.

If no expert can be obtained, take samples of the suspected food and submit them promptly through your nearest Stock Office for analysis. If a soup is suspected, do not forget to submit samples of the water and raw material as well. As the constituents of swill usually vary from day to day, it is important to submit a sample of the particular swill that caused the trouble. In this way the origin of the nitrite can be traced and a useful lesson learnt.

Mrs. BELL'S APPRECIATION.

Mrs. A. F. Bell has requested publication of the following message: "I am sorry that it is impossible to reply individually to the hundreds of friends in country centres who have generously given their sympathy to me in the loss of my husband, Arthur. I know now that much genuine help and support can thus be given. Please accept my gratitude."

Identical Twin Calves are Valuable

By J. W. RYLEY, Chief Husbandry Officer, Animal Husbandry Research Branch.

Some aspects of identical twins, including ways in which they can be recognised and their value in research are discussed in this article.

Many farmers and graziers are probably aware from contact with the Departmental officers in their districts, that the Department is interested in obtaining identical twin calves for use in research work. During the past few years some have been collected and are being used at Regional Experiment Stations and the Rocklea Animal Husbandry Research Farm in investigations of nutritional and management problems.

Because they are very valuable in research work, more identical twins are needed, and should farmers have twin calves which they consider are identical, it is requested that they contact the nearest Government Veterinary Officer, Stock Inspector or Cattle Husbandry Officer.

HOW TWINS OCCUR.

Ordinary Twins.

Most twins result from the fertilization of two different eggs by two different sperms. They may be the same or different sexes. The sex combination of ordinary twins shows approximately the following relationship:—

Bull–Bull	Bull–Heifer	Heifer–Heifer
25%	50%	25%

Those twins of the same sex, whether bulls or heifers, can be depended upon to be as fertile, when they mature, as single calves. The same applies to bull calves in a bull-heifer set of twins. However the heifer calf in this combination, known as a "free martin", is usually infertile and will never show heat. The explanation of this occurrence lies in the fact that in cattle, but not other domestic animals, approximately 90 per cent. of twins have a common blood system leading to their mother's placenta, or birth membrane. The sexual organs of the bull twin mature before those of the heifer twin and begin to secrete hormones at an earlier stage in their development in the uterus, or breeding bag, or womb. Because of the common blood system, these hormones circulate in the heifer twin also and suppress development of her sexual organs. It is therefore unwise to keep a heifer twin for breeding, whose co-twin is a bull as, on the average, only one in 10 will be fertile.

Identical Twins.

Identical twins, on the other hand, develop from the fertilization of one egg by one sperm. Normally this would result in a single calf, but occasionally the egg and sperm combination split after fertilization and two calves develop. Because the genetic or inherent make-up, including sex, is determined at fertilization this results in the production of two calves with the same make-up and sex. Because of the same inheritance they are similar in most respects and are called identical twins. Identical triplets or even quadruplets can develop in the same manner but they are extremely rare. In New Zealand, where identical twins have been collec-

ted for many years, two sets of identical triplets were obtained during the first six years. It has been calculated that identical triplet heifers occur only once in four million calvings.

FREQUENCY OF TWINS.

In New Zealand, where much information has been obtained on ordinary and identical twins, it has been determined that on the average there is one twin birth in every 100 calvings. The limited amount of information available on twinning rate in Queensland dairy cattle suggests that the rate is much lower here and may be as low as one twin birth in every 500 calvings.

Overseas data indicate that there is a wide variation between the ratio of identical twins to total twins born in the various dairy breeds. Figures vary between two and 10 per cent. Even if we apply the lower figure to Queensland, there should be at least 20 pairs of dairy-type identical twins born here each year. The figure is probably much higher.

VALUE FOR RESEARCH.

The simplest forms of husbandry or production experiments involve the use of two groups of animals to compare the effect of two different rations or management practices on some production characteristic, such as growth rate or milk production. One of the major difficulties in experiments of this type is the marked variation between animals. For example, in any herd of cows under the same management practice, there is a great variation in the amount of milk or butterfat produced by individual cows.

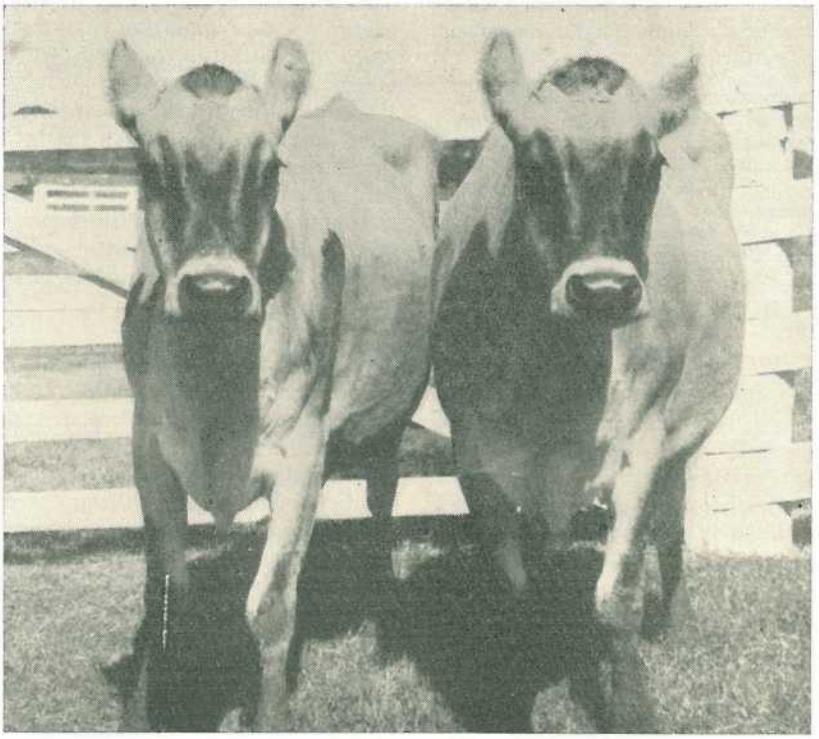

Plate 1.

A Pair of Identical Twin Calves at the Animal Husbandry Research Farm, Rocklea.

The effect of this variation is largely overcome in experiments with laboratory animals (for example guinea pigs, rats, and mice) by breeding strains with little variation and by using large numbers.

This is a practical procedure in these small animals because the generation length (that is, the average age of parents when their young are born) is short, numbers of offspring are produced at each birth and the facilities for feeding and housing them need not be large or expensive.

Although the use of laboratory animals is very valuable for experimental work, the information obtained from them must be applied and evaluated in the domestic animals.

Domestic animals, particularly cattle, are not suitable for breeding strains with little variation, because of their much longer generation length and the tendency for undesirable characters to appear.

The larger the numbers that can be used in a group for experimental work the more reliable are any differences obtained, because the law of averages will tend to even out the variation between groups. However, because of the size of cattle and the amount of feed required, large numbers of animals make these experiments cumbersome and costly.

As previously explained, identical twins have the same inheritance and therefore, if managed and fed in exactly the same way, theoretically they should respond similarly. It follows that, if the two animals of a set are managed or fed differently, the difference in their response should allow a comparison of the value of the different treatments.

Identical twins have been compared with unrelated animals and they have been evaluated on the basis of production characteristics. It was found, for example, that for growth rate the twin efficiency value was 13, that is one pair of identical twin calves was as reliable as two groups of 13 unrelated calves.

Therefore, in an experiment to determine the effect of two methods of feeding on growth rate of calves, 10 sets of identical twins provide an answer as accurately as two groups of 130 unrelated calves.

This relationship will vary for different characteristics, as shown by the following examples of twin efficiency values.

Characteristic.	Twin Efficiency Value.
Butterfat production ..	54
Milk production	22
Butterfat percentage ..	15
Blood phosphorus ..	15
Growth rate	13
Feed intake	8
Persistency of lactation ..	4
Blood calcium	1

These figures are used only as a guide by research workers, but it will be evident that identical twins can be very valuable in improving the reliability of experimental work on many aspects of cattle production.

The limited number of identical twins that have been obtained by the Department have been used in an experiment on calf feeding, studies on digestibility of feedstuffs and in a grazing trial on paspalum pastures in south-eastern Queensland to examine the effect of copper supplementation on growth rate.

HOW TO RECOGNISE THEM.

To help farmers to decide whether any twin calves born on their properties are likely to be identical, a number of points are listed as a guide. If after checking these points on the calves farmers believe they have identical twins, it is requested that they contact a Departmental officer.

Points to be considered are:—

1. They must be the same sex, either both bulls or both heifers.

2. They must be the same colour. That is a very valuable guide as about 90 per cent. of twins that are not identical have different hair colour. In young calves the actual hair colour is often obscured by the birth coat. However, the colour of the eye lashes, ear fringes and brush of the tail are very useful, because they are not obscured by the birth coat colour. The occurrence of white patches should be of the same general pattern in both twins, but the size and shape of the patches may vary.

3. They should have the same conformation. Comparison of the shape of the heads is more easily done by eye, particularly the length and width of the head and length and width of the lower jaw.

4. In Jersey and Jersey-cross cattle there is often a pigmented streak on the skin inside the ears, which covers varying proportions of the lower part of the ear. In identical twins the intensity and extent of this pigmentation should be the same.

5. Identical twins need not necessarily be the same size.

For examination the calves are held closely together with their heads in the same direction and each point is considered separately. Since two calves of the same breed have so many traits in common, it is important to look for *differences* and not similarities.

PURCHASE.

If after inspection the Departmental Officer considers that the calves are identical and healthy, he will make arrangements for purchase. The Department has standard prices for purchase of identical twin calves. It is preferable that calves are over one week old at purchase, because they do not travel well when younger. The officer will also obtain for record purposes details on date of birth, breeding, feeding and any vaccinations.

It should be pointed out that identical twins are of no greater value than other cattle for commercial purposes but are of particular value for research. This value is independent of breed, conformation or productivity, but depends entirely on proof that they are identical.

Lucerne as a Grazing Crop.

Outside the recognised lucerne-growing districts, many landholders are now turning to lucerne as a nutritious and high-yielding grazing crop. Grazing lucerne is proving a good investment on the poorer soils and in the lower rainfall areas. Drainage is the major factor and the crop should only be grown on a well-drained soil. To disregard this may mean the complete loss of the stand in the first wet season. The cost of seed for grazing stands is not high. A light seeding of 1 to 3 lb. an acre is sufficient in the 20 in. rainfall belt. Sown lightly, the plants have ample room to develop large crowns which can stand up to grazing. Before planting, lucerne should be inoculated to provide the root nodule bacteria that supply nitrogen to the plant. Inoculum can be obtained from the Agriculture Department, free of charge.

—O. L. HASSELL, Senior Adviser.

Tropical Legumes For Better Pastures

By S. R. WALSH, Officer in Charge, Bureau of Tropical Agriculture.

Tropical legumes have proved themselves an important ingredient of sown pastures in the wet tropics, and graziers in the high rainfall areas of North Queensland will be well repaid if they sow the correct legumes in their pastures.

The following are the main reasons why inclusion of the legumes is recommended:

(1) They will maintain the soil fertility from the initial stages of land clearing;

(2) They will provide a balanced pasture for the stock; and,

(3) This pasture will give greatly increased production of high quality beef.

There are, however, certain precautions which must be taken if the grass-legume mixture is to be successful:—

(i.) Plant the legume most suitable to the climate and soil type;

(ii.) Plant only pure seed from reliable sources;

(iii.) Use the correct inoculum; and,

(iv.) Don't overgraze the pasture but manage it correctly.

WHEN FOREST IS CLEARED.

Under natural rain forest conditions the fertility of the soil is fairly high. There is a high return of organic matter to the soil from rotting leaves, roots and other plant parts. The soil bacteria are working under favourable, moist conditions without being greatly affected by extremes of temperatures, so that the conversion of leaf mould and other plant residues into plant foods is rapid and practically continuous.

In addition to this, the canopy of leaves formed by the trees protects the soil from the battering effect of tropical rains, so that losses by erosion of soil rich in plant foods are very slight.

Once this forest cover has been cleared and burned (as usually follows), the soil is exposed to different climatic influences. Unless proper care is taken, the heavy tropical rains quickly leach the plant foods from the top layers of the soil even if no actual soil erosion occurs. The leaching and exposure of the soil lead to a rapid decline in fertility.

One way of protecting the soil is to plant grass and treat it as a crop. Although such grass pastures will stabilise the soil, help to control weeds, and provide valuable fodder for stock, their productivity will gradually decline except under special conditions.

The main reason for this loss in production is the exhaustion by the grass of the available soil nitrogen which is not readily replenished under a pure grass sward. Moreover, where the pastures are used to produce milk or beef, the sale of these products results in the removal from the pasture of valuable nitrogen in addition to other plant foods.

The special conditions where grass yields do not decline, are found for

example, where annual flooding deposits a layer of silt which acts as fertilizer. However, this occurs only in isolated areas and in any case it means that country further up the stream has lost valuable soil, so it cannot be classed as an entirely satisfactory way of maintaining soil fertility.

PART PLAYED BY LEGUMES.

Where grass is sown alone and production declines due to dropping soil fertility, there is also a decline in protein level and palatability. This is where the legumes come into the picture, and this is the part they play:

(1) Vigorous legume growth results in increased soil fertility because of the legume's ability to "fix" atmospheric nitrogen. This nitrogen in turn is made available to the associated grass in the pasture, which also grows more vigorously and becomes more palatable.

(2) Pasture legumes have a higher protein content than the grasses and unlike the grass they maintain this protein at a high level throughout the grazing season. In the case of tropical legumes the grazing season extends virtually throughout the year.

(3) Legumes also have a higher content of minerals important for healthy animal growth.

(4) Maximum returns are assured from a balanced grass-legume mixture.

While grass alone is not a balanced grazing crop it is also true that a complete legume pasture is also not wholly satisfactory. In such a pasture, over a period of time, the build up of nitrogen is so great that it eventually leads to an invasion of weeds and grasses of inferior type. It is therefore far more satisfactory to plant higher quality grasses with the legumes than to allow the poorer strains to invade the paddock. It is the reverse of this which occurs more frequently in many tropical pastures in Queensland today, that is, grasses are planted, but no legumes.

The association of grasses and legumes goes back to very early times in agriculture and many of those combinations are still in use today. However, for tropical conditions this association is comparatively new but nevertheless is most important.

Guinea grass, for example, when growing in combination with centro has a deep rich green colour in marked contrast to the yellowish green of guinea grass growing alone. The dark green grass is also more palatable than the paler grass.

This difference in colour and palatability, which shows up best during the wet season, is due to the greatly increased amounts of nitrogen made available in the soil by the legume, which in this case is centro.

DIFFERENT FROM SOUTHERN LEGUMES.

There is quite a marked difference between most grazing legumes suitable for tropical conditions, and those which grow in the more temperate zones.

In common with most plants used by man in the tropics, one of the chief differences lies in the habit of growth. Legumes suitable for tropical pastures have a robust and vigorous growth and cover quite a considerable area of ground from one main root. Together with this robust growth they also have larger leaves and stems, and invariably are slightly hairy. The majority of the legumes also root from the nodes or joints and seed profusely.

This habit of growth ensures their survival under conditions where high temperatures, high rainfall and fertile soils continue to produce lush vigorous plants whether they be weeds or types useful to man.

The tropical legumes are therefore well suited to combine with the high yielding grasses such as guinea grass, para grass, and molasses grass; in fact they give their best pasture performance when they are used in

association with such tall growing vigorous grasses on which they can climb. In an established tropical pasture mixture, the legumes are found intertwined throughout the grass stools stems and leaves.

A question which is often asked is "Do these legumes cause bloat like the lucerne and clovers of the South"? To date no cases of bloat have been reported in stock grazing on tropical legumes, due possibly to the greater proportion of roughage found in the coarser plants.

Feeding Values Compared

The results of chemical analyses of the four legumes centro, puero, stylo and calopo, and their comparison with the composition of some tropical grasses are shown. These figures illustrate the capacity of the legumes to maintain protein levels in the pasture, especially during the dry season when cattle normally make their poorest growth:

Plant.	Season.	Analyses of Water-Free Material.		
		Crude Protein.	Lime.	Phosphate.
		per cent.	per cent.	per cent.
Centro	Wet	23·8	3·61	0·84
	Dry	15·8	1·44	0·49
Puero	Wet	19·5	2·63 to 1·047	0·607 to 0·42
Stylo	Wet	18·05	2·70	0·75
	Dry	10·55	1·27	0·49
Calopo	Wet	19·5	2·17	0·584
Guinea grass	Wet	16·2	1·0	0·644
	Dry	6·8	0·413	0·276
	Old growth	4·5	0·410	0·148
Molasses grass	Wet	14·9	0·513	0·940
	Dry	8·4	0·315	0·415
	Old growth	3·3	0·416	0·172
Para grass	Wet	18·6	1·488	0·917
	Dry	9·9	0·341	0·388
	Old growth	5·8	0·368	0·208

Interesting live weight gains were recorded in 1957 from Departmental grazing trials at Utchee Creek near South Johnstone. Guinea grass and centro pastures which are now nine years old gave the following results from two four-acre paddocks grazed by beef cattle for 273 days:

The Guinea grass and centro paddock produced 1,085 lb. of live weight during the trial period while the Guinea grass alone produced only 588 lb. of live weight over the same period.

$$S + F = P.$$

Raising the level of soil fertility is one of the most important means of increasing productivity.

SOME TROPICAL PASTURE LEGUMES.

It is not proposed to describe all the tropical pasture legumes, but only those which have been closely studied under Queensland conditions, such as centro, puero calopo, stylo and Glycine. These are discussed briefly:

Centro (*Centrosema pubescens*).

Centro is native to South America, but has been found growing wild in Java and is now used extensively throughout the tropical East as a cover crop.

Description: It is a vigorous perennial climbing legume with trifoliate leaves some 1½ in. long and ¾ to 1 in. wide, dark green in colour, forming a thick ground cover 15 to 18 in. deep.

The plants flower profusely, producing large, showy, pea-type flowers. The seed pods which are produced chiefly during August and September are flat and about 5 in. long; when ripe they are dark brown to black in colour containing 18 to 20 brownish black seeds. (Plate 1.)

Value in Pastures: This legume is the most useful of all those tried in the wet tropics of Queensland. It is very palatable to stock and combines well with guinea grass, para grass and other grasses to form a well balanced mixture high in protein, calcium and phosphate.

Centro is fairly drought-resistant but under tropical conditions in Queensland it has been found to be more suitable for the lower flats where moisture conditions are good, and it does very well on soils of higher fertility. It is recommended for most coastal soils in regions with an average annual rainfall of 70 in. or more, and also in the drier tropics where

Plate 1.

A Guinea Grass—Centro Pasture Mixture at Utchee Creek, South Johnstone.

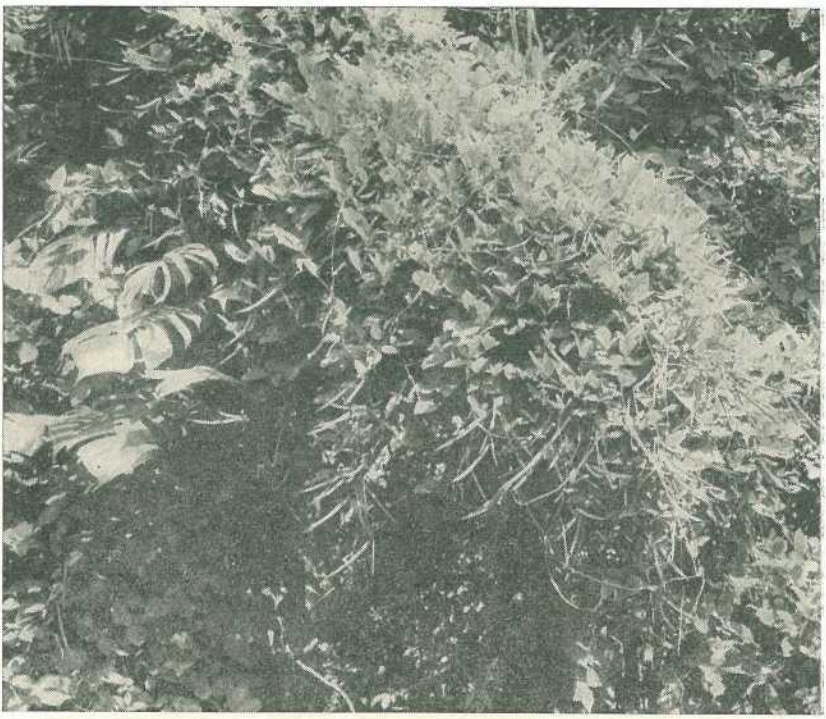

Plate 2.

Centro climbing a Scrub Face at Utchee Creek, South Johnstone.
Note the clusters of seed pods.

Plate 3.

Puero at Utchee Creek, South Johnstone. This legume has completely dominated molasses grass and has climbed over wild tobacco and neighbouring trees.

irrigation is available. This legume is also being tested extensively in Departmental plots along the coastal strip south to the New South Wales border.

Puero (*Pueraria phaseoloides*).

Puero is indigenous to the East Indies, but is now grown throughout most tropical countries as a green manure and cover crop.

Description: It is a vigorous climbing perennial legume often producing runners 15 to 20 ft. in length, and usually about the thickness of a lead pencil or slightly thicker; with these and a number of secondary shoots a dense cover 24 to 30 in. in depth is formed within eight to nine months of sowing. The leaves are large and hairy, approximately 2½ to 3 in. in length and about the same in width.

Puero produces an abundance of small mauve flowers from which develop more or less cylindrical pods some three inches in length, carrying the small brown seeds. The seed pods mature irregularly making harvesting a difficult task. (Plate 2.)

Value in Pastures: While puero is sufficiently vigorous to smother shorter less robust grasses such as molasses grass or purple-top guinea, it is nevertheless susceptible to damage from heavy grazing. In addition, although it produces a mass of vine-like stalks the amount of fodder available is restricted to the relatively thin cover of top leaf growth. It would appear to be of more value as a long-term cover crop used to control weeds and give light grazing, than as a permanent pasture legume.

Plate 4.

Calopo Growing with Molasses Grass at the Bureau of Tropical Agriculture, South Johnstone.

Calopo (*Calopogonium mucuniodes*).

Calopo was introduced to the East Indies from tropical America as a cover crop.

Description: Calopo is a vigorous aggressive legume forming a mat of foliage and rotting leaves 15 to 18 in. in depth. It has trifoliate hairy leaves slightly smaller than puero, that is, being approximately 1½ to 2 in. long and about the same width. It climbs readily and in old established areas is frequently found covering fence lines. (Plate 3.)

Description: It is a vigorous perennial plant growing 2 to 3 ft. high with a light yellowish green narrow leaf. This legume somewhat resembles lucerne in appearance, but may become woody if allowed to grow unchecked for some years. In some strains of stylo the leaves have a sticky feeling, this being due to an exudation from numerous small hairs

Plate 5.

Stylo Invading Blady Grass on the Basilisk Ridge, South Johnstone.

The flowers are pale blue in colour and the seed pods 1 to 1½ in. long, yellowish brown in colour, and covered with fine brown hairs The seed is yellow and slightly smaller than puero. It could be classed as a short term perennial, but its unpalatability to stock makes it an undesirable legume for pasture.

Stylo (*Stylosanthes gracilis*).

Stylo is a native of Brazil and another common name sometimes used for it is Brazilian lucerne.

on the underside of the leaves. The seed is produced in the small seed heads which develop on the ends of the stalks. The seed is unevenly shaped and covered with an outer brown case which when removed reveals a shiny yellow seed, slightly smaller in size than lucerne seed. (Plate 4.)

Value in Pastures: Although Stylo makes rather slow growth in the seedling stage and may be overgrown by some vigorous grasses in the early stages of establishment, it is a valuable pasture legume because of its

capacity to grow well on soils of relatively low fertility. It is known to grow and spread on eroded hillsides where blady grass is often dominant.

The legume is not readily eaten by stock when it is young and this natural protection assists in its establishment. As it matures, it is grazed freely. When grazing takes place after seed has ripened, many of the seeds pass undamaged through the animals and the natural spread of the plant is greatly accelerated.

Glycine (*Glycine javanica*).

Glycine introduced to Australia from Africa is also found throughout parts of Asia, East Indies and America.

Description: It is somewhat similar in appearance and habit of growth to centro, but is not so vigorous under coastal conditions. The leaves are 1-1½ in. long and ¾-1 in. wide, with the underside covered with short fine hairs. The pods are 1 to 1½ in. long and covered with light brown hairs; the seeds are dark brown to black, about the same size as the puero seed.

Value in Pastures: This legume is showing great promise on the tropical highlands such as the Atherton Tableland, where it has shown ability to spread naturally into adjoining grasslands. It cannot stand extremely wet conditions such as are frequently met with on the tropical coast; it is also a shy seeder under warm humid conditions. Glycine is not recommended, therefore, for the wet coastal lowland district.

Tropical Legumes To Sow

The choice of a pasture legume to plant in the wet lowland tropics is limited not only by the suitability of a particular species to the conditions but also by the availability of seed.

Of the many legumes which have been tested under coastal tropical conditions, centro and stylo have proved the best.

Centro should be sown on the lower flats and the more fertile foothills of the tropical coast.

Stylo is recommended for sandier soils and for the steeper, more eroded and often weed-infested hillsides particularly in the somewhat drier phases of the tropical coastal country.

BEST WAY TO ESTABLISH.

The actual method of establishment depends on the class of land being brought under pasture. In scrub land, if the first burn is a good one, the legume could be sown with the grass. On the other hand if a second burn is required in order to remove excessive unburnt timber the legume should be planted after this latter burn. Planting followed by a burn the next year will kill many young plants and seriously reduce the stand.

If the legumes are sown after the first burn and hormone sprays are used to control weed growth, care must be taken to avoid spraying the young legumes which are susceptible to these weedicides.

On cultivated land the seed may be broadcast or sown in drills—in this latter method, the drills need only be shallow—about 2 in. deep and up to 6 ft. apart. It is advisable to roll after sowing to ensure soil compaction and a better germination.

SOWING RATE.

The following are recommended sowing rates when the legume is planted in conjunction with grass:

Centro, 3 lb. per acre.

Puero, 3-4 lb. per acre.

In addition, both of these species may be planted by small rooted cuttings, sown at intervals in rows about 6 ft. apart.

Stylo is planted at the rate of 3-4 lb. per acre. Since it is very difficult to purchase seed of this legume, small plots should be established for seed production. A method of establishment where seed is not available is to cut existing stylo stands when the seed is mature, and scatter the plant material in favoured spots in the paddock.

INOCULUM IS NECESSARY.

The use of inoculum is most desirable when planting any legume. It is not the plant itself which is able to "fix" or utilize the nitrogen from the soil air, but bacteria which form and live in nodules on the plant roots. Should these bacteria be absent or ineffective, the legume has to draw all its nitrogen requirements from the soil just as other plants do. So, unless the right bacteria are present on the legume roots, the legume will be in no way superior to any other plants in improving the nutritive value of the pasture and raising the fertility of the soil.

Most legumes require their own particular strain of bacterium. Inoculum has now been developed for each legume, and is obtainable free from the Department of Agriculture and Stock, Brisbane.

When ordering, state the type of legume being planted and also the amount of seed to be treated.

Instructions as to the method of using the inoculum are contained in the box with the material. In a hot climate do not order inoculum too far in advance, and on receipt, store in a cool place.

MANAGEMENT OF TROPICAL LEGUMES.

Time of First Grazing.

It is impossible to give definite information concerning the time which should elapse between planting and first grazing. This will depend on many variable factors as well as on the type of legumes used and on the stage of growth.

As mentioned earlier, stylo is not particularly palatable in the early stages. Consequently a pasture including stylo may be grazed relatively soon in the establishment period without injury to the legume. This early grazing may be necessary to prevent the young legume being overgrown by the grass.

On the other hand centro and puero are much more palatable and more likely to be damaged by early grazing. With this type of pasture two main points should be kept in mind regarding early grazing. First, don't graze too soon; and second, don't graze too long.

Some Important Points.

Excessive shading by vigorous grasses may lead to a reduction in the effectiveness of the legume. This excessive shading could be due to undergrazing of a well established pasture, in which case it may be overcome by heavier stocking or by a high mowing.

Overgrazing will also damage these pastures and reduce productivity. Under tropical conditions it is most desirable to maintain a height of 15-18 in. in the grass legume mixture. This keeps weeds to a minimum and retains a sufficient leaf area of the useful species to enable them to make quick regrowth.

For reasons described earlier puero will not stand periods of prolonged heavy grazing. The loss of the comparatively thin layer of leaf and mechanical damage by trampling to the stems lead to very slow regrowth and invariably an invasion of weeds.

In most coastal areas, fires are a problem. Stylo is one legume which is not seriously affected by a fire since, providing soil moisture is available, the recovery after burning is rapid. This regrowth may be from the old plants

or may follow a germination of self-sown seeds. Puero on the other hand, receives a very severe set back from a fire and it may take 18 months to recover.

At times, mowing of pastures is required to control weeds and grasses of low nutritive value. When this is necessary it should be realised that these legumes are not adapted to low mowing which removes a large proportion of long twining stems from which future leaf growth would be made. Close mowing will therefore delay regrowth and thus interfere with total pasture yields and especially the yield of high protein legume growth.

Where mowing is considered essential it should be carried out as infrequently as possible and as high as possible.

HOW LONG WILL LEGUMES LAST?

The effective life of tropical legumes in a pasture depends on the management rather than on the legume itself. The legumes themselves are all perennial, and, with the possible exception of calopo, will last for very long periods under favourable conditions.

A well managed pasture will last for many years providing a balance is maintained between the grass and legume. Both overstocking and understocking will shorten the life of legumes in a mixed pasture. Pastures with centro as the legume have lasted for 10 years without deterioration at the Bureau of Tropical Agriculture at South Johnstone.

HELP TO CONTROL WEEDS.

Both stylo and centro are suitable species for weed control.

Under the heavy rainfall conditions of north-east Queensland the majority of the cleared hillsides are covered with blady grass and invariably the soils are of fairly low fertility. On these hillsides stylo has proved itself to be a valuable legume to compete with blady grass. It is being used on a wide variety of soils for this work, and is found from south of Tully to north of Cooktown on the coastal strip.

Centro has given good results in some of the higher ranges on the red basaltic soils as a means of assisting control of lantana and blady grass.

Legumes are not capable of controlling the weeds solely on their own and require assistance in the form of good management methods. This may involve the use of hormone sprays.

It should be remembered that these legumes are susceptible to hormone sprays. Therefore when hormones are used for "spot" spraying of weeds in the pasture, care should be taken to see that the legumes receive as little spray as possible. When the legumes have a good ground cover a slight amount of hormone which may go on them during careful weed spraying will not greatly affect them.

IS SEED AVAILABLE?

Seed supplies are poor for all tropical legumes except centro which is imported in quantity from the East Indies. Limited quantities of stylo are also occasionally imported.

The results of experiments on seed harvesting which were published in the *Queensland Agricultural Journal* for February 1958 indicate that it may be possible to harvest many of these legumes economically under Queensland conditions.

When purchasing seed, it should be procured from a reliable source and should be free from seeds of undesirable plants. This is particularly important when buying seed brought in from foreign countries.

Dairymen Unite to Conserve Feed

By J. J. SULLIVAN, Senior Adviser in Cattle Husbandry.

Dairymen in the central Burnett are using a powerful weapon in a promising attack on feed shortage.

TO central Burnett dairymen, the recent drought has underlined the need for fodder reserves and has acted as a spur. They realise that modern machinery removes much of the hard work from fodder conservation. It will handle large quantities of fodder in a short time and does not call for a large labour force. On the other hand the capital cost of harvesting machines is high in relation to the average farm income. Also, their use on any one farm is limited.

Can a system be devised where advantage is taken of the benefits and at the same time reduce the handicaps? These dairymen say "Yes"—and they are proving it.

Co-operation is the key.

Silage the Target.

In devising their plan of co-operation, these farmers have placed the accent on the conservation of silage. This is because the average progressive dairyman in the district now conserves hay to the full extent of his farm storage capacity. Any increase in the target for hay reserves would, in most cases, mean further outlay of money and time in building operations. Therefore an immediate approach was made to the conservation of trench silage.

In broad outline the plan that has been devised has four objectives for achieving its aim of widespread conservation of silage:

(1) Formation of neighbour groups of three to six dairymen for the joint purchase and co-operative working of silage-making machinery.

(2) Formation of farmer groups on a locality basis for the employment of silage-making machinery by contract.

(3) Location of silage-making machinery, available by contract, to serve the "contractors' groups."

(4) Co-operation with local officers of the Department of Agriculture and Stock.

Development in 1957.

During 1957 the nucleus of farmers' silage groups was formed at Gayndah, Binjour, Mundubbera, O'Bil Bil, Ceratodus, Branch Creek, Biggenden, Dallarnil, Booyal, Bundaberg and Maryborough.

Four "farmers' joint purchase groups" and "farmers' contract groups" to warrant the operation of four silage-making contractors were organised. Finally, contractors were established in areas to serve the "contract groups."

Progress in 1958.

The persistence of drought conditions until the end of February resulted in all but one of the joint purchase groups failing to get their machinery for operation in the 1957-58 season. It was found possible, however, to bring all farmers with silage crops into contract service groups.

The net result to date has been the increase of trench silage from a few hundred tons conserved on about a half-dozen farms to approximately 4,000 tons on about 40 farms. If early frosts do not occur there is every prospect of fulfilling the target of 5,000 tons spread over 50 farms.

on the smaller farm unless he can engage it profitably in contract work. The initial cost is high in relation to his annual income, and even when the machinery is used to the best advantage on a farm it is likely to be idle for more than 11 months of the year.

Plate 1.

This Silage Trench on Sloping Ground is Easy of Access.

At the present time, plans are being laid for the extension of operations to the north and south Burnett. Some groups will be operating in both these areas in the summer of 1958-59.

Why This Success?

The factors responsible for the outstanding success of this group action are:—

(1) Farmers have recognised the need for greatly increased supplies of good-quality roughage on dairy farms.

(2) Group action is proving much more effective than individual effort in these aspects:

(*a*) *Economic*:

Individual purchase of fodder conservation machinery is hardly an economic proposition for the dairyman

In the case of joint purchase by a group, each individual has the full use and benefit of, say, £1,000 worth of machinery, for an initial outlay of £150 to £350 according to the number in the group.

Apart from the advantage to group members, the local industry benefits from the fact that each machine brought into the area is responsible for many more hundreds of tons of conserved fodder available to hundreds more cows than is the case with individual ownership.

The low operating cost of modern silage-making machinery is attractive. Where there is a continuous run of work available in the locality the "group contractors" can deliver the green material in the trench for prices

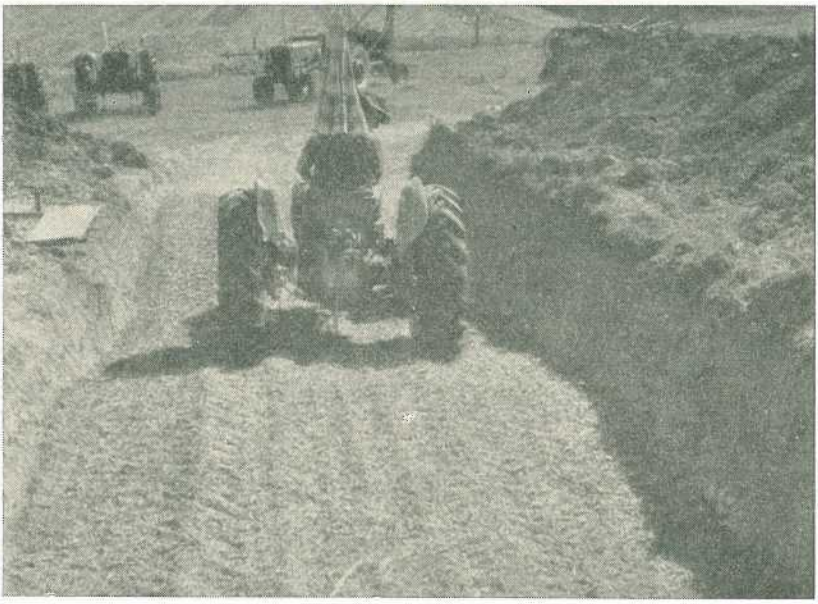

Plate 2.
This Ensilage is Well Compacted.

as low as 7s. per ton. The rolling of the material and the covering of the trench is done by the farmer.

It has been possible also to organise the services of an earth-moving contractor on a group basis. A trench of 50-ton capacity can be dug for an average cost of £13.

(*b*) *Labour*:

Silage-making calls for additional labour on the farm. For successful work, experienced men are required. There is no pool of such labour available from which the farmer may draw at a particular time. The most helpful and satisfying labour which any farmer can get is that of his neighbours. Group action gives each man an incentive to help his neighbour because he is also helping himself. This means that the job is done in the most economical and most efficient way.

(*c*) *Impetus of Group Movement*:

Group action in eliminating or diminishing difficulties reached a momentum which carried operations to a point far beyond that attainable by individual effort.

The aims and the promise of group action is revealed by the apt summing-up of a leading central Burnett dairyman: "A drought-proof farm has always been the cherished dream of every dairyman. It has always been a castle in the sky. For the first time in my life I can see the prospect of that dream coming true."

Such is the acknowledged possibility and ultimate aim of fodder conservation operations in the Burnett.

Keep Them Off Tractors.

It has been found that children are involved in 25 per cent. of all accidents on tractors and implements on rural work.

Children should be kept away from tractors and implements at all times. Don't carry passengers.

Tuberculosis-Free Cattle Herds. (As at 19th August, 1958.)

Aberdeen Angus.

G. H. & H. J. Crothers, "Moorenbah," Dirranbandi
A. G. Elliott, "Ooraine," Dirranbandi
W. H. C. Mayne, "Gibraltar," Texas

A.I.S.

M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
F. B. Sullivan, "Fermanagh," Pittsworth
D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
W. Henschell, "Yarranvale," Yarranlea
Con. O'Sullivan, "Navillus" Stud, Greenmount
H. V. Littleton, "Wongelea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
Sullivan Bros., "Valera" Stud, Pittsworth
Reushle Bros., "Reubydale" Stud, Ravensbourne
A. C. and C. R. Marquardt, "Cedar Valley," Wondai
A. H. Sokoll, "Sunny Crest" Stud, Wondai
W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
W. H. Thompson, "Alfa Vale," Nanango
S. R. Moore, Sunnyside, West Wooroolin
H.M. State Farm, Numinbah
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
D. G. Neale, "Grovely," Greenmount
A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
W. D. Davis, "Wamba" Stud, Chinchilla
Queensland Agricultural High School and College, Lawes
C. K. Roche, Freestone, Warwick
Mrs. K. Henry, Greenmount
D. B. Green, "Deloraine" Stud, Durong, Proston
E. Evans, Wootha, Maleny
T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
M. F. Power, "Barfield," Kapaldo
A. H. Webster, "Millievale," Derrymore
W. H. Sanderson, "Sunlit Farm," Mulgildie
R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, *via* Murgon
R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
C. A. Heading, "Wilga Plains," Maleny
G. S. and E. Mears, "Morden," M.S. 755, Toogoolawah

Ayrshire.

L. Holmes, "Benbecula," Yarranlea
J. N. Scott, "Auchen Eden," Camp Mountain
E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
T. F. Dunn, Alanbank, Gleneagle

Friesian.

C. H. Naumann, "Yarrabine" Stud, Yarraman
D. J. Pender, "Camelot," Lytton road, Lindum
S. E. G. Macdonald, "Freshfields," Marburg

Guernsey.

C. D. Holmes, "Springview," Yarraman
A. B. Fletcher, Cossart Vale, Boonah
W. H. Doss, Degilbo, *via* Biggenden
A. C. Swendson, Coolabunia, Box 26, Kingaroy
C. Scott, "Coralgrae," Din Din Road, Nanango
R. J. Wissemann, "Robnea," Headington Hill, Clifton
G. L. Johnson, "Old Cannindah," Monto
A. Ruge & Sons, Woowoonga, via Biggenden
G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428, Grantham
N. H. Sanderson, "Glen Valley," Monto

Jersey.

Queensland Agricultural High School and College, Lawes
J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
J. F. Lau, "Rosallen" Jersey Stud, Goombungee
G. Harley, Hopewell, M.S. 189, Kingaroy
Toowoomba Mental Hospital, Willowburn
Farm Home for Boys, Westbrook
P. J. L. Bygrave, "The Craigan Farm," Aspley
R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
E. A. Matthews, "Yarradale," Yarraman
A. L. Semgreen, "Tecoma," Coolabunia
L. E. Meier, "Ardath" Stud, Boonah
A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
F. W. Verrall, "Coleburn," Walloon
C. Beckingham, Trouts road, Everton Park
W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
W. S. Kirby, Tinana, Maryborough
S. A. Cramb, Bridge st., Wilsonton, *via* Toowoomba
J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
T. Nock, Dallarnil
P. Fowler & Sons, "Northlea," Coalstoun Lakes
F. Porter, Conondale
H.M. State Farm, Palen Creek
B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie

Poll Hereford.

W. Maller, "Boreview," Pickanjinnie
J. H. Anderson, "Inverary," Yandilla
D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick.
E. W. G. McCamley, Eulogie Park, Dululu
Wilson and McDouall, Calliope Station, Calliope

Poll Shorthorn.

W. Leonard & Sons, Welltown, Goondiwindi

Barn Hay Drying

By C. G. WRAGGE, Agricultural Engineer.

(*Continued from August,* 1958.)

One of the most important items to be considered in any drier installation, whether it be for hay or grain drying, or both, is the type and size of fan to be employed. It is therefore advisable to seek the advice of firms specialising in ventilation equipment.

Fans are divided into three main groups:

(1) Centrifugal.

(2) Axial flow.

(3) Propeller.

Centrifugal fan.—With a centrifugal fan, the air enters at the centre of the hub, is turned through an angle

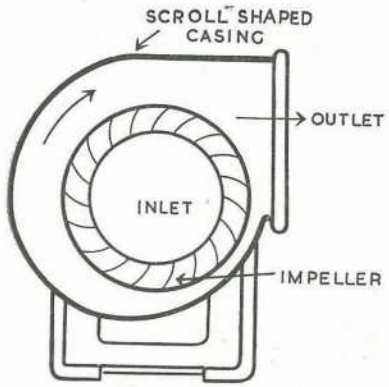

Plate 5.

A Typical Centrifugal Fan. The air enters at the centre or hub, is turned through 90 deg. and discharged outwards into a surrounding casing shaped in the form of a scroll.

of 90 deg., and discharged outwards into a surrounding case, shaped in the form of a scroll (Plate 5). These fans are subdivided into three classifications according to the shape of the blades (Plate 6), namely:

(1) Forward curved.

(2) Straight or paddle.

(3) Backward curved.

Centrifugal fans are used mainly where high pressures are required but they will adapt themselves to changes of pressure by a rise or fall of air volume delivered. A word of caution, however, is made about forward-curved and paddle-blade fans—If the resistance (static pressure) against which the fan is operating, drops, as for example, when the air is diverted from a full bay to a partly filled bay, the volume of air will increase and the horsepower demand rise sharply, possibly overloading the motor. With the backward-curved blade this trouble does not occur.

As the air has to be turned through 90 deg., the efficiency of centrifugal fans is usually about 60–70 per cent. Recent developments, however, in the use of "aerofoil" shaped blades (in many respects similar to the aerofoil blades of axial-flow fans) have increased efficiencies to close on 80 per cent., but generally speaking, efficiencies are lower. This type of fan also has the disadvantage of bulk.

Axial-Flow Fans.—These fans (Plates 7 and 8) take in and discharge the air in the same straight line and are, therefore, usually more efficient than centrifugal fans. They are mainly used where lower static pressures are required, say up to 2½ in. W.G. Higher static pressures are possible with two-stage axial fans, that is, two fans arranged in tandem, each being driven by its own motor and the two impellers rotating in opposite

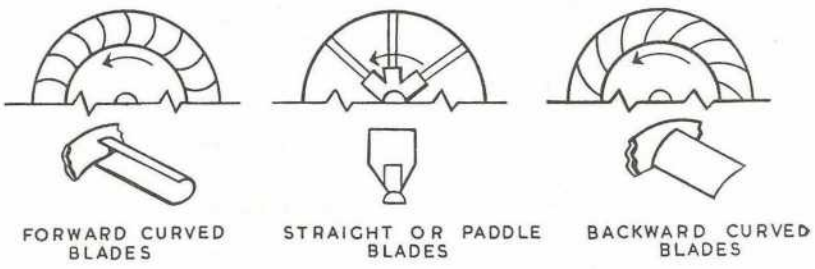

Plate 6.

The Three Main Types of Centrifugal Fans Which are Identified According to the Shape of Their Blades.

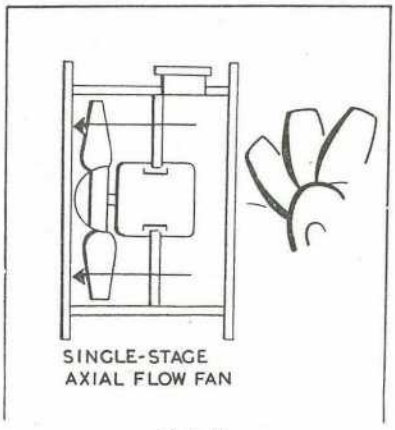

Plate 7.

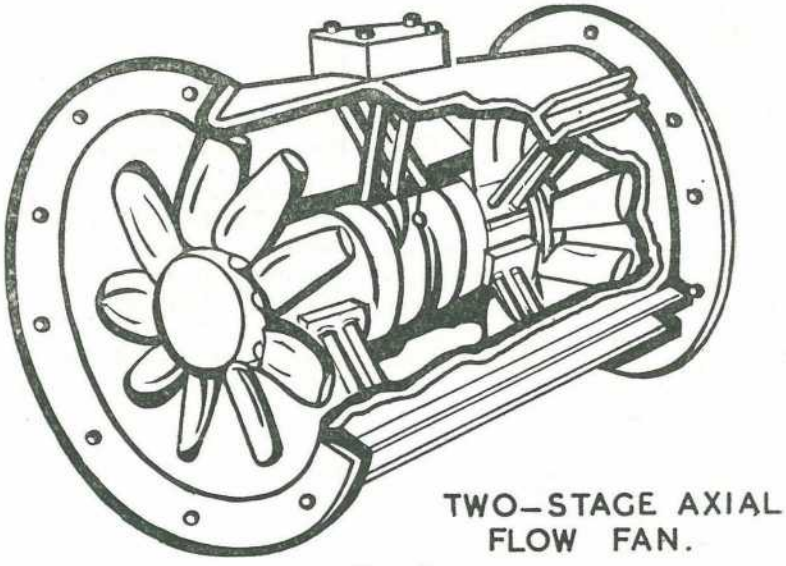

Plate 8.

directions. The pressure developed by these fans with both stages in operation can be up to three times the pressure developed by one stage alone. This type of fan is now being used extensively because of its higher efficiency (over 80 per cent.), compactness and simplicity of installation. It is for these reasons that the majority of drier installations in the United Kingdom are equipped with axial fans.

Propeller Fans.—These fans (Plate 9), of which the desk and ceiling models are examples, are designed for systems where there is little or no ducting and where a large volume of air at very low pressure is required. They are used in the ventilation of buildings and in drying installations where the static pressure at the required air flow is below 0.75 in. W.G. Maximum pressure is developed when the fan is mounted on a diaphragm plate with the impeller projecting as illustrated (Plate 9).

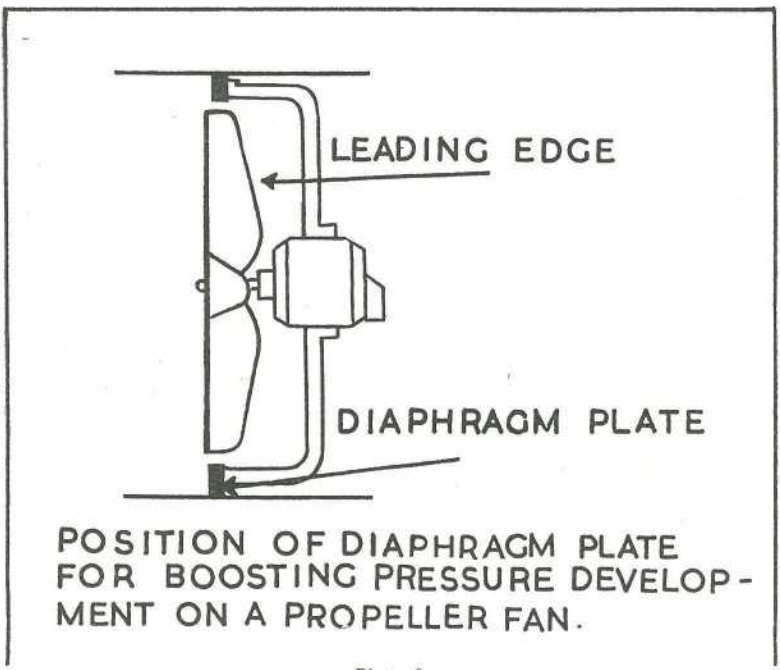

Plate 9.

FAN PERFORMANCE.

The type of fan can be considered when the drying requirements are known. The diameter of the impeller, or blades, of a fan gives an approximate indication of the speed at which it should run. The actual speed of the fan will depend upon a number of factors such as the number of blades, the pitch angle or shape of the blades, and the performance required. The graph (Plate 10) gives a rough idea of the maximum speed of a fan if it is not possible to find any information relating to its performance. The following details should be provided to the supplier to enable a quotation to be made for a fan that would meet the particular requirements:

(1) Output of air required in cubic feet per minute (C.F.M.).

(2) The static pressure in inches water gauge (inches W.G.) against which the fan will have to operate.

(3) If electric power is available, the nature of the supply, that is, D.C. or A.C. (single or 3-phase), and voltage. If no electric power is available, the make, horse-power and speed of the stationary engine it is proposed to employ to drive the fan.

The recommended air flow (C.F.M.) for barn hay drying has for some time been accepted as 20 C.F.M./sq. ft. of drier floor area, with a static pressure of 1.15 in. W.G. Recently the latter figure has been stepped up to 1.5 in. W.G., particularly for operation in the wetter parts of the country. Duct velocities usually do not exceed 1,000 ft. per minute. The MAXIMUM depth of hay loading should be about 14 ft. of settled hay (approximately 24 ft. of loose hay.)

At this stage it is as well to refer to the latest method of barn hay drying known as the "cold-blow/hot-blow" or "Highlo" process, which is described later. This method requires more than twice the volume of air per square foot of floor area as that already quoted, with a static pressure of 2 in. W.G. for the cold-blow stage, and up to 5 in. W.G. for the hot-blow stage.

As barn hay drying installations have frequently proved effective for grain drying without any structural alteration, it will be appreciated that the rate of drying and static pressures encountered are affected by such factors as suitable air flow, type of grain, and weave of bag. Assuming that the accepted 25 deg. temperature rise is given to the air, the figures in Table 1 may be used in specifying the fan required. The static pressure figures are for the grain and bags only and do not include the resistance of the air heater; in the case of electric heaters this is unlikely to exceed 0.15 in. W.G.:

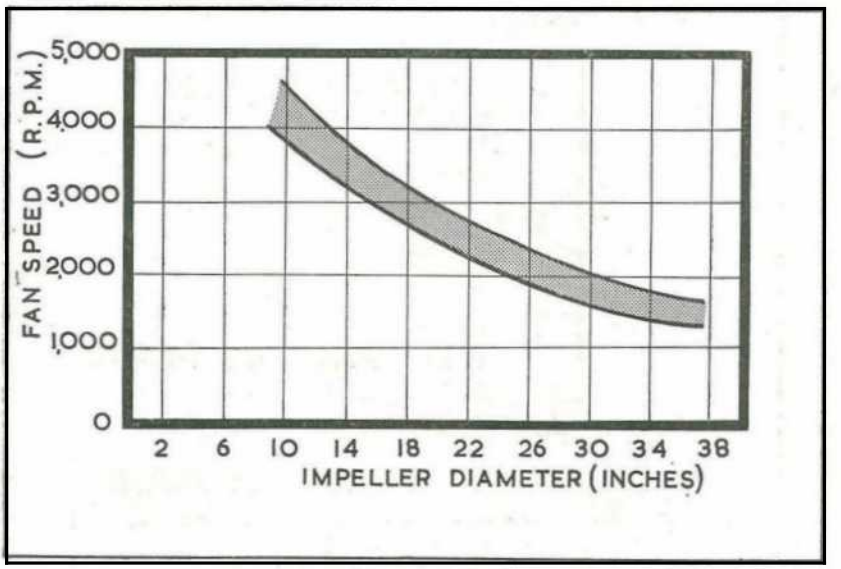

Plate 10.

When no Information is Available on a Fan's Performance, Measure the Diameter of the Impeller and Use This Graph to obtain a Rough Guide to the Fan's Maximum Speed.

TABLE 1.

Rate of Drying per hour.	Air Flow per Bag Hole C.F.M.	Static Pressure.
1%	142	0·75 in. W.G.
¾%	88	0·3 in. W.G.
½%	50	0·1 in. W.G.
¼%	20	Negligible

Source: Farm Mechanisation Vol. VII No. 73.

Note: The figures apply to platform type driers which are basically the same in principle, the only difference being that instead of the entire floor area being slatted or of weldmesh, grilled openings are left in the false floor on which the half-filled bags are placed for drying. Any openings not in use are sealed off with blanking covers.

ing with the usual 25 deg. F. temperature rise and the same static pressures.

USEFUL FAN LAWS.

A number of laws can be used to estimate the performance of a fan when one or more of the variable quantities are altered. Only the most commonly applied laws will be stated

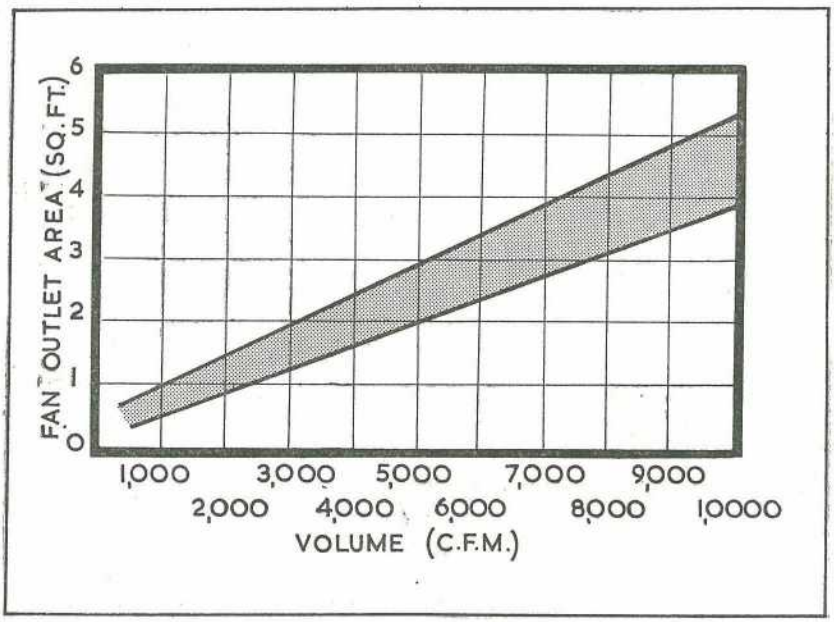

Plate 11.

This Graph Shows the Approximate Airflow for Various Fan Outlet Areas (Diameters in the Case of Axial-flow Fans). Flow will vary with speed of rotation but the shaded area on the graph shows the range of reasonable speeds.

The figures can, however, be taken as a guide if it is desired to use the barn hay drier installation as a dual-purpose drier for hay and grain.

If the "Highlo" process is adopted, the first stage of drying wilted material at a depth of 6–7 ft. with unheated air will require 55 C.F.M. per sq. ft. of floor area, or 340 C.F.M. at 2 in. W.G. per bag of grain in a single layer. For the second *stage* with heated air, the air flow is as given in Table 1 for in-bag grain drying here, namely those relating to the changes in fan performance when the speed of rotation is altered on a particular fan. *It must be noted, however, that if the fan is fitted to another system or installation, one cannot use the performance figures for the previous installation to predict the new performance.*

When the speed of a fan is altered, the volume of air, pressure and horsepower will vary as follows:

(1) New Volume =

$$\text{Old Volume} \times \frac{\text{New speed}}{\text{Old speed}}$$

(2) New Pressure =

$$\text{Old Pressure} \times \frac{(\text{New speed})^2}{\text{Old speed}}$$

(3) New horse-power =

$$\text{Old horse-power} \times \frac{(\text{New speed})^3}{\text{Old speed}}$$

STATIC PRESSURE.

Static pressure is the force exerted by the fan in forcing air through a duct system. It is usually expressed in inches water gauge (in. W.G.), (the distance the pressure will depress a column of water in a U-tube). It is not easy to estimate the static pressure against which a fan will operate efficiently. In the case of axial fans the following guide can be used in practice: the greater the number of blades and the smaller the pitch angle, the higher the static pressure that can be developed.

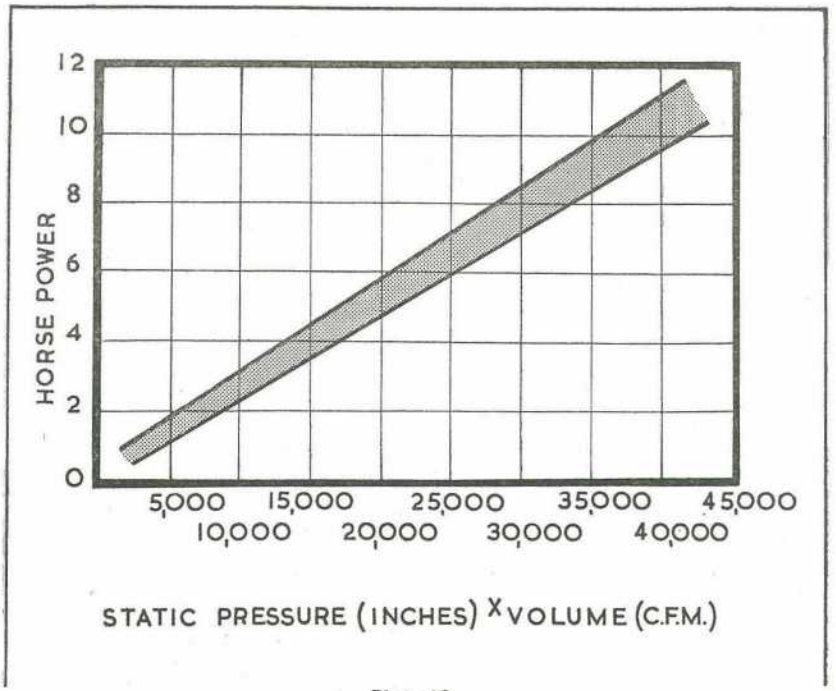

Plate 12.

By Multiplying the Volume by the Static Pressure and Reading Off the Horsepower from the Graph, an Approximate Horsepower Requirement of the Fan can be Obtained.

AIR FLOW.

A guide to the air flow (C.F.M) that a fan will deliver can be obtained by measuring the area of the air outlet of the fan or the diameter of the impeller in the case of an axial flow fan. The graph (Plate 11) gives the approximate air flow for a given outlet area. This flow will vary with the speed of rotation; the graph, however, covers the range of reasonable speeds.

HORSE-POWER.

In estimating the horse-power required to drive the fan, three main factors are involved, namely, (*a*) volume of air (C.F.M.) (*b*) static pressure (in. W.G.) and (*c*) fan

efficiency. If the volume of air and static pressure are known, an idea of the range of power required can be obtained from the graph (Plate 12) by multiplying the volume by the pressure and reading off the value of horse-power on the graph.

MEASURING FAN PERFORMANCE.

If it is not possible to estimate the performance of a fan by any of these methods, or if a more accurate value is required, it is not very difficult to measure its performance in the following way.

The fan should be fixed to a piece of ducting (Plate 13), either square, rectangular or circular, and of uniform cross-section for a length of about seven times its diameter or width. The other end of the ducting should be evenly baffled to create a back pressure: bales of hay or straw can be used for this purpose.

The measuring apparatus consists of a glass U-tube of about ¼ in. internal diameter and with limbs 3–4 in. in length. If a U-tube is not available, two straight lengths of glass can be joined by rubber tubing so that the latter forms the base of the U. Two pieces of metal tubing (X and Y) of about ¼ in. internal diameter are fixed to the ducting and connected by rubber tubing to the ends of the U-tube. Note that the lower end of tube X is flush with the inside of the ducting; the other metal tube Y passes through the duct wall to the centre of the duct, where it is bent at right angles so that the open end of the tube faces *into* the airstream. The U-tube is half filled with water which can be coloured with a few drops of ink to make it easier to see.

With the fan blowing into the ducting, the difference between the levels in the U-tube is measured in inches and used in the following formula:

$$Q \text{ (cu. ft. per min.)} = 4{,}000 \sqrt{H} \times A.$$

where H is the difference in height (in inches) of the columns of water in the U-tube, and A is the cross-sectional area of the ducting in square feet.

For circular ducting the formula becomes

$$Q = 22D^2 \sqrt{H}$$

where D is the diameter of the ducting in inches.

The bales can be packed less or more tightly and the test repeated to give different values of air flow. Before changing the position of the bales, the metal tube (Y) should be disconnected from the U-tube and the difference in level of the liquid in the tube noted: this gives the static pressure at that particular air flow. It is

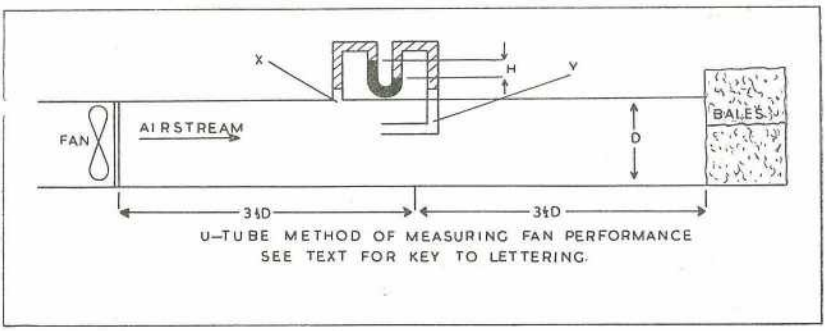

Plate 13.

A Diagrammatic Sketch of the U-tube Method of Measuring Fan Performance.

important to remember, therefore, that *both* tubes are connected when measuring air flow and only one tube (X) when measuring static pressure.

The test can be repeated for various fan speeds, but the fan laws could be used for estimating the performance at different speeds once the performance at any one speed has been determined.

MOTOR SPEEDS.

A.C. electric motors, whether single- or 3-phase, always run at a fixed speed which depends upon the number of poles in the motor. The horsepower of the motor has no bearing on its speed. The following table gives the range of motor speeds that will be encountered:

TABLE 2.

No. of Poles in Motor.	Synchronous Speed : R.P.M.	Normal Motor Speed : R.P.M.
2	3,000	2,875
4	1,500	1,440
6	1,000	960
8	750	720
16	600	575

When the motor speed is known (this is stamped on the nameplate), the speed of the fan can be calculated by measuring the diameter of both the fan and motor pulleys, from which

$$\text{Fan speed} = \text{Motor speed} \times \frac{\text{motor pulley diameter}}{\text{fan pulley diameter}}$$

Similarly, the fan pulley diameter can be calculated when the speeds of the fan and motor are known as well as the motor pulley diameter.

$$\text{Fan pulley diameter} = \text{Motor pulley diameter} \times \frac{\text{motor speed}}{\text{fan speed}}$$

BELT DRIVES.

V-belt drives are principally used due to their silent running and their ability to absorb sudden shocks; they also have a much better grip on the pulleys so that the belt can run under less tension. This reduces the pressure on the bearings of both the motor and the fan.

CHOICE OF FAN.

With a knowledge of the types and performances of fans, a choice can now be made as to the most suitable type for barn hay drying. Generally speaking, it is possible to eliminate the propeller type because, the static pressure developed is too low, although special models have been made to operate against a static pressure of 3 in. W.G. The choice therefore lies between the centrifugal and the axial-flow type. As already mentioned, the latter type is preferred in the United Kingdom for drier installations because of its higher efficiency, compactness and simplicity of installation. The size of the fan will be determined by the particular design of the drier and the floor area.

If unheated air drying is to be adopted, a single-stage axial fan should meet the requirements. If the "Highlo" process is adopted consideration would have to be given to a two-stage axial fan.

[TO BE CONTINUED.]

Queensland Year Book, 1957.

A copy of the 1957 issue of the Queensland Year Book retains the same form as previous issues, with later figures inserted in all statistical tables. The Year Book will be available in the main bookstores at the prices of 5s. for paper-covered copies and 7s. 6d. for stiff cloth-covered copies. Copies may also be obtained from The Deputy Commonwealth Statistician, 42 George Street, Brisbane.

Looking At Herd Recording From The Inside

By S. W. IVERS, Adviser, Herd Recording Section.

So that the farmer may know exactly how much milk and butterfat each of his cows is yielding, trained men are putting technical methods to work to produce the now well-known service of herd recording.

Herd recording in a general sense concerns the recording of dairy herds and the issue of reliable information on dairy herd production and management.

This article will enable farmers to look behind the scenes and see from the inside how herd recording works, and how it helps them.

Firstly, there is the point of view of the farmer. Why does he test? Conscious of the fact that he has all his money tied up in the dairy farm, he seeks to gain the maximum financial return from this capital outlay. If he has a family, the responsibility of providing for their upbringing and education makes it necessary for farm production to be maintained or increased to a high level. Costs must be kept to a minimum. He realises that on his farm there is room for improvement, and to effect this he must have a plan based on the knowledge of the productive capacity of each cow that he milks. So, he becomes a member of a herd recording group.

HIS USE OF RECORDING INFORMATION.

The information obtained indicates those cows that should be culled and those that could be kept for breeding replacements. Spectacular increases in production have been achieved by simply culling the "passengers". This gives the higher producers more to eat, with resulting increases in the yields of milk.

The farmer, however, must approach the culling question with care because various factors could be causing production losses, for example, month of calving, disease, or lack of sufficient feed. Some cow families mature later than others, and they should be given a second chance. On the other hand, as the result of the bull running with the herd, some cows are too young and small when they come into production. Also herd wastage from the farm, caused by disease and sterility, may be high, and in these circumstances low producers would be kept until these problems were solved.

A bull yard is an essential feature of any farm where breeding programmes are planned, and particularly where seasonal calving is practised.

The farmer obtains an indication of the best way to utilise the available feed on the farm, and the best crops to grow to increase production.

These facts emphasise the need to keep records if farming is to be a successful business. He is too busy to have an involved system, but as a group member, he is assisted by the issue of a handy, simple shed record.

SHED SHEET
195

SIRES

Initial of Sire	Name	Breed	HB No

Particulars of Cow				Particulars of Calving						Particulars of Mating						Remarks
Recording Number	Name	Tattoo No	Age	Date of Calving	Normal or Abnormal	Sire of Calf	Sex	Reared Sold or Destd	Tattoo No	Dates of Services			In Calf To	Due to Calve	Date Dried Off	
1																
2																
3																
4																
5																
6																
7																
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Plate 1.

This Shed Sheet is Designed to Provide Farmers with a Simple Record System.

This provides for recording information such as identification marks, ages, calving and service dates, and the time when the cow is due to come into production. It is large enough to fit between the wall studs of the dairy buildings (Plate 1).

A common culling practice and one worthy of adoption is to divide the herd into three groups according to their production ranges and to aim at culling the members of the lowest range and replacing them with progeny from the top bracket. By these means, a steady improvement should be obtained.

THE HERD RECORDER.

What of the man who performs the actual work of testing? The recorder is a key man as the whole system depends on him. He has an interesting and varied life.

He has a different roof over his head most of the month and must be able to fit in with farm arrangements. He is interested in his work which, though routine, provides sufficient variety to maintain his interest.

The recorder is a valuable link in obtaining information on certain herd husbandry practices on Queensland

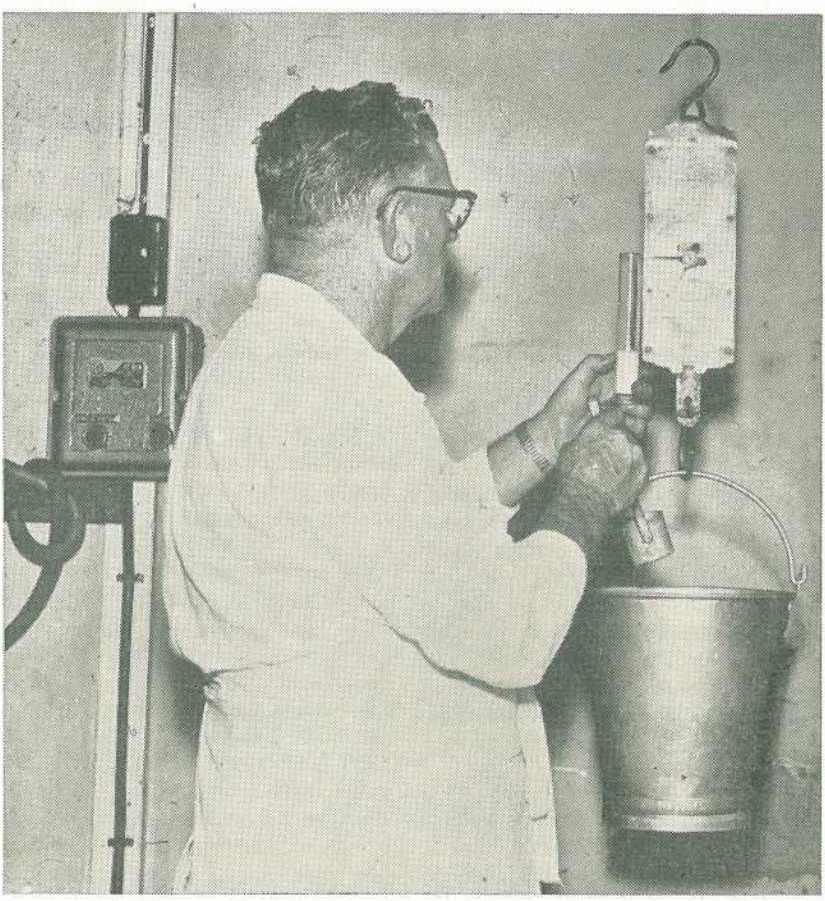

Plate 2.

Recorder Sampling Milk from Test Buckets. Note quantity of milk is weighed on the scales.

farms. This information provides the basis of many survey investigations undertaken by the herd recording section. These surveys result in recommendations for the ultimate improvement of farm income.

Much of the success of herd recording is due to the herd recorder. In many instances it is his encouragement which has led the farmers to keep herd records and to adopt proven farm practices.

HERD RECORDER AT WORK ON THE FARM.

The herd recorder calls at the farm once each month. His recording duties embrace sampling milk from each cow on two successive milkings (usually evening and morning), and then testing it for butterfat content by the Babcock test. Samples from each milking are taken proportionately to allow for the different quantities obtained at each milking.

As well as recording the herd, he tattooes heifer calves which have been born since his last visit. This is positive identification and removes any doubt from the farmer's mind as to the parentage of the calf. It is essential of course for the recording member to know the sire and dam of the calf to be tattooed. When the farmer gets his culling programme working, he knows with certainty the calves that he should keep. Recent work in New Zealand has shown, under their conditions of production, that one-third of the bulls in herds are capable of raising the production, one-third will only maintain production, and the remaining third will LOWER production.

As the basis of the farm economy is to increase the net financial return, the farmer seeks to raise the average production and must endeavour to breed daughters better than their dams. This focuses attention on the sire, and, when sufficient testing data is available, a sire survey indicates just how much he is influencing the production of the future herd. If in the category of lowering production, he should be replaced.

HERD RECORDING—HEAD OFFICE.

The "nerve centre" of herd recording is situated in Brisbane, where the results of farm recording are received and tabulated.

Here, trained staff carefully analyse production records and note any trends or fluctuations. Surveys are constantly being carried out into some aspect of management, and the results are then passed on to the group members so that they can be incorporated in their farm programmes. A careful watch is kept on variations in production and the reasons sought.

Modern automatic machinery has been installed and this has facilitated the work of the section and enabled results to be passed back rapidly to the farmer. An example of this is the recent issue of monthly progressive totals. These totals indicate the total production of each cow at the varying stages of the lactation within a matter of weeks of her being recorded. The complete lactation results are now received by the farmer in sufficient time to assist him in quickly arriving at a decision as to whether the progeny of any cow should be kept or removed from the herd. The findings of this section are discussed with the farmer himself by an officer of the Division of Dairying who visits each of the farms regularly in an advisory capacity. He talks over farm problems with the farmer and offers advice on lines of action. Perhaps the outcome is the selection of a better sire for the herd; a constructive culling programme may be drawn up; or he may be advised to seek information on the establishment of pastures or raising the nutritional standard of the herd.

ALL MUST CO-OPERATE.

The success of herd recording depends upon a close liaison between the farmer, the herd recorder and the officers of the Department of Agriculture and Stock.

The farmer must realise the need for recording and be prepared to use the results.

The recorder must be conscientious, capable and able to adapt himself to conditions on each farm.

The Herd Recording Section must ensure that reliable records are forwarded to the farmer early enough to be of use and in a form easily understood. The results of surveys undertaken to prove or disprove the value of various farm practices must be made available to the industry.

It is essential that these findings be applied on the farm if the greatest benefit is to be obtained from the results provided by the Herd Recording Section.

A LETTER TO

DEAR DAD,—Thank you for your letters; I'm afraid I still owe you a few. We had a small outbreak of "lumpy wool" in the sheep in the ration paddock. Fortunately it does not appear to have spread to the main flocks. I had not seen this trouble before. About half a dozen of the sheep had horny, scabby lumps in the wool, matting it in places. On some the nose and ears also had scabby lumps. The Boss asked the local Sheep and Wool Adviser to come out, and he told us it was caused by a fungus that invades wool follicles of the skin, mostly during wet periods. He told us to isolate and shear the affected sheep. We used blade shears and shore the lumpy wool sheep on bags in a temporary yard away from the woolshed. We burned the affected wool and bags we shore on, to lessen infection danger. The Sheep and Wool Adviser treated the sore skin of the shorn sheep with copper sulphate solution, ½ lb. to 1 gallon of water. He told us that lumpy wool is sometimes confused with "scabby mouth," but that scabby mouth rarely invades the fleece area, being mostly confined to face and mouth, and sometimes found on udder and legs. He also said that wool matted by sheep louse or by heavy grass seed invasion may sometimes be confused with lumpy wool trouble. The Sheep and Wool Adviser took some lumpy wool scab specimens and fleece clippings, and asked the Boss for a lot of information about past outbreaks and history. This, he said, is in connection with a survey into the cause, spread and incidence of lumpy wool in Queensland flocks.

Affectionately, Bill.

Brucellosis-Tested Swine Herds

(As at 19th August, 1958.)

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
V. F. Weier, "Sa Crescent," Clifton
N. Rosenberger, "Nevrose," Wyreema
B. Osborne and Dr. J. W. Best, Miltown Stud Piggery, Warwick
W. Young, Kybong, via Gympie
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
D. Ludwig, Cainable, via Beaudesert
J. & S. Kahler, East Nanango

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
Barron Bros., "Chiltern Hill," Cooyar
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
P. F. Ives, Capalaba
D. Ludwig, Cainable, via Beaudesert
J. C. Lees, "Bridge View" Stud, Yandina
R. Rhodie, Clifton
C. Assenbruck, Mundubbera
A. J. Mack, Mundubbera

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M. S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
R. A. Collings, "Rutholme" Stud, Waterford
A. J. Mack, Mundubbera
J. Ashwell, "Greenhill," Felton South

Large Black.

E. Pointon, Goomburra

Farm Wisdom

MONEY spent on soil conservation may seem to some farmers like a big outlay for no apparent return. But enough examples are coming forward from all over the State to prove that conservation measures show a profit.

Take the case of a farmer at Wooroolin, in the South Burnett. In three years, he spent £500 to complete a conservation scheme on his 160-acre block. Before he started, 30 eroded acres had been retired to grass, but they were so run down that they gave very little grazing. Completion of the conservation scheme enabled these 30 acres to be reclaimed. This year, they are growing peanuts, estimated to return £1,000 profit, or double the cost of protecting the whole farm. In addition, there's no erosion on the rest of the farm to reduce yields from other crops.

Examples like this, and there are many of them, make it clear that soil conservation is a good investment.

—J. E. LADEWIG,
Chief Soil Conservationist.

"GAYNDAH buffel will treble the value of our land," say Mr. Wolfenden and Sons, "Glenmona", of Beelbee—approximately 10 miles east of Kogan.

The sandy soil type in question is third rate. Originally it supported mainly box and bulloak. The native pasture is fine and sweet when young but soon loses its nutritive value as it ages. It is at this stage that the value of Mr. Wolfenden's buffel pasture is really assessed—it then carries the sheep on into the season.

Mr. Wolfenden said that for some time he had considered buying better country, but now with improved grasses like buffel, blue and green panic, he believes he is on the eve of a new approach to the economic use of his poorer country.

Within two weeks of breaking up his native pasture, some 10 acres were sown to Gayndah buffel at the rate of 5 lb. per acre. The seed was broadcast from a jeep followed by harrows. February, 1957, was the month when, the eve of the recent drought, about 10 inches of rain were registered for the year. Fortunately following sowing two 90-point falls of rain ensured germination and the buffel has never looked back.

From experience Mr. Wolfenden said it is a waste of time and seed to throw it into undisturbed native pasture. Even if a few plants do grow the stock will never let-up on them.

—R. G. WILSON,
Adviser in Agriculture.

COTTON is a crop ready-made to fill a dual role in Queensland farming. It is ideally suited to follow pasture in a balanced farming rotation and at the same time to return a worthwhile profit.

With the added attractions of an unsaturated home market and a guaranteed price of 14d. a lb. for good seed cotton, cotton growing should have a wide appeal to farmers.

Repeated experiments have shown that breaking up grassland and rotating with crops is beneficial to both pastures and crops. Cotton is an excellent row crop to plant immediately after grass. Under dryland conditions, well-grown crops will give a gross return of £40 per acre, and under irrigation, at least twice as much.

Modern farm machinery has taken the drudgery out of cotton growing. The crop can now be handled mechanically at all stages of growth, including harvesting. This is a great advantage over earlier days when growers had to rely entirely on hand picking.

In Queensland, cotton will grow on a wide variety of soils. It can and has been produced in many districts from Inglewood in the south to Mareeba in north Queensland. There is great scope for its expansion in the Callide and Dawson Valleys, on the Darling Downs and on some of the better types of brigalow country.

—W. J. S. SLOAN,
Director of Agriculture.

CONSERVATION of soil moisture by fallowing is the greatest single factor in successful wheat growing in Queensland. All evidence goes to show that wheat cropping without adequate stored water is always risky in Queensland. Studies at experiment stations have shown that the heavier soils will supply a wheat crop with one inch of water for every 5 or 6 in. of fully wet soil. So long as the planting rains link up with the moisture in the subsoil, the roots of the wheat plant will use the stored water. Where borings with a soil auger show that the soil is wet to a depth less than 2 ft., crop prospects are only fair. Good crops can be expected when "the season in the ground" provides wet soil to a depth of 3 ft. or more.

—G. H. ALLEN,
Senior Agronomist.

MONEY in the bank Yes, Sir! Silage is like money in the bank for Messrs. Fred and Claude Lee, corriedale sheep stud specialists and pasture improvement enthusiasts of "Coomoomie", south of Glenmorgan. Some 10½ inches were recorded for 1957—the average is usually 22 inches. This drought, they claim, was more severe than that of 1946. It lasted two months longer and water reserves were even lower.

From September to early February, 2,000 to 7,000 ewes and lambs were fed 800 tons of chopped silage and 6,000 bales of wheaten, oaten and green panic hay. Even so, they still had sufficient stored feed to last another 12 months. Their feed storage at the beginning of the drought was 2,500 tons of trench silage and 15,000 bales of hay.

Some 200 ewes perished, but their loss was more than replaced by the hundreds of quality lambs marked. Mr. Claude Lee said one man handling a front-end loader and tip-truck took about four to five hours to feed 7,000 sheep.

Mr. Lee also commented that his baled green panic-lucerne hay taken from his improved pastures in 1954 was of markedly better quality than either his baled oaten and wheaten hay.

Messrs. Fred and Claude Lee are highly impressed by the drought hardiness, profuse seedling response and rapid feed of their green panic and Gayndah buffel pastures. They said that they had good 6-in. feed on their improved pasture whilst their native grasses were still not long enough for their sheep. Both the buffel and green panic grasses had also spread by seed to adjacent areas and drainage lines.

—R. G. WILSON,
Adviser in Agriculture.

Control Weed Growth.

WEED growth can be troublesome in newly planted irrigated pastures particularly where plantings were made in June and July. Don't graze young weedy pastures as this checks the pasture species and encourages growth of the ungrazed weeds. Mow the pastures before the weeds become established. A topping of the pastures is usually sufficient to check weed growth. Clippings can be left on the field to form a mulch on the soil surface. Several mowings may be required but mowing rather than grazing should be used for weed control.

—A. NAGLE, Irrigationist.

Control of Insects in Cotton in Central Queensland

By T. PASSLOW, Entomologist.

IN central Queensland, a large number of insect species is associated with cotton crops in the field. Some, such as *cutworms, thrips* and the *cotton tipworm* may injure the seedlings; *Heliothis* larvae destroy squares and bolls; *rough* and *pink bollworms* and *yellow peach moth* caterpillars attack mainly the older bolls; the *harlequin* and *stainer bugs* puncture bolls; and the fifth group including *loopers, leaf perforator, web spinner, jassids* and *aphid*, injure foliage.

Pests of Seedlings.

Cutworms are night-feeding caterpillars which cut through the stems of seedlings.

Tipworms are small caterpillars, up to ½ in. in length, which burrow into the tips of the seedlings and destroy terminal buds.

Thrips are small, yellowish to black insects, $\frac{1}{16}$ in. long, which feed on the young leaves.

Pests of Squares and Bolls.

Heliothis are well-known caterpillar pests of many crops other than cotton, and generally feed on the fruiting and seeding parts of plants. Their characteristic injury in cotton is a neat round hole eaten into squares and bolls. The plants shed squares and young bolls so damaged, but may retain a proportion of the injured larger bolls in which some of the locks will mature.

Pests of Bolls.

Rough bollworms are spiny caterpillars, up to ¾ in. in length, with a mottled colour pattern of dark brown, yellow and grey. *Pink bollworm* larvae, which are salmon pink with brown heads, measure to ½ in. in length. Both of these insects injure cotton by burrowing into squares and bolls, the greatest injury occurring in older bolls.

Yellow peach moth larvae eat into older bolls, are a greyish colour and up to 1¼ in. in length.

The distinctive and colourful *harlequin bug*, and the *cotton stainer* injure cotton by puncturing older bolls with their needle-like mouthparts, and extracting plant juices.

Pests of Foliage.

Of the foliage pests, *loopers*, which are pale green caterpillars up to 1½ in. in length with a characteristic looping action in moving, are the most important. The *leaf perforator* is a small, light green caterpillar ¼ in. long, and the larvae of the *web spinner* are slender, quick-moving, green grubs ¾ in. long when full grown. These pests chew into foliage, *loopers* eating

large ragged holes into the leaves, the *perforator* causing a shot hole effect in the older leaves, and the *web spinner* skeletonizing and soiling leaves with webbing and excreta.

Jassids and *aphids* extract sap with their sucking mouthparts. Adult *jassids* are small yellow or green winged insects about ⅛ in. in length. *Aphids*, which occur in colonies, are greyish green and slightly smaller.

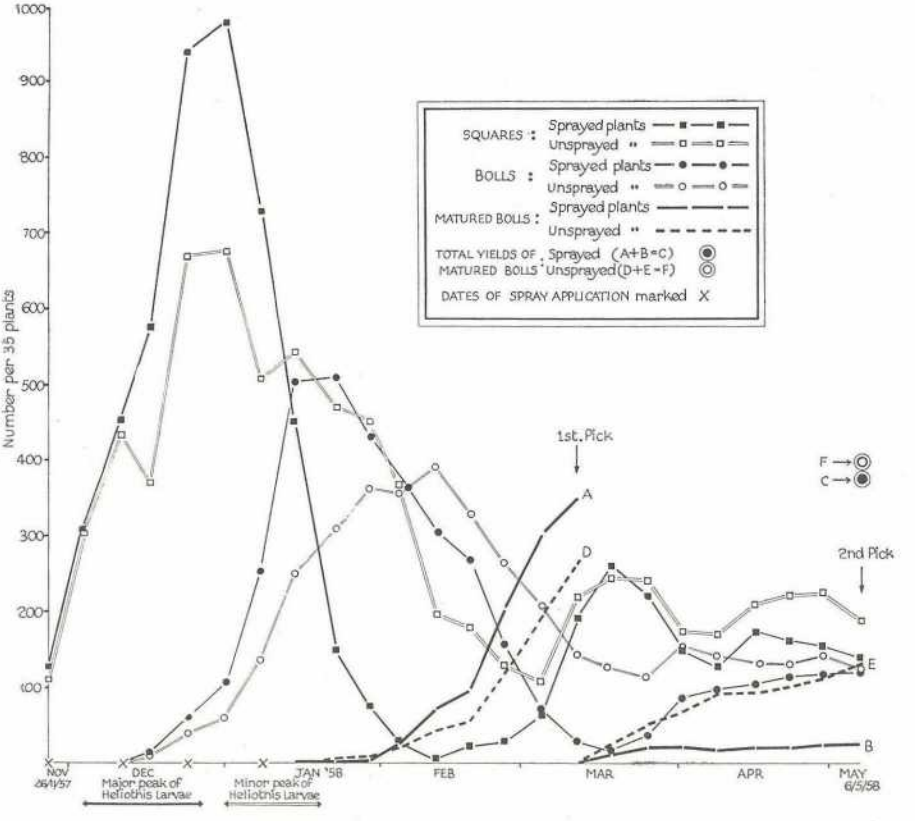

Plate 1.

Results From a Cotton Pest Control Trial, Illustrating Plant Behaviour and Yields.

APPROACHES TO CONTROL.

Pests of Seedlings, Squares and Bolls.

Before the availability of modern insecticides, attempts were made to kill, usually with arsenic, insects associated with cotton, and emphasis was placed on the importance of protecting seedlings and the first major burst of squares and consequent bolls whilst in the young stages; this gave seedling pests and *Heliothis* the status of major pests of cotton.

Seedling pests, however, injure crops only in an occasional season. Of the three, *cutworms* are the most damaging. When required, DDT applied at ½ lb. per acre in not less than 15 gal. of water will give good pest kills.

In cotton crops, which are usually planted in late October and early November, three peak periods of *Heliothis* larval activity may be experienced; during December, January and March, and normally the last two are minor. Before the advent of DDT, growers used arsenic when *Heliothis* egg counts exceeded 7 per 25 terminals, and the insecticide was applied during December and early January, coinciding with peak *Heliothis* numbers and the formation of the bulk of early squares and young bolls. Although DDT has replaced arsenic the old approach has been retained: some growers, without preliminary egg counts and others only when counts exceed 15 per 100 terminals, use the following programme:

Applications of DDT emulsion at 0.2 per cent. active in 25-50 gal. of water, two weeks after germination; at the first major burst of squaring, normally 3-4 weeks after the first squares appear; and three weeks later.

This DDT programme gives good pest kills, but nevertheless to improve the economics of cotton growing in Queensland there has been continued agitation for improved controls of insect pests. Accordingly, in the central districts over the past 10 years, relevant detailed experimental work has been carried out and has been intensified during the past three years. Although crops were protected as thought desirable during early growth, increased total yields were seldom obtained.

An example of trial results* in irrigated crops, planted in late October, is illustrated in Plate 1. In this type of trial four sprays at fortnightly intervals, instead of two with an interval of three weeks as in the commercial programme, were used. Controlling the insect pests resulted in plants holding larger percentages of early squares and bolls; later however, fall from sprayed plants was sudden whilst that from unsprayed plants was gradual. The spraying resulted in appreciably increased yields in the first pick but did not improve total crop yields.

In rain-grown cotton, plant behaviour was basically similar, and again spraying did not increase total yields.

There are two types of crop, however, where controlling pests by spraying may give increased total yields: in poorly grown crops which are not sufficiently strong to replace squares and young bolls following attack, and in late sown crops where the onset of cool conditions prevents replacements. The economic advantage of spraying in these instances is doubtful as the yields from poorly grown and late crops are not comparable, even in the absence of pests, with those from correctly grown crops. Furthermore, in late sown crops the *Heliothis* peak of concern occurs during March, and is seldom severe.

Pests of Bolls.

Rough bollworm attacks bolls at all stages of development from late January to harvest but is only of minor importance. Damage by *pink bollworm* and *yellow peach moth* larvae occurs late in the season, but populations of these pests are rarely sufficiently large to cause concern.

The *harlequin bug* and *cotton stainer* do not cause economic damage but their feeding punctures may allow the entry of boll rotting fungi. This is seldom of importance as bug populations are highest in the dry seasons when the fungi cause least damage.

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* In this trial the yields as pounds of seed cotton per acre were:

	First Pick	Total
Sprayed	1,159	No significant difference, both approximating 1,400
Unsprayed	883	

Pests of Foliage.

Of the foliage pests the *web spinner* is present only in neglected crops as this pest breeds in weed growth, not in cotton; the *leaf perforator,* occurring during early and mid-season is of no economic importance; *jassids* are of importance only on rare occasions and may be controlled as required by spraying with DDT at 1 lb. active per acre. *Loopers,* however, which occasionally infest crops during mid-season may be responsible for reduced plant vigour and consequent lowered yields: these are controlled efficaciously by spraying with endrin at ½ lb. active per acre, and treatment is required in most crops when populations exceed one to two caterpillars per plant.

To give adequate cover, these insecticides should be applied in not less than 15 gal. of water per acre.

GENERAL COMMENT.

Good kills of most insects associated with cotton in central Queensland may be obtained by using modern chemicals. With present plant behaviour and general field conditions, however, this killing is not an important factor in increasing over-all yields in the better crops.

SCIENTIFIC NAMES.

Cutworms	*Euxoa radians* (Guen.) *Agrotis infusa* (Boisd.)
Thrips	*Thrips tabaci* Lind.
Cotton tipworm	*Crocidosema plebeiana* Zell.
Heliothis	*Heliothis armigera* (Hubn.)
Rough bollworm	*Earias huegeli* Rog.
Pink bollworm	*Pectinophora scutigera* (Hold.)
Yellow peach moth	*Dichocrocis punctiferalis* (Guen.)
Harlequin bug	*Tectocoris diophthalmus* (Thunb.)
Cotton stainer	*Dysdercus sidae* Montr.
Loopers	*Anomis flava* F. *Antarchaea chionosticta* Ath.
Jassids	*Austroasca terrae-reginae* (Paoli) *A. viridigrisea* (Paoli)
Cotton Aphid	*Aphis gossypii* Glov.
Leaf perforator	*Bucculatrix gossypii* Turn.
Web spinner	*Loxostege affinitalis* (Led.)

Fertilize Your Waterways Now.

THE SAFE disposal of run-off water from contour banks depends on a good cover of grass in waterways.

In many waterways the growth of grass is inadequate because in the absence of a legume, the soil nitrogen supply is depleted.

A dressing with fertilizer in early spring is a good investment. On fertile soils sulphate of ammonia at 2 cwt. per acre is sufficient. On infertile soils use a mixed fertilizer instead at the rate of 3 cwt. per acre.

—J. E. LADEWIG, Chief Soil Conservationist.

Fruit Fly Control in Citrus Orchards

By A. W. S. MAY, Senior Entomologist.

Fruit flies have been recognised for many years as pests of citrus in southern and central Queensland, although damage is more usual in coastal and sub-coastal districts. Choice of varieties for districts as well as present methods of harvesting and marketing are based largely on long experience with these pests.

Those districts producing fruit for local consumption concentrate on varieties that are least open to fruit fly attack. The large-scale production of early maturing susceptible varieties is confined chiefly to districts where the cost of routine measures to combat fruit fly is compensated by appropriate market returns.

SPECIES OF IMPORTANCE.

Two species, the *Queensland fruit fly* and *Perkin's fruit fly* are of major economic importance. The former is dominant and causes damage in all citrus-growing districts. The latter is a pest in coastal and sub-coastal areas, being more prevalent during the late summer.

Plate 1.

Fall of Grapefruit Caused by Fruit Fly Attack.

Plate 2.
Fruit Fly Stings in Grapefruit.

SYMPTOMS OF DAMAGE.

Citrus, though readily attacked by fruit fly does not always serve as an ideal medium for breeding these pests. Rind characters may prevent egg laying or hatching, and in addition, larvae often fail to develop, especially should secondary rot organisms infest the fruit. Stung fruit, however, are of no commercial value and eventually fall from the tree.

Eggs are deposited within the rind, and when green fruit are stung the areas surrounding the punctures ripen prematurely. Later, as the fruit colour, these areas assume a greenish-brown appearance. Punctures may be at first difficult to detect when coloured fruit are stung. As secondary rot organisms infect the sites, however, circular water-soaked areas develop. With grape fruit, citrons, ripe lemons and other thick-rinded fruits, gum frequently exudes from the punctures.

Numerous punctures may be made in the more forward fruit of susceptible varieties during periods of major fruit fly activity, but eggs are not laid with all these stings. Sometimes a reddish corky layer is formed around the cavities in which eggs are laid, and this prevents further larval development.

Oil cells may be punctured as the ovipositor is inserted into the rind and again eggs may not be deposited. Furthermore, oil released from the punctured cells may destroy eggs laid and spill out on the surface of the rind. Fruit so affected, if exposed to the direct rays of the sun, will often scald and develop a brown, calloused, sunken area, at times up to 1 in. in diameter, around each site.

The larvae tunnel either within the pithy layer of thick-rinded fruits such as citron, grapefruit and second crop oranges, or penetrate, often by way of the central pithy core, into the fruit proper, and feed within the juice sacs. The tunnels made within the rind by

newly emerged larvae show as brown gum streaks throughout the white, raggy tissues. A large proportion of the larvae that feed within the rind of lemons, citrons and Seville oranges fails to develop.

Larvae usually complete their development, however, in grapefruit, cumquat, orange and second crop fruit of all sweet varieties, especially in sub-coastal and inland areas.

In southern highland districts, the onset of cool weather at a time when early varieties of grapefruit and orange approach maturity serves to suppress fruit fly activity. On occasions, when warm moist conditions extend into late April and early May, damage to early varieties may be experienced.

In inland and far western districts, citrus generally is not troubled by fruit fly. Early season varieties may be attacked in late March and April in seasons of prolonged summer rains, and late Valencia oranges may be damaged when good early season rains are experienced.

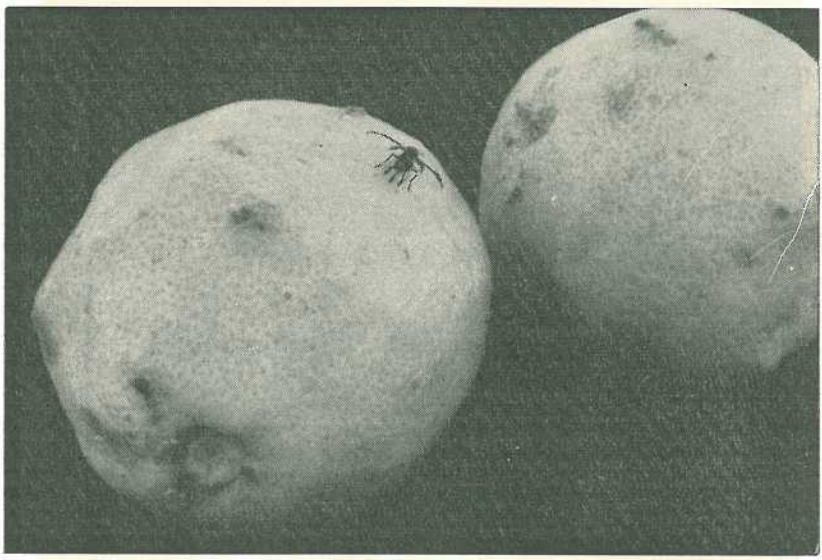


Plate 3.
Queensland Fruit Fly Stinging Lemon Windfall.

FACTORS INFLUENCING DAMAGE.

Seasonal Conditions.

When ripening of the fruit coincides with warm and humid weather, fruit fly damage may occur. Fruit grown under forcing conditions of manuring and watering are more prone to attack by these pests.

In coastal and sub-coastal districts, conditions suitable for fruit fly activity may be experienced in all but the coldest months: however, damage is more usual in February, March and April, during and immediately following late summer rain.

Varieties.

Damage to some varieties is avoided when these ripen at times when the pests are not active. Lemons of the summer crop, however, although maturing during periods of major fly activity, are not attacked unless allowed to colour before harvesting.

Windfalls, particularly as they colour, are attractive for egg laying and larvae will develop to maturity while the fruit remain sound. In wet periods however, these fruit decompose rapidly and few larvae survive.

The Meyer lemon, on the other hand, is prone to fruit fly damage and may be stung before colouring. during September and October if the weather is warm and moist. Careful attention should always be given to the harvesting of lemons in the green mature stage (see Varieties).

Where facilities exist for rapid preparation and marketing, the harvesting of all susceptible crops as the fruits mature, will often help in

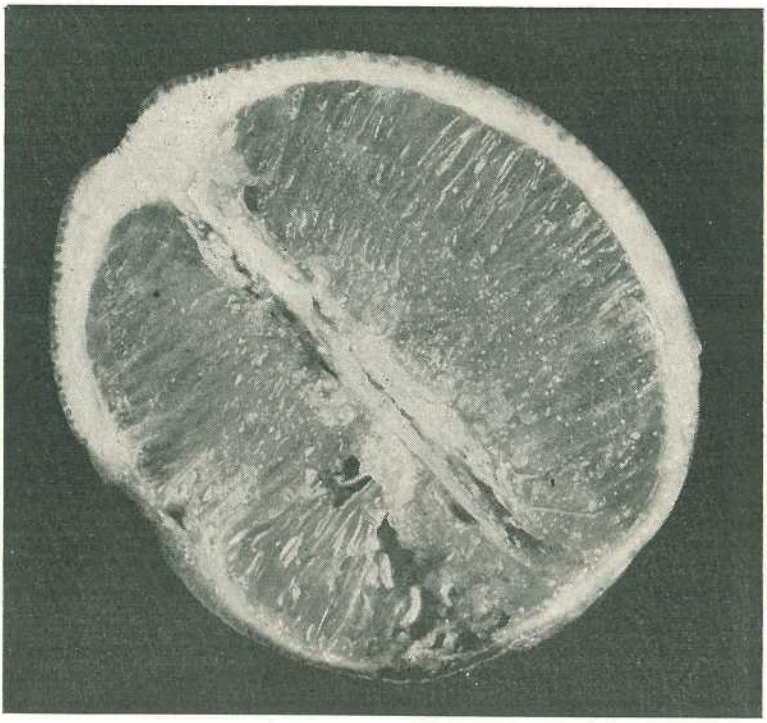


Plate 4.
Meyer Lemon Infested by Fruit Fly.

Crops of this hybrid maturing between December and March in coastal and sub-coastal districts may be damaged severely if conditions are wet and harvesting is delayed.

CONTROL.

Harvesting.

To avoid fruit fly damage to late maturing varieties, particularly late Valencia orange, the fruit should not be allowed to remain on the trees lessening fruit fly damage. Culling operations with the sequence of colouring, grading and packing serve to eliminate stung fruit.

Chemical.

In seasons when fruit flies are particularly active, especially in coastal and sub-coastal orchards, chemical measures may be required to supplement other methods of control. DDT sprays are most efficacious for this purpose.

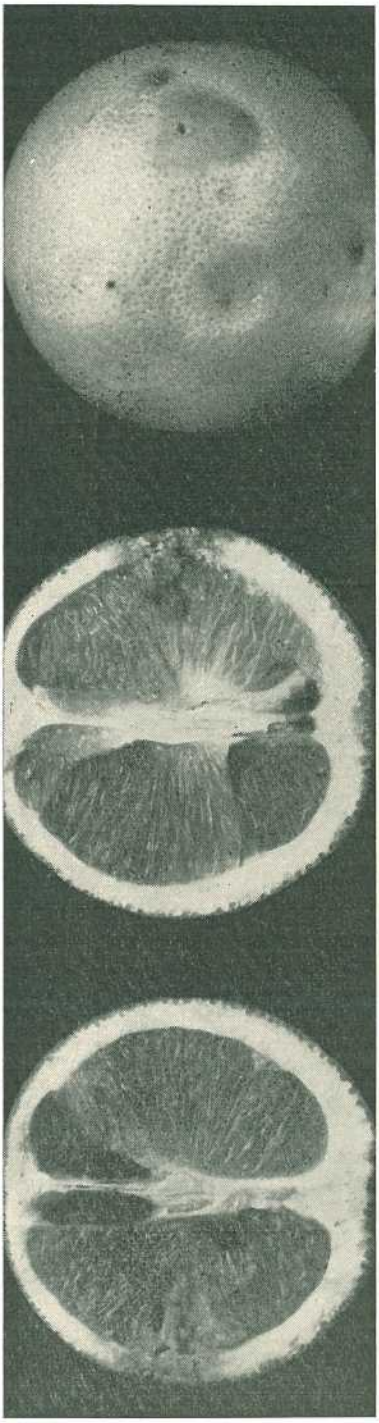


Plate 5.

Washington Navel Orange Damaged by Fruit Fly. Escape holes of mature larvae show in uncut fruit.

Well grown citrus provide ideal shelter for fruit flies. Blossoms, secretion from scale insects and aphids, as well as fruit juices, serve as food sources, while the dense canopy of foliage provides the shelter. In such orchards, fruit flies can be trapped throughout the year. The timing of spray applications is best decided from the numbers of fruit flies taken in traps, the prevailing weather conditions and the stage of fruit maturity.

Large, open, leafy trees, preferably oranges and mandarins, are best for trapping. Several of these should be chosen at vantage points in the orchard and traps hung singly or in pairs within the canopy and away from the direct rays of the sun. Should numbers of flies trapped be high as

Plate 6.

Secondary Infection to Fruit Fly Sting in Navel Orange.

early season varieties approach maturity, DDT should be applied immediately. Two sprays, at 0.2 per cent. strength, two weeks apart are usually sufficient. Further applications at fortnightly intervals may be required if harvesting is delayed, or in seasons of continued fruit fly activity.

The DDT may be applied as a general cover spray, when joint control of other pests, such as citrus bugs, is required. *Equal benefit against fruit fly is obtained however, when the*

spray is applied only to the under surface of leaves and to the inside of trees. Applied in this manner as a sweep spray, so that run-off is reduced to a minimum, approximately one gallon of spray is sufficient to treat large, leafy trees.

In some districts, particularly those serving local markets, ripe fruits may be left on the trees during winter and spring. There is little risk of fruit fly damage to these crops in normal years. At the first indication of fruit fly activity, however, either harvesting should be prompt, or DDT should be applied immediately.

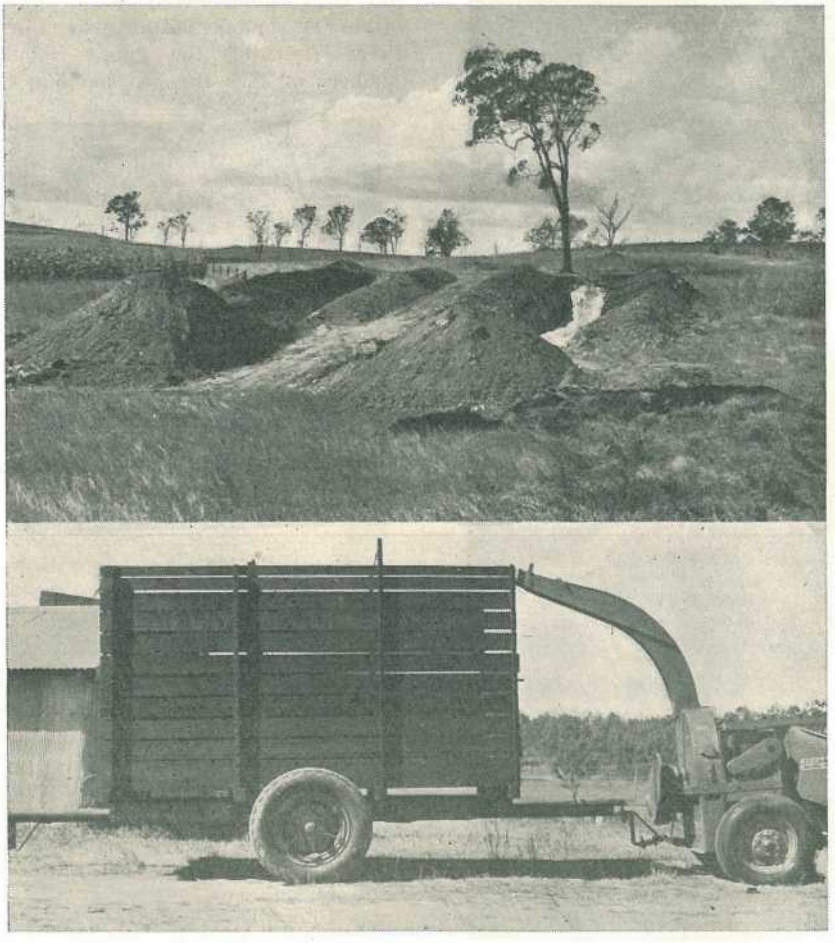
As the activity of mites may be increased by the use of DDT for fruit fly control, attention to these pests should be given as required.

Scientific Names.

Queensland fruit fly *Strumeta tryoni* (Frogg.)

Perkins's fruit fly *Strumeta humeralis* (Perk.)

Insurance Against Drought



TOP: A pair of well-drained hillside 200-ton trench silos, close to the cropping area. **BOTTOM:** Forage harvester and trailer, used for collecting and chopping cured hay from the windrow.

Green Fingers

THE SUCCESS or failure of a fruit tree, whether in orchard or home garden, can be greatly influenced by the manner of planting it. When the bundle of plants arrives and you are ready to start planting, take a good water supply into the field, together with buckets, shovels and secateurs, and a few bags.

Now take the bundle of trees out to the paddock and put it in the shade. Cut the stitches in the wrapping and pull apart the packing material just enough to find the two or three strings that tie the trees together. Cut these strings with a knife. Now lift out one tree, fold the packing back over the rest and cover the bundle with a couple of bags.

Look over the root system of the tree you have taken out. If any roots are badly twisted, broken or scraped, cut them back to sound and straight wood. If the main roots have broken or jagged ends cut them off clean with the secateurs. This gives them a chance to heal over quickly.

Put a mound of earth into the hole of sufficient size that when the main roots are stood on it and lateral roots spread, the bud union on the stem is several inches above the normal ground level. Place the tree in the hole so that the bud union is on the side from which the prevailing wind blows—usually south east in North Queensland. The bud union is the weakest part of a young tree and could be broken with a strong gust of wind blowing on to the tree from the wrong direction.

Spread the roots carefully and if any are too long to accommodate in the hole take out a little more earth to allow them to be laid out straight. Rake top soil in with the hand and pack it between the roots with the fingers. Once this is done, filling can be carried on with the shovel. When the roots are all covered get into the hole and tramp the soil firm. Then pour in a bucket of water and when it has soaked away complete the filling with dry earth—but be careful not to cover the bud union.

The planting operation is now complete but the top should be cut back if necessary to strong wood on three or four leaders, and have weak shoots removed altogether. If the tree is only a straight whipstick it should be headed at a little above knee height.

—S. E. STEPHENS,
Horticulturist.

ON THE infertile, light, sandy soils of coastal Queensland, grape growers often have difficulty in maintaining vigorous vines.

Hardy grapes like Isabella and Iona thrive in almost any soil, but the more fancied Black Muscat and Black Hamburg are much harder to grow. They lack vigour when established on their own roots in sandy soils, and heavy fertilizer applications seldom encourage rapid growth.

Lack of vigour can be overcome by grafting the vines onto vigorous Phylloxera-resistant rootstocks. Growers on sandy soils show a preference for Rupestris de Lot rootstocks. This stock appears to suit both the Muscat and Hamburg. It's easy to graft and imparts its vigour to these commercial varieties. However, the Rupestris du Lot stock will not thrive in badly drained soil, and care in selecting land for new plantings is essential.

—C. N. MORGAN,
Senior Adviser in Horticulture.

PAPAW GROWERS will get the best returns by keeping to the varieties and strains that have proved themselves in their own districts. By using seed from the best plants on their own farms, they can be sure of better crops than if they planted other seed or new varieties from other districts.

In trials at the Redlands Experiment Station, Sunnybank and Brookfield strains and the locally-bred Hybrid No. 5 have all cropped better than introduced varieties. Agriculture Department plant breeders are at present purifying the best of the Sunnybank and Brookfield strains, but seed is not expected to be available for another year or so.

Limited quantities of Hybrid No. 5 seed will be available by September, and from then on regular supplies of the hybrid seed should be available.

—*J. B. DAVEY,*
Experimentalist.

Lambs on Lucerne

Cross-bred Ewes and Lambs Grazing Non-Irrigated Lucerne on a Fat Lamb Property at Bell, Queensland. Queensland's climate has an unreliable rainfall incidence. This means that fat lamb farmers must "even out" natural pasture growth by growing green crops and pastures, and storing fodder to avoid feed shortages in drier months.

Potted Facts.—II

Tariff Protection Aids Ginger Growers

By D. R. LEWIS, Division of Marketing.

Returns to ginger growers last year averaged nearly 1s. a lb.—the highest on record.

The ginger of commerce is obtained from a plant with underground tuberous stems. India, Jamaica, and Sierra Leone are the principal exporters of the dried stem. While most of the Indian production is for domestic consumption, that of Jamaica and Sierra Leone is for export. China produces large quantities of ginger but primarily for consumption in the preserved form.

Ginger is used for medicinal purposes, for preserves, confectionery and for ginger beer.

GROWN IN BUDERIM DISTRICT.

The ginger industry in Queensland had its origin in the mid-1920's when small quantities of seed imported from China were sown in the Buderim district. The first official record of the quantity produced was in 1928-29 when the Queensland Government Statistician reported that 10 tons of green ginger, valued at £500, were produced from three acres sown in the Buderim district. The following year 25 tons were harvested from seven acres. However, ginger could be imported at low prices from China and the industry did not expand and production did not again reach 10 tons until 1941-42.

Up to 1942 Australian requirements had been met by imports, mainly in the form of dry, unground ginger, and ginger in syrup and brine. The latter came chiefly from China and Hong Kong.

After the outbreak of war in 1939 shipping restrictions led to a curtailment in these imports, and with the entry of Japan into the war imports virtually ceased. This opened the Australian market to local producers. However, the Buderim growers were prevented from expanding production because of the limited nature of the market for green ginger and because of the lack of processing facilities.

CO-OPERATIVE FORMED.

In July, 1941, the Buderim Ginger Growers' Co-operative Association was formed and, aided by Government assistance, a pretreatment factory was erected at Buderim. Final processing was done at Sydney. Once the market was established, growers took advantage of the situation and disposed of their ginger outside the association. As a direct result of this action a Ginger Marketing Board was set up in July, 1942, with the co-operative acting as the agent of the board. Ginger production expanded rapidly and by 1946 had reached 742 tons from an area of 145 acres.

About 1946-47 the board made application to the Tariff Board for protection in respect of green ginger, ginger in brine and syrup, and crystallised ginger, but the matter did not come up for hearing.

During 1949-50 sales were slow due to buyer resistance, transport and other difficulties, and the fact that there was a large carryover of stocks

from the 1949 harvest. The seller's market for ginger in Australia was changing rapidly to one in which competition from the imported article was becoming very strong. A definite buyer resistance to the local product was developing because of the lower quality of the processed article compared with that of imports.

Supported by a Government guarantee of a bank loan of £28,500 the association decided to make a radical change in its processing methods. Production, however, showed a sharp decline to 393 tons in 1951, and to 84 tons in 1952. A further approach was made to the Tariff Board and some additional protection was given. The tariff on ground ginger was increased from a minimum of 3d. per lb. to a minimum of 11d. per lb. but the increased protection on processed ginger for the sweetmeat trade was negligible. Production, however, continued to fall and by 1954 was down to 33 tons.

9d. PER LB. TARIFF.

Following a further approach to the Tariff Board, a tariff of 9d. per lb, on all importation of brined ginger, ginger in syrup, and preserved ginger was approved in May 1955.

At present the industry finds itself in a peculiar position. Ginger production and processing have been developed over years of experimentation to supply a superior product for the sweetmeat trade. Seed supplies, however, have fallen to a very low level because of the economic decline of the industry prior to the granting of effective tariff protection in 1955. Tariff protection, together with local processing of imported ginger in syrup—the co-operative imported 100 tons of Chinese ginger in syrup in 1957—has enabled growers to remain in the industry. To ensure supplies for the 1958 crop, most of the 1957 harvest was withheld for seed.

The association receives, treats, and markets ginger, and distributes the net proceeds of sales direct to growers. Growers are exempted from delivery to the Board provided they deliver under contract to the Co-operative. The table shows deliveries of ginger to the board or to the association, realisations per lb. delivered, and the net return to growers since 1942.

DELIVERIES OF GINGER, REALISATIONS PER LB. RECEIVED, AND RETURNS TO GROWERS, 1942 TO 1957.

—	Deliveries to the Board.	Realisations per lb. Delivered.	Returns to Growers (average per lb.).
	Tons.	*d.*	*d.*
Average 1942–1944	187	6·487	5·314
Average 1945–1949	625	6·276	3·918
Average 1950–1954	252	8·451	3·175
1955	28	14·237	6·617
1956	36	37·239	7·489
1957	32	33·383	11·873

Silage Sense.

IF the best possible silage is wanted:

Firstly the crop should be cut at the most desirable stage of maturity. This stage generally coincides with grain formation, or slightly earlier.

Then the crop should be chopped so that it may be packed well, to exclude air, and finally sealed so that air and water cannot enter.

—*J. L. GROOM, Senior Agronomist.*

Why We Have Commodity Marketing Boards

By H. S. HUNTER, Director of Marketing.*

The early experiences with wheat should provide farmers with a clear illustration of the advantages to be secured by organised marketing.

Marketing boards are established at the request of the growers, and are maintained in operation from term to term with their consent. They do not represent the Crown. Marketing policy is determined by the elected representatives of the growers. The only other member on these boards is the Director of Marketing, who represents the Government, since the boards use powers delegated to them by parliament.

Growers of a commodity do not take action to have a marketing board established unless they are dissatisfied with their lot under conditions of open or uncontrolled marketing. Their dissatisfaction may arise from production apparently in excess of demand, or from a conviction that the buyers to whom they sell drive too hard a bargain, or depress prices by playing one grower off against another, or it may be that they see a need for increased efficiency in methods of distribution.

In any of these circumstances it is natural that the thoughts of growers should turn to ideas of co-operative selling. Unfortunately the conventional type of voluntary co-operative when employed for the selling of agricultural products has been found to be ineffective in improving the producers' lot when it comes up against the competition of offerings of the commodity placed on the market outside of its control.

*This talk was broadcast on the A.B.C. Country Hour.

Because of this defect the statutory marketing board has been evolved, which in effect is a co-operative selling agency through which all producers of the commodity are obliged to market their produce. By this method the board, if efficiently managed, can secure for each and every grower the full market value of his produce.

Loyal Support Necessary.

Once the producers in an industry make such a fundamental change in their marketing methods, then it logically follows that a basic change in attitude is called for and they must one and all cease to regard their fellow producers as their competitors. Failure to do so may lead to clandestine transactions in breach of the law, or interstate sales which may be protected by the Commonwealth Constitution. Both types of dealings are equally disruptive of the accepted marketing scheme and inimical to the long term welfare of the industry and of every producer engaged in it. Such dealings are merely a reversion to the policy of "beggar my neighbour," which, of course, is a game that all can play.

It is not sufficient therefore that legal aspects should be the sole determinants as to whether it would be necessary to support the board and the growers' collective marketing scheme. There are deeper considerations of self interest which demand loyal adherence and support in all circumstances.

Whilst an individual grower may by other means secure to himself temporary advantages, he does so only at the expense of his fellow growers, some of whom may be induced to follow his example. The few who may follow his lead, all too soon become the many, until the burden of maintaining the marketing scheme and all the advantages of collective bargaining for market price and general conditions in the industry falls on the shoulders of fewer and fewer grower supporters. Succeeding ministers for agriculture have felt constrained to warn that such a state of affairs leads only to the dissolution of a growers' board and its marketing scheme.

Ask the Older Grower.

Just what are the advantages that could be lost? Of recent years the statutory marketing schemes for grains have been threatened by what has been called "outside selling." The answer could be sought from some of the older generation of wheat growers who produced and sold wheat on the open market. They sold mainly to flour millers who, being in competition with each other in the marketing of their flour, naturally sought only the best wheat from the points of view of milling quality and of economical milling. Only the best fields on a grower's farm were selected under such a system and he was left with lesser grades of milling wheat on his hands.

What was the position under board control? Well, for a start, the millers were all assured that each and every one of them would get his fair share of the higher grades of wheat and he would be expected to take his fair share of the lower grades. A grading system was established by the board which protected both the grower and the miller.

And what of the all-important question of price? Under open market conditions the miller's buyer, after selecting the wheat he was prepared to purchase, told the grower his price would be the ruling price for f.a.q. wheat, at Darling Harbour, Sydney (the then nearest point of export) *less* the cost of transporting the Queensland grower's wheat to Darling Harbour—this being his alternative market.

With the establishment of the board and the selling of wheat through one channel, a revolution in wheat price determination took place. The millers were then informed that any geographical advantage over the ruling Darling Harbour price was to the growers' account and furthermore that Queensland wheat being of higher protein content and milling value than the Australian f.a.q., was entitled, for its top grades, to a premium over the f.a.q. price.

These early experiences with wheat provided a very clear illustration of the advantages to be secured by organised marketing. The success of the Wheat Board was such that the growers of other primary products sought and were granted the right to establish similar marketing schemes. Their respective histories may be likened, in more or less degree, to that of wheat, except in those cases where the lack of grower support brought about the termination of the whole marketing scheme as with canary seed, potatoes and onions.

Control of Products.

The Butter and Cheese Marketing Boards enabled the factories to control their products in the hands of agents and up to the time of first sale. Their establishment proved to be a first step from which grew the development of the Australia-wide Dairy Products Equalisation Scheme, by means of which the Australian level of prices for these commodities is effectively protected from the effects of sudden changes in the price on our principal overseas market—a system

of marketing which is of vital importance and of the utmost value to the industry in the face of the current catastrophic fall in values for butter on the United Kingdom market.

Similarly the egg producer is enabled by co-operative selling through marketing boards to maintain in Australia the price level indicated by the Australian economy, irrespective of the uneconomic level to which selling prices may fall in the United Kingdom where the domestic producer is subsidised by the Government.

It is indeed hard to conceive that farming industries such as maize growing on the Atherton Tableland (where artificial drying of the maize is necessary) or peanut growing throughout Queensland could have attained to their present importance in the absence of a co-operative storage and marketing scheme fully supported by the growers, and thus enabling the respective boards to feed the market in an orderly manner with the products of these seasonal crops over the full year's cycle. When board control came into operation, peanut growing soon changed from a small market garden proposition to a major farm crop with individual acreages running in some instances into three figures.

Established boards also operate many side projects of great assistance to the individual grower, such as seed supplies, co-operative hail and fire insurance schemes, sack and other container supplies, and so on. Not the least of the advantages is that government assistance when needed can be given to farmers collectively where it cannot be given individually.

Of course, the organisations that provide the growers with these benefits have fixed overheads to meet—they are the growers' own organisations. The outside seller shares in the benefits, but makes no contribution towards costs of operation. This is not good, but the main damage he does flows from his entering into competition with the board on the market. These marketing schemes will be of most benefit when their regulations are buttressed by a strong grower opinion which the outside seller would hesitate to offend.

To Estimate Worms in Sheep.

An estimate of the number of worms your sheep are carrying is often a useful guide in planning your control measures. A burden of 1,000 barber's pole worms, or 10,000 hair worms, or 100 to 200 nodule worms is likely to cause severe symptoms or death. While a post mortem examination may show you that worms are present, that alone does not tell you how serious the infestation is. But a worm count will. This is how you can count barber's pole worms: Separate the fourth stomach and tie a string at each end of it so that it becomes a small bag isolated from the rest of the gut. Sever the gut at each end, outside the string, so that you still have the fourth stomach and its contents intact. Place the fourth stomach in a kerosene tin, slit it open and almost fill the tin with water. Wash out all the worms and contents from the fourth stomach, stir very thoroughly and ladle out a pint of the well-mixed contents before settling can occur. Pour this pint of fluid into a shallow dish and count all the worms in it. Your count of worms multiplied by 32 will give you a fairly close estimate of the total number of worms.

—R. B. YOUNG, Senior Adviser in Sheep and Wool.

Best Way To Use a Thermometer

Have you a sick cow? A sick pig? Then the ordinary stub bulb clinical thermometer is your best friend. With it you can take the most important step towards finding out what is wrong.

3. Run your eyes along this ribbon till it ends; and then read where it ends on the temperature scale.

Each big mark on this scale represents 1 deg. F (95, 100, 105, 110, are marked), each little one .2 deg. F.

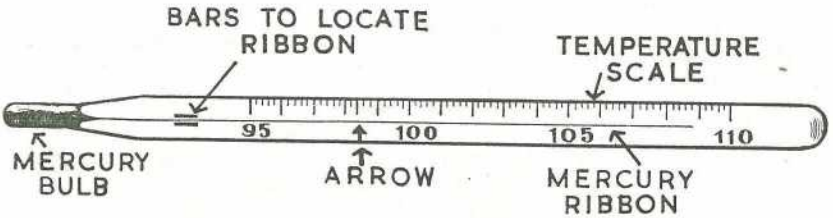


Plate 1.

An Ordinary Stub Bulb Clinical Thermometer.

How to Use it.

1. Shake the mercury down with several flicks of the wrist. Look and see that it is down below 99 deg. F.

2. Insert the mercury bulb about 4 in. through the anus. Leave in place at least 60 sec.

3. Withdraw and read.

4. Wash before using on the next animal.

How to Read it.

1. Hold the thermometer between your thumb and forefinger level with your eyes as shown; with the temperature scale at the top, the bars near the bulb in the middle and arrow on the bottom.

2. Looking between the bars roll the thermometer between your thumb and finger until you see the ribbon of silver (mercury) running up from the silver in the bulb.

Normal Temperatures.

For most animals this lies between 101 deg., 102 deg. F. Up to 1 deg. F may be added to this for hot days, and 1 deg. F for fast exercise.

Thus a cow which has run half a mile on a hot summer's day might have a normal temperature of 103 deg. F.

In general, a high temperature means that a germ or other organism is at work. Considered with the other symptoms it makes diagnosis a lot easier, AND accurate diagnosis is the basis of treatment.

If you can tell your veterinary officer what a sick cow's temperature is, when you ring him up, he will be in a better position to advise you.

W. R. Ramsay, Veterinary officer.

Paddocks for Poddies.

Provide at least four calf paddocks for rotational grazing and worm control.