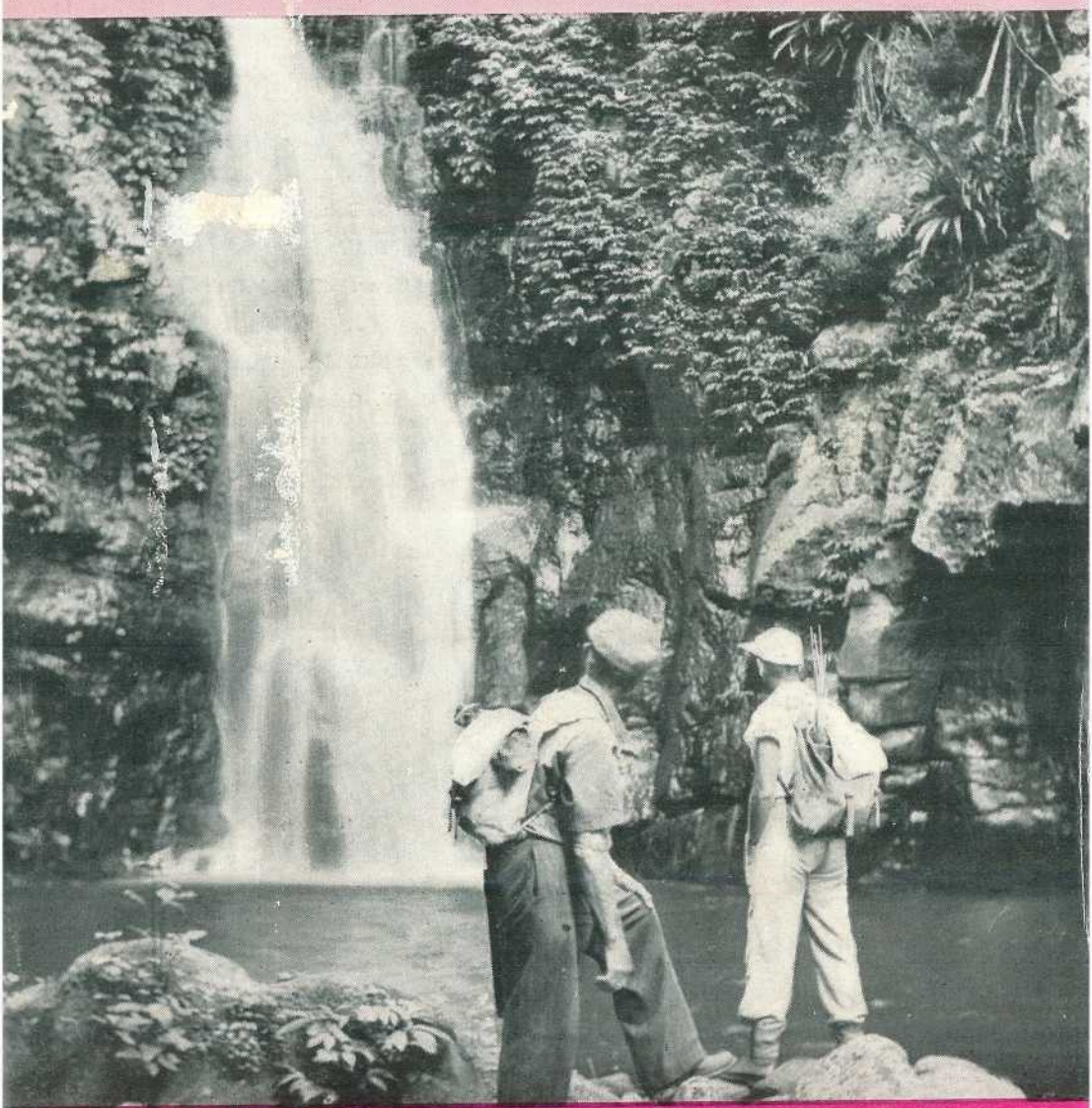
Queensland AGRICULTURAL JOURNAL



WATERFALL IN LAMINGTON NATIONAL PARK (See p. 486). PHOTO., J. D. SMITH.

Vol. 85 JULY, 1959 No. 7

Registered at the General Post Office, Brisbane, for transmission by Post as a Newspaper.

Contents

«»

Editor: E. T. Hockings.

Published by the Department of Agriculture and Stock,
William Street, Brisbane.

Subscription rates (payable to Under Secretary, Department of Agriculture and Stock, William Street, Brisbane):

Queensland farmers, schools and students—5s. a year; others—£1 a year.

*You'll Grow Better Wheat Following Lucerne**

Lucerne has once again shown that it can help wheat growers increase the yield and protein content of their crops.

WHEAT grown on land previously under lucerne found a place among the winners in the 1958 Field Wheat Competition. For the last three years, championship field or bushel-of-wheat entries have come from crops that followed lucerne in rotation.

[The field wheat competition is organised each year by the Royal Agricultural Society of Toowoomba.]

The reserve championship in the 1958 competition went to Mr. H. H. Tod, of Jondaryan, with a crop of Lawrence. Though grown on downs country that has been cropped for 60 years, it yielded 45 bushels an acre with a grain protein content of 14.3 per cent. In addition, the crop was heavily grazed.

The main reason for this outstanding performance was that the wheat followed lucerne in a five-year rotation. The lucerne had enriched the soil and improved its physical structure so that it was in ideal condition for wheat growing.

Further evidence of lucerne's worth in wheat growing was brought to notice right on Mr. Tod's own farm. His wife also had an entry of Lawrence in the competition. This entry was in a paddock adjoining the old lucerne land and on cultivation only 12 years old. But it followed a linseed-short-fallow rotation. It was so inferior to the Lawrence that followed lucerne on the 60-year-old cultivation that Mrs. Tod withdrew her entry.

The championship went to a crop produced on the brigalow country and grown by Messrs. T. M. P. Ziesemer and Sons of Condamine. This crop of Spica, grown on virgin soil, yielded 47 bushels an acre with a protein content of 16 per cent.

Boost for Brigalow

In the past, the black earths of the Darling Downs have always claimed the championship. Now that the mantle has fallen on the brigalow country, it could well cause an upsurge of interest in this vast tract.

Grain protein content of all the entries from the brigalow soils was high. Average protein content of all competition entries was 13·3 per cent. But the average of the entries from the brigalow was 15·3 per cent., and that of the remainder 12·4 per cent.

Study of the protein content of all entries suggests that, on the Darling Downs, this depends largely on land

*[Compiled from the judges' report on the Royal Agricultural Society's 1958 Field Wheat Competition. Judges were Messrs. J. Hart, Senior Adviser in Agriculture, Department of Agriculture and Stock, Toowoomba; and C. S. Clydesdale, Field Officer, Queensland Wheat Board.]

Plate 1.

Which Varieties Would You Select? They are (left to right): Spica, Festival, Gabo, Charter, Koda, Puora, and a Puora back-cross which will be named during the present season. Note the difference in the stem rust between resistant and susceptible varieties.

management. Both the highest and lowest protein figures were found in the same district—the highest, 15·6 per cent. at Jondaryan, and the lowest, 9·5 per cent. at Dalby.

In the brigalow belt, the districts longest under cultivation returned the lowest protein figures.

Brigalow-belt growers would do well to heed this pointer. Obviously, new ground will produce grain equal to the best in Australia. But fertility can drop quickly.

For maintenance of fertility, and fertility of course directly influences yield and protein content, growers

Plate 2.

Mr. T. M. P. Ziesemer in a Prize-Winning Crop of Gabo. Gabo is not a "showy" variety, but note the mass of grain heads.

should study Mr. Tod's rotation. On the brigalow lands, lucerne may be just as useful in restoring and maintaining yields as it is on the downs.

Proper management appears to be the key to the successful development of the brigalow lands as a major grain-growing area. Under a programme designed to maintain fertility and protect the soil from erosion, a bright future would seem assured.

Varieties of Rust

Rust was a serious problem in the 1958 competition. It caused the withdrawal of 58 or 16 per cent. of the entries and reduced the yield and general scoring ability of many others.

Gabo, Charter, Puora, Seafoam and Koda were the varieties most seriously hit. Some areas were completely destroyed, but others, because of peculiar local conditions, escaped with only slight loss.

The judges' experience in this competition suggests that only three of the available varieties now remain resistant to stem rust. They are Spica, Festival and Lawrence. In any district subject to stem rust—and this includes most districts in the State—Departmental recommendations cannot go beyond these three. Lawrence is the outstanding recommendation for early sowing and Spica and Festival are best for midseason or late sowing.

There should be seed of at least two new Queensland crossbreds to add to these three in the 1960 season.

Some growers may find it hard to discard Gabo, that quick, high-yielding, short-straw wheat. But there's no room for loyalty to past performers. What happened to Gabo in 1958 can and will happen again!

The Awards

The competition attracted 364 entries, but 90 were withdrawn before final judging.

Plate 3.

Mrs. V. R. Welsh, of Jackson, Framed in a Background of the Fast-Developing Brigalow Country.

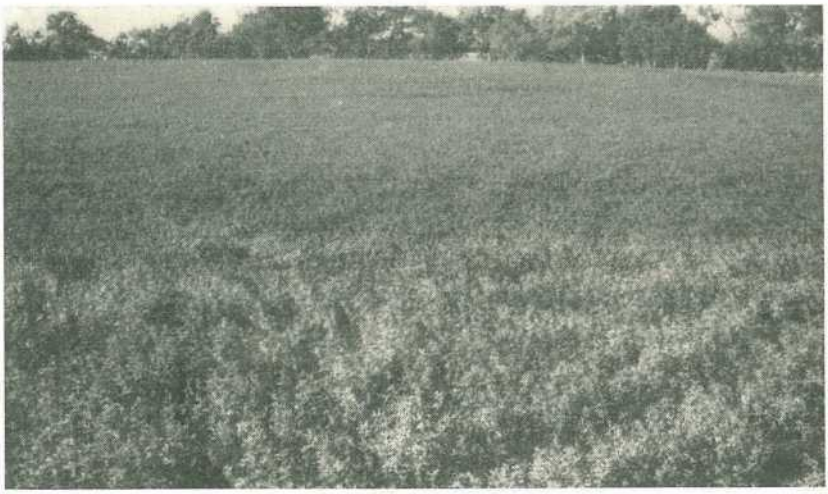


Plate 4.

Lucerne Grows Well on the Downs Country. This fine crop was produced by Mr. S. Johns on the heavy black soils of the Bowenville district.

Results were:

Grand Championship—T. M. P. Ziesemer and Sons, Condamine; Spica.

Reserve Championship—H. Tod, Jondaryan; Lawrence.

Zone 1—H. Tod, Jondaryan, Lawrence, 1; B. D. Teakle and Sons, Jondaryan, Festival, 2; J. Gwynne, Jondaryan, Festival, 3.

Zone 2—J. E. Bligh, Brookstead, Festival, 1; L. E. H. and L. Garthe, Yandilla, Spica, 2; D. G. G. and H. Bligh, Brookstead, Festival, 3.

Zone 3—L. and G. L. Sandercock, Jimbour, Spica, 1; I. G. Paterson, St. Ruth, Festival, 2; W. J. Morris, Pirrinuan, Spica 3.

Zone 4—T. M. P. Ziesemer and Sons, Condamine, 1 (Spica), 2 (Koda), and 3 (Gabo).

Zone 5—Black and Staines, Guluguba, Puora, 1; Staines, Coutts and Bahnisch, Guluguba, Gabo, 2; A. E. and C. L. Westman, Clermont, Festival, 3.

Wheat for Storage

A General View from the Top of Overhead Silos Showing Last Season's Wheat Arriving for Storage at Malu.

Plate 1: Maintaining a More Even Sward by Regular Topping with the Mower.

Good Pasture Management Pays

By A. HUTCHINGS,
Senior Adviser in Cattle Husbandry,
and O. L. HASSELL,
Senior Adviser in Agriculture.

By good pasture management and careful attention to stock, Mr. J. Hausman maintains daily production of 50 gallons of milk from his herd of 32 cattle. Only small amounts of supplementary feed are bought and this is a one-man 40-acre farm.

Three years ago Mr. J. Hausman sold his rugged scrub property at Mt. Mee and purchased this property at Bald Hills. The farm had been very much overstocked but by sound management it is now providing a good living.

Pastures and Management

The land is slightly undulating. The soil consists of a gravelly clay loam overlying tightly packed clay at a depth of about 6 in. Fences have

been built and there are now eight paddocks, the largest being 10 acres. Paspalum, kikuyu and wild white clover are the major pasture plants on this property and Mr. Hausman says this is the "home of clover".

It is worth noting that progressive farmers, in areas where white clover will grow, make every effort to improve its yield; they know how important white clover is in pastures.

Surplus grass growth is mown to a height of approximately 4 in. with an old-type mower drawn by a light tractor. The grass is mown before it seeds, so as to maintain young grass growth and allow clover to come through. During wet seasons, the grass is mown several times. Cattle eat some of the freshly mown grass as it is "haying", and the remainder provides mulch to protect surface roots from the hot sun and storm rains and to contribute to soil fertility.

Renovating and Manure Spreading

Droppings are spread with a set of diamond tooth harrows. A number of paddocks are renovated with a chisel plough each year to loosen the hardened surface soil, thereby improving water penetration, aeration and fertility. The harrows follow the chisel plough to remove clods and fill in the hollows.

Although artificial fertilizer has not been used, four paddocks will be top-dressed with superphosphate next year.

This is becoming important on many coastal dairy farms. A considerable amount of fertility is removed from farms selling whole-milk. Superphosphate stimulates

Plate 2.

Natural Shade Adjacent to Small Paddocks.

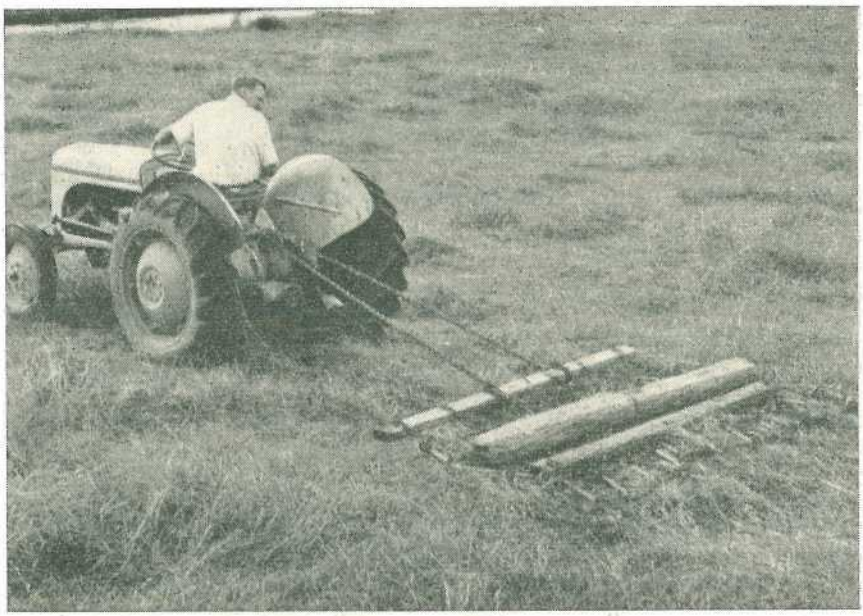


Plate 3.

Spreading Droppings to Maintain Steady Grass Growth.

clover growth, which in turn supplies nitrogen to the grass. On a number of pastures on other properties an application of sulphate of ammonia has also prolonged grass growth in autumn and accelerated spring growth.

In three years heavy weed growth has been replaced by relatively good grass and clover by this form of management. Some persistent thistle growths are chipped by hand.

Irrigation

A spring provides a good supply of water in a small dam, and to date, four paddocks have been irrigated. Spray irrigation is used. During the drought of 1958, a 4-acre paddock was given a ¾-hour application of water twice weekly. By controlled grazing on this paddock, supplemented with 2 lb. of pollard for each cow each day, and a few pounds of lucerne chaff, 25 cows produced 45 gallons of milk daily.

The Dairy Herd

A mixed herd of 32 cows, mainly Jerseys, is kept. There are eight registered animals.

The bull is kept in a separate paddock. He is hand-fed during the mating season and a month before. All cows are hand-mated and accurate breeding records are kept. Breeding troubles have been negligible.

Matings are arranged for April-May calvings. This, together with a regular supply of nutritious feed and a mild form of steaming up, so that the cows are in very good condition at calving time, provides for a good winter production.

Production is generally steady at the 50 gal. level from 25-27 cows in milk. As the herd is always well fed and most of the cows are in advanced lactation by Christmas, there is not a great increase in production during

Plate 4.

Chisel Ploughing Improves Water Holding Capacity of Soil and Pasture Growth.

the summer "flush" period. Annual production is over 450 gal. of milk to the acre.

Conservation

A small paddock has provided sorghum or maize for green feed but this is to be replaced by cow cane. In addition, a strip of cow cane has been planted along a western fence and serves a double purpose as a windbreak and as feed, if needed, when pasture growth is at its lowest in spring.

Water and shade are accessible from most paddocks. The compactness of the property and appropriate paddock layout do away with long walks by stock at any time. Careful farm planning and attention to the details of pasture management are paying dividends on this property.

Safety First

When using power take-off or running engines in enclosed sheds, ensure that there is ample ventilation so as to avoid poisoning from exhaust fumes. Keep all doors and windows open.—Industrial Safety Advisory Service.

Big Fodder Yields From Small Water Supplies

By A. NAGLE,
Irrigationist.

Small supplies of irrigation water can play a surprisingly big part in growing fodder in Queensland. Used to supplement moisture stored in fallows and from irregular storms, light but timely irrigations will carry a crop through to maturity without loss in yield.

YEAR-ROUND irrigation of perennial crops like lucerne and pasture is no doubt the ideal way to use irrigation water and equipment profitably. But in many parts of Queensland, irrigation water supplies drop so low every dry spring that watering restrictions have to be imposed.

It is here that supplementary irrigation can give such an amazing response.

Let us consider the yields and water requirements of some of our best fodder crops.

Lucerne, for example, is the crop most widely grown in Queensland for conservation as hay. Under irrigation, hay yields up to eight or 10 tons an acre are not uncommon, while yields of green material are in the region of 40 tons an acre.

However, lucerne is a heavy user of water. Between 800 and 1,000 tons of water are required to produce one ton of dry matter. (This, of course, is the amount of water available to the plant, not rainfall or irrigation water. One acre-inch of water weighs 100 tons.)

The actual amount of water required to produce a ton of lucerne will vary with seasonal conditions. During hot, dry weather, the plants naturally need more water than they do under humid conditions. Under the conditions at Biloela and Gatton, 24 in. of irrigation water in addition to the 26 to 28 in. rainfall can be expected to give an annual yield of 7½ tons of hay to the acre. An application of 40 in. of irrigation water a year has given a yield of 10 tons of hay. These high yields make lucerne an attractive crop.

Irrigated pastures, too, can play an important part in fodder conservation. Yields in the region of 40 tons of green material or a grazing rate of 1½ to 2 dairy cows to the acre have recently been recorded. Small areas of irrigated pasture can serve as a valuable fodder reserve. Although pasture uses about the same quantity of water in a year as lucerne, it is shallower-rooted and needs more frequent irrigations than the deep-rooted lucerne.

It is clear, then, that both lucerne and pasture need large quantities of water. This will not present any difficulties in favoured areas, but in many

Plate 1.

Light But Timely Irrigations Can Carry a Crop Through to Maturity Without Loss in Yield.

places the requirements of these crops just could not be met.

Use of Annual Crops.

This brings into the picture the merits of annual rather than perennial crops in making the best use of limited water. Here the place of irrigation lies in supplementing rainfall and moisture trapped in fallows. In recent years, this has been studied at the Gatton Regional Experiment Station. The studies have shown that a 2-in. irrigation or thereabouts, applied when the crops are about to suffer from water shortage, is usually sufficient to ensure a good yield.

Trials have shown that some of these short-term plantings will produce from one to two tons of green forage a week.

For example, a planting of Lawrence wheat and dun field pea averaged 1½ tons of green material a week. This crop was planted in a moist seedbed in midwinter, and there was no further rain. A 2-in. irrigation was given five weeks after planting, and after 10 weeks' growth the crop yielded 15½ tons of green material an acre.

Another mixture, Lawrence wheat and field peas, yielded 14¼ tons an acre for an average production of just over 1 ton of green material a week. There was a good soil moisture at planting time, and because no rain fell, a 2-in. irrigation was given about six weeks later. Just before harvest there was a 3-in fall of rain, but this was largely too late to influence the yield.

Oats and barley have also given greatly increased yields after one timely irrigation. Up to five tons of oaten hay an acre have been taken off.

Summer Crops.

Summer crops have responded well to supplementary irrigation, even though the rates of evaporation and transpiration are much higher than in the winter.

A planting of white panicum and Poona cowpea produced 13½ tons of green material an acre in six weeks' growth. This is an average green-weight production of 2¼ tons a week. The crop was produced on stored soil moisture with a two-inch irrigation about a fortnight after sowing.

Another planting of white panicum and Poona cowpea made during a dry December yielded 22 tons green weight an acre after 10 weeks' growth. Although the season was dry, the only irrigation this crop was given was an application of 1¾ in. about six weeks after sowing.

Yields of Sugardrip sweet sorghum at Gatton have reached 35 tons of green material an acre. The crop was given irrigations of 1 in. at planting and a further 2 in. during the growing period. Without irrigation, eight to 10 tons an acre can be expected, so in this instance, irrigation trebled the yield.

Maize can also give high yields under irrigation. Crops of maize and sorghum irrigated for silage can ensure that the silos are filled in the expectancy of lean periods in winter and spring.

It is important to realise that stored soil moisture has played a big part in obtaining these high fodder yields. Although the crops have received at the most 2 in. of irrigation and 1 in. of rain during the effective growing period, stored soil moisture has amounted to another two or three inches.

It can be seen that five to six inches of water can be relied upon to produce from 15 to 20 tons of green fodder in six to 10 weeks. The use of fallows and irrigation water in this way is worth serious consideration when water is limited or where the soil is unsuitable for lucerne.

It is quite clear that irrigation need not be limited to perennial crops. With supplementary irrigation, plantings can be timed to meet seasonal shortages of fodder, which every farmer can predict fairly accurately. It will also extend the growing season to permit double cropping; that is, winter cereal crops can be followed by summer fodder crops. By ironing out the seasonal shortages of fodder through irrigation, planned dairy production is possible.

In the end, of course, only the farmer himself can decide how to make the best use of his available irrigation water. The courses open to him are: to grow lucerne or pastures with their high year-round water requirements; to grow short-term grazing crops with supplementary irrigation; or to use supplementary irrigation to grow maize or sorghum for silage.

Therefore, his decision must be based on a review of his available water supply, the water requirements of his crops and the seasonal fodder needs of his farm.

Pasture and Crop

Green Panic Pastures—Once a green panic pasture has germinated, its success and persistence are influenced directly by its management. Failures after a good strike have often been traced to heavy and continuous grazing.

Withholding grazing is recommended in the first year until after the pasture has seeded. This is a safety measure to ensure that seedlings will come up in the next summer to replace any plants that have died. If early grazing is necessary, allow about 12 in. to 2 ft. of bulk to develop before grazing lightly.

Green panic should go into the winter with some bulk growth as crown protection. Avoid close grazing or mowing between late autumn and early spring. Rapid, but not close, grazing followed by four to eight weeks' spelling, has given the best results, especially when lucerne is sown with the grass.

—S. MARRIOTT,
Assistant Director of Agriculture.

Profit in Reclaiming Eroded Land—Increases in yield usually repay a farmer handsomely for the money spent stabilizing eroded land. There's not enough recognition of the yield increases that follow land reclamation. Instances of the benefits that can accrue are seen in the experiences of two Queensland farmers.

One farmer at Cambooya found that, eight years after implementing a soil conservation programme, his barley yields had increased from six bags an acre to 15 bags. In addition, his land is now cheaper and easier to work. More than 100 miles away, a farmer at Wooroolin got an immediate profit. He contoured his whole farm at a cost of £500. This included a 30-acre paddock that had been abandoned from cultivation for many years because of erosion. From the first crop after reclamation, this paddock returned a profit of £1,000—double the cost of treating the whole farm.

—J. E. LADEWIG,
Chief Soil Conservationist.

Paspalum – White Clover—Treated as a perennial crop, paspalum-white clover pastures are highly productive and repay handsomely the cost of the extra attention they need. Low yields are usually the direct result of poor management.

Summer management of these pastures calls for mowing the vigorous paspalum. However, regrowth is often so rapid that the paspalum is again rank and unpalatable before the next grazing. This can be overcome by high mowing or topping, six to 10 days before grazing.

Sod-seeding white clover and rye grass into the sward in the autumn will boost winter forage yields. Deferred grazing will also increase the winter feed supply. This involves mowing in April and allowing the regrowth to stand over until July or August. In this way, autumn-saved pasture is on hand to meet the seasonal shortage of nutritious fodder.

—A. NAGLE,
Irrigationist.

Certified Seed for 1959—This year a number of farmers throughout the State have once again undertaken the production of certified seed of various crops. Yield prospects of these crops are extremely bright, and although harvesting of some has not commenced yet it appears that with the exception of bean seed, the supply of certified seed will meet the demand for the next planting season.

Crops being grown for certified seed production include a number of late and mid-season maturing maize hybrids, several varieties of grain and sweet sorghum, sweet sudan grass, three tomato varieties, Biloela and Gayndah buffel grass and three french bean varieties.

All certified crops are grown, harvested and the seed cleaned under strict Departmental supervision to ensure that the high quality of the seed is maintained. The seed is sold only in sealed bags labelled with a certification label or in sealed certification packets.

—N. V. HIBBERD,
Standards Branch.

Barley a Popular Crop

A BARLEY CROP GROWN AT WACOL LAST SEASON. In 1958, the main barley growing area in Queensland, the Darling Downs, produced a record 7,250,000 bushels from 220,279 acres.

Economic Feeding Of Our Dairy Herds—II.

By W. F. MAWSON, Senior Adviser in Cattle Husbandry.

Information on the nutritive values of foodstuffs and the nutritional requirements of dairy cows will help the farmer to work out an efficient and economic feeding programme.

In order to understand differences in the values of various foodstuffs it is desirable to define some terms which are commonly used. You need a working knowledge of the following:

1. *Dry Matter* (*D.M.*). This refers to the water-free content of a foodstuff. Chemical analyses of foodstuffs in Queensland are given a "Dry Matter" basis as this allows comparison on a food value basis. The cow's appetite is estimated in terms of Dry Matter rather than in pounds of food as eaten. Examples of the Dry Matter content of feeds are given towards the end of this article.

2. *Total Digestible Nutrients* (*T.D.N.*) This is an expression of the total nutrients in 100 lb. of the material. The T.D.N. value is usually given in terms of Dry Matter. It is the measure of the energy value of a food and does not take into account the loss incurred in digestion.

3. *Starch Equivalent* (*S.E.*). This is a measure of the energy value of a food so that T.D.N and S.E. are similar in principle. The difference is that T.D.N. is a *gross* measure and S.E. an estimate of a *net* measure. S.E. gives the value of 100 lb. of foodstuff in terms of starch. The term "food units" is also used instead of S.E.

4. *Digestible Protein* (*D.P.*). This gives the number of pounds of digestible protein per 100 lb. of feed—again usually on a Dry Matter basis. Chemical analyses show protein as "Crude Protein". The relationship between Crude Protein and "Digestible Protein" varies according to the type of feed. Most of the protein-rich meals are highly digestible and the digestible protein content can be expected to be from 80 to 90 per cent. of the crude protein.

With reference to grasses and crops, a guide is as follows (D.M. basis):

Crude Protein Content.	Digestibility Estimate.	Digestible Protein.
15% and over	70%–75%	11% and over
10%–15%	60%–70%	7%–11%
Less than 4%	Nil	Nil

Protein is essential in many body functions including muscle development, repair of cells and milk production.

production. Especially during winter, many pastures are low in phosphate and this brings about a deficiency in the animals.

Animal Requirements.

TABLE 1

GUIDE TO DAIRY COW FEED REQUIREMENTS PER DAY UNDER GRAZING CONDITIONS.

(a) *Maintenance*:

Type of Cow.	Average Bodyweight (lb.).	Dry-matter (lb.).	T.D.N.	D.P. (lb.)
Jersey	800	18–22	7·0– 8·0	0·5 –0·6
Guernsey and Ayrshire	900–1,000	22–26	8·0– 9·0	0·6 –0·65
A.I.S.	1,000–1,200	25–30	9·0–11·0	0·65–0·75
Friesian	1,100–1,400	27–35	10·0–12·5	0·7 –0·85

(b) *For Milk Production*:

Add for each gallon of—

	T.D.N.	D.P. (lb.).
4 per cent. Milk	3·0	0·50
5 per cent. Milk	3·5	0·55

(c) *For Reproduction*:

Add to maintenance for last 2–3 months—

T.D.N.	D.P.
6·0	0·60

Example: What are the requirements of an A.I.S. cow giving 3 gallons of milk a day?

	T.D.N.	D.P.
(a) Maintenance ..	10·0	0·7
(b) 3 gallons of 4%—		
(T.D.N.)		
(3·0 x 3)	9·0	..
(D.P.)		
(0·5 x 3)	..	1·5
	19·0	2·20

Mineral Requirements

While the dairy cow requires many minerals for proper nutrition, these are normally obtained by the grazing animal. In Queensland, phosphorus is the outstanding exception. This mineral is usually referred to in terms of phosphate. A deficiency of phosphate is often shown by a depraved appetite when the animals chew bones, rags or bark; a rough coat, fragile bones and low milk

Milk is rich in phosphate—there being about ½ oz. in each gallon. The quantity of phosphate in milk remains relatively constant so when a deficiency of phosphate occurs, the milk supply is reduced rather than the phosphate content of the milk lowered.

To ensure that a lack of phosphate does not limit production, it is essential that a reserve be built up in the bones of the cow while she

is dry. Dry cows have the ability to store both phosphate and lime (calcium) in the bones. Heavy producers are unable to absorb sufficient phosphate from the feed to compensate for the amount secreted in milk during the early part of lactation.

Attention must be paid to the needs of the dry cow. Phosphate can be supplied by means of bone meal or bone flour either mixed in feed or placed out as a lick with coarse salt. The quantities required will vary but as a guide, dry cows and milkers should receive 2–4 oz. daily in feed. Two ounces of bone meal supplies almost enough phosphate for 1 gallon of milk. When a lick is provided, free access should be allowed. The lick composition can be as high as 75 parts bone meal and 25 parts salt by weight but if stock will not eat this mixture a 50–50 mix can be used.

Methods of adding phosphate to drinking water can be used but are effective only where animals have access to no other source of water supply.

All feeds supplied to cows contain some water or moisture. The food nutrients are contained in the "water-free" fraction (Dry Matter) and thus the proportion of dry matter in a foodstuff should be known. The following table is a guide to the amounts of water and dry matter in representative foodstuffs:

TABLE 2

AVERAGE DRY MATTER CONTENT OF TYPICAL FEEDS.

—	Percentage Dry Matter.	Percentage Moisture or Water.
Lush pasture or irrigated pasture ..	10–15	85–90
Growing pasture or crop	20–30	70–80
Silage	25–30	70–75
Pasture or crop at seeding stage ..	35–40	60–65
Hay	85–90	10–15
Grains	87–92	8–13

Plate 4.

A Dehorned Herd Quietly Strip-Grazing a Winter Crop.

Example of Appetite Requirements of 1,000 lb. cow (25 lb. Dry Matter) based on above figures—

Lush pasture or irrigated pasture—200 lb. green wt.

Growing pasture or crop—100 lb. green wt.

Silage—90–100 lb. green wt.

Pasture or crop at seeding stage—70 lb.

Hay—30 lb.

Grains—not suitable alone.

From this example several points should be noted—

1. Owing to the very high moisture content of lush pasture, cows may not be able to satisfy their dry matter requirement. In addition, the T.D.N. intake may be low, resulting in loss of body condition.

2. Lack of palatability of pasture at the seeding stage may lead to animals not eating their full requirement. The protein intake is likely to be low, resulting in reduction in milk production.

3. Any rain or dew on these pastures will further increase the water content of the material ingested.

4. High producers often have an appetite limit higher than average.

The figures are only guides, as variation will occur due to such factors as soil fertility, stage of harvesting, species of grass and conditions during conservation.

It is generally agreed that production suffers when the crude protein content of the feed falls below 13 per cent. A glance at the table will show that good quality pasture or grazing crop can be expected to contain over 13 per cent. protein. Legume silage or lucerne hay of above average quality are borderline.

The following example shows how to use the tables in estimating the productive worth of feeds—

A 1,000 lb. cow eats 25 lb. dry matter of growing pasture. Her food intake is—

				T.D.N.	D.P.
T.D.N.	$\frac{25}{100}$ of $\frac{60}{1}$	=	15·00	15	..
D.P.	$\frac{25}{100}$ $\frac{15}{1}$	=	3·75	..	3·75

Maintenance requirement of a 1,000 lb. cow is 9.0 T.D.N. and 0.65 D.P. The amount left for production is 6.0 T.D.N. and 3.15 D.P.

Guide to Value of Fodders

TABLE 3

FIGURES ARE SHOWN PER 100 LB. DRY MATTER.

	T.D.N.	D.P.
Lush pasture or irrigated pasture (those containing a high proportion of legume would have an even higher protein content)	60–65	20
Growing pasture or grazing crop	55–60	10–15
Grass or crop in seed (depending on species)	45–55	1–8
Standing mature grass (depending on species)	25–40	0–2
Maize, sorghum, silage or green fodder	60–70	4–8
Lucerne or cowpea silage	50–55	10–12
Cow cane	50–55	2–4
Molasses	50–60	0
Lucerne hay	50	10–12

There is sufficient T.D.N. for 2 gallons of milk and enough digestible protein for 5 to 6 gallons. In such a case it is likely that the fresh cow will produce 3½ to 4 gallons of milk. This is possible by two means. Some of the surplus protein can be used for energy purposes and the animal can also use any body reserves of fat for the same purpose. It is important to note that while part of surplus protein can be used as energy, surplus energy cannot be used as protein.

TABLE 4

GRAINS AND OTHER CONCENTRATES.

	T.D.N.	D.P.
Wheat ..	80	8–10
Sorghum ..		
Maize ..		
Barley	75	7
Oats	70	8
Wheat Bran ..	60	11–14
Wheat Pollard ..	70	11–14
Blood meal	70	70
Meat and Bone meal (Protein meal) ..	65–70	35–50
Peanut meal ..	75–80	35–40
Cottonseed meal ..	65–75	33–38
Linseed meal ..	70–75	25–28
Coconut meal ..	70	15

Grains generally have a high T.D.N. value and are somewhat low in protein. Various meals are high in protein and also have a fairly high T.D.N. value. Table 4 sets out a guide to the value of common foodstuffs in these groups.

By law, meals prepared by various firms are required to carry a label on every bag. On the label is indicated, among other things, the percentage of crude protein. The crude protein in such meals is normally highly digestible and the digestible protein can be estimated at 80–85 per cent. of the crude protein figure.

When buying concentrates, the first essential is to know whether an energy-rich feed (high in T.D.N.) or a protein-rich feed (high in digestible

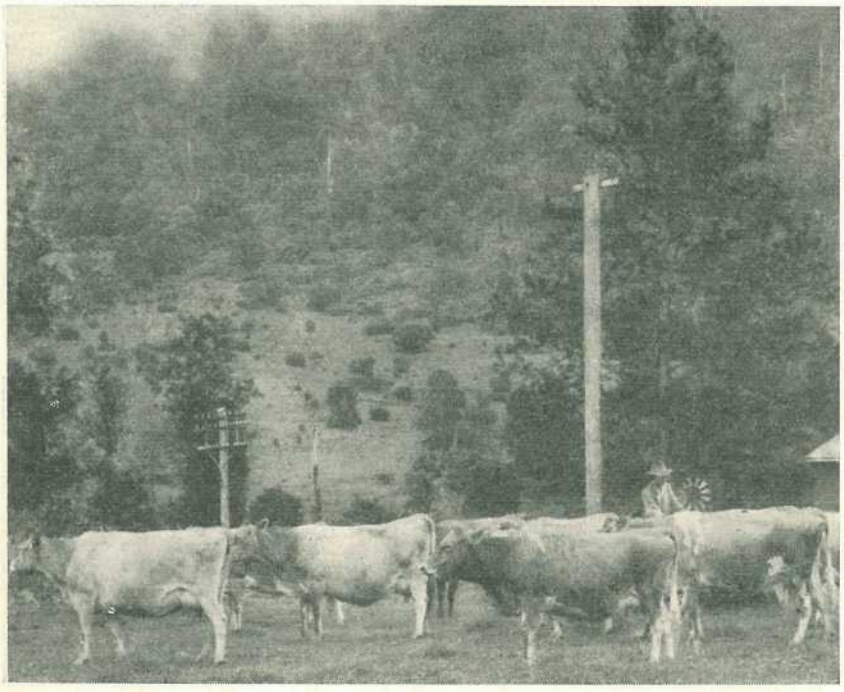


Plate 5.

Good Husbandry is Reflected in a Well-Managed and Profitable Herd.

protein) is required. Then the cost per unit T.D.N. or D.P. should be calculated and the purchase made on the basis of the cheapest unit.

Concentrate Mixtures

There is little advantage in feeding a mixture of many feeds as a concentrate. Provided changes in feed are made gradually, the cow's digestive system will adapt itself. Any concentrates fed will be basically either grains or meals or a mixture of the two. If prices are about the same it is wise to use a mixture of two grains and/or two meals. Should one become in short supply or rise steeply in price, a switch can be made to the other one without inconvenience.

Meat and bone meal and also blood meal are less palatable than most other meals, and animals usually require a gradual introduction to them. For example, a farmer who was using peanut meal as a protein concentrate would probably find difficulty—and loss of production—if he were forced to change over to meat and bone meal within a couple of days. The wise plan in this case is to start using a little meat and bone meal a month or so before the supply of peanut meal is exhausted.

The following table gives the cost per unit of T.D.N. and D.P. for the commonly purchased foodstuffs. Those with the lowest cost per unit are the cheapest. Thus molasses bought for £2 a 44-gallon drum costs 1.3d. a unit of T.D.N. and lucerne hay at £10 costs 2·2d. a unit of T.D.N., and are the cheapest shown in the table. Lucerne at £10 a ton costs 10.8d. a pound digestible protein and is a cheaper source of protein than, for example, peanut meal at £40 a ton. However, when lucerne exceeds about £13 a ton, the position is reversed. When quantities of feed are bought it pays to watch prices very carefully. The table shows some prices of feeds and their value per feeding unit at that price.

TABLE 5

COST OF VARIOUS FEEDS BASED ON FEEDING VALUE.

Feed.	Cost per Ton.	Cost per 100 lb.	Per 100 lb. of Foodstuff.		Cost per Unit.	
			T.D.N.	D.P.	T.D.N. (Pence).	D.P. (Pence).
	£	s. d.				
Lucerne Hay	20	18 0	50	10	4·3	21·5
	10	9 0			2·2	10·8
Wet Brewer's Grains ..	3	3 0	15	3·5	2·4	10·0
Wheat	20	18 0	..	..	2·7	24
Maize	25	22 6	80	9·0	3·7	30
Sorghum	30	27 0	..	..	4·0	36
Bran	20	18 0	60	12	3·6	18·0
	25	22 6			4·5	22·5
Pollard	20	18 0	70	12	3·1	18·0
	25	22 6			3·9	22·5
Blood meal	45	40 0	70	70	6·9	6·9
Meat and Bone meal ..	40	36 0	70	45	6·2	9·6
Peanut meal	40	36 0	80	35	5·4	12·4
Cottonseed meal	40	36 0	75	33	5·8	13·0
Linseed meal	40	36 0	70	25	6·2	17·3
Coconut meal	33	30 0	70	15	5·1	24·0
Molasses—						
Per 44 gallons	2	6 8	60	Nil	1·3	..
Per 44 gallons	5	16 8	..	..	3·3	..

This table is by way of example since prices vary. It does show how to apply a knowledge of feeding values, and the necessity of knowing what is required before attempting to buy. To make the calculations, obtain the price per 100 lb. and divide by the T.D.N. or D.P. value. This will give a price in terms of units of T.D.N. or D.P., which is the best basis for comparing feeds.

More detailed advice on many aspects which have been mentioned is available from various branches of the Department of Agriculture and Stock. Pamphlets which deal with such subjects as crop growing, pastures, silage and hay making, prevention and treatment of such conditions as bloat and grass tetany and other aspects of dairy production may be obtained on request. Appropriate officers are available in main dairying districts and they should be consulted for on-the-spot advice.

[CONCLUDED.]

There's Good Feed Here

A Herd of Dairy Cows Strip-Grazing Spray-Irrigated Pasture in the Beaudesert District.

Monto Dairymen Show Profit From Herd Recording

By H. G. DOUGHERTY,
Dairy Officer.

DURING the first couple of years, the benefits gained from herd recording are small when compared with the gain in future years. Farmers in the Monto district, who have recorded their herds for a number of years, have shown that increased production per cow through herd recording has made their labours worthwhile.

TABLE 1

No. of Years Recorded.	No. of Herds.	No. of Cows.	Production.	
			Butterfat.	Commercial Butter.
1 and 2	15	963	130	157
3	3	182	143	172
4	6	379	188	227
*1st year recorded	6	353	138	166

* The first year's averages for the four years group are included at the bottom for comparison.

Cows recorded for four years have an average return of £37 to the farmer with commercial butter valued at 3s. 3d. a lb. This return is £11 8s. greater than that obtained from cows recorded 1 and 2 years. Their average return is only £25 10s.

In an average herd of 50 cows, the annual income has been increased by £570. Herd recording fees would cost £25.

Mould Future Herd

The aim of herd recording is to provide farmers with information which will enable them to mould a future herd of high-producing cows. A mature cow that produces over 200 lb. of butterfat per lactation is considered desirable. If she produces less than 150 lb., replacement should be sought.

Farmers who have recorded for a number of years have been able to do this, as shown in Table 2. During the first year of recording a majority of cows are considered to be in the unprofitable range while very few are considered profitable. The remainder producing from 150 to 200 lb. are considered paying boarders.

After 4 years' recording, almost half of the herd is listed in the profitable group. The increase in the number of cows over 300 lb. should also be considered. In herds recorded for 1 and 2 years, only one cow in 320 produced over 300 lb. butterfat. After 4 years recording this average is reduced to 1 cow in 34½ in this high production range.

TABLE 2

Years Recorded.	No. of Cows.	Profitable Over 200 lb. Butterfat.	Unprofitable under 150 lb. Butterfat.	Over 300 lb. Butterfat.
1 and 2	963	86 (9%)	697 (72%)	3
3	182	35 (19%)	105 (58%)	5
4	379	184 (49%)	79 (21%)	11
During 1st year recorded ..	353	49 (14%)	229 (65%)	1

After 4 years' recording, the number of unprofitable cows has been reduced to 21 per cent. This compares very favourably with 72 per cent. for herds recorded only 1 and 2 years.

Farmers who are recording continuously have, over the years, gathered information and built up their records on each member of the herd.

They have learnt that a cow's value cannot be judged on one or two lactations; it is her lifetime production which shows up her true value. She should also be able to transmit these production qualities to her daughters.

Cow families have been found to be the method of building up a good herd. Complete family records obtained from continuous herd recording can make this possible.

Many farmers in Queensland have used herd recording to great advantage. It has enabled them to obtain greater production per cow, per acre and per unit of labour. To obtain these advantages, adequate records are essential. The information supplied must also be understood and used correctly. Your local Dairy Officer can assist you with any problems which may arise.

The secrets for success through Herd Recording are; maintain adequate records, use information correctly, and, above all, record your herd continuously. With the service given by the Herd Recording Branch, the records required by the farmer are simple and easy to keep.

Keep Diesel Fuel Clean

Grit in diesel fuel means rapid and unnecessary wear in your engine. For trouble-free running and long engine life, clean fuel is the first requirement.

Filters between the fuel tank and the injectors cannot offset initial carelessness. Wear begins once dirt reaches the injector mechanism. A small amount of grit will soon cause sufficient wear to impair the performance of the engine.

To help prevent trouble from grit in the fuel, start first by keeping your storage tank clean and covered. Refuel through a hose carefully wiped clean with a fluff-free rag, and always use a clean filter funnel with a fine mesh strainer. Don't empty the storage container completely; the dregs are almost certain to contain harmful impurities. Check the fuel filter regularly and clean or replace the element when necessary.—*C. G. WRAGGE, Agricultural Engineer.*

You can help your cows to make more profits

By D. K. HOGAN, Dairy Officer.

EVERY dairy farmer knows that, due to increased labour costs, he has been forced to do more and more work himself. The stage has been reached where one man is trying to do the work of two. This is an earnest endeavour to cut production costs. But evidence of its failure is, in some cases, most noticeable by the lower grades obtained at the factory for the product.

These low grades are due mainly to neglect and hurried cleansing methods in the dairy. This fault is far from isolated, it may be found in any part of the State and is directly related to management.

In this, the farmer can do a lot to help himself, and at the same time, help his cows to make more profits. He should try to reduce his costs by deleting unnecessary dairy chores and paying more attention to the things that really matter.

More Return From Same Work

One of the first essentials of an efficient, profit-making dairy farm is that each cow in the herd should be a working member. Most herds carry at least one-third loafers. Continuous herd recording is the only method by which to be certain that each cow is producing to her worth in the herd. This could be the first step in decreasing production costs by increasing the unit of production per cow. It simply means that more return is gained for the same labour.

Let us next look at the general management in the milking shed. Are the machines milking quickly and cleanly? Is it wholly necessary to strip the cow after the machine? Do you have enough units to keep the operators fully occupied and so milk in as short a time as possible? Do you start the cow before you put the machine on, so as to obtain the milk quickly and reduce or eliminate stripping?

Only a small percentage of Queensland's milking machines are replaced each year, and so their age is up to 15 or more. Many of the machines have been checked over, but there are still a large number to be done. It must be remembered that a machine must be in first class order to do its work properly.

The efficiency of a machine does not have to drop very much for it to take an extra minute to milk each cow. In a herd of, say, 50 cows this represents 450 hours for each lactation period, with the added possibility of udder troubles.

Save Stripping Time

Stripping after the machine is a very controversial subject; some believe in it, some don't. It all comes back to the efficiency of the machine and the correct training of the herd.

With a modern efficient machine, and the herd properly handled, stripping is unnecessary. It, too, is a time-waster. A herd of 50 cows

hand stripped twice daily over a normal lactation period can cost the farmer 900 hours' work. This is allowing two minutes to strip each cow each milking. It has been found that this is close to the average time taken by a large number of farmers.

Starting each cow by washing and massaging the udder to stimulate a complete milk let-down is time well spent. While this is being done, each quarter can be tried with a strip cup to detect any signs of disease. Neglect of this practice allows disease to obtain a stronghold before treatment takes place; thus the production life of another cow is lost.

Getting the cow's milk down in this way has three good effects: Firstly, quicker milking is obtained; secondly, the milking is more thorough; thirdly, with these two factors working for you, stripping is not necessary, because the cow gives all the milk to the machine.

Suitable equipment is another time-saver in the dairy. Most farmers struggle on for years without a suitable hot and cold water supply at the dairy. Some even carry these commodities long distances. This is far from necessary in this mechanical and enlightened age.

Hot and Cold

If a plentiful supply of hot and cold water is not available at the dairy, cleansing of machines and utensils suffers to the detriment of the cream grades, not to mention the time wasted trying to wash with lukewarm water.

The average dairy farmer is hard-working, and like any other worker, is entitled to a holiday each year. This can be arranged with good planning and management.

Confined bulls and seasonal calving on cream farms allow the farmer a break during the year; he may take a vacation or do farm maintenance work. The cows can be all out at one time of the year, during that period best suited to the area. Seasonal calving is gaining in popularity and is one of the most forward steps accepted by the industry for some years.

Short cuts in industry and study of efficiency in management are not new. Some of the largest food-producing factories employ men fulltime to do nothing else but to find methods to cut the cost of production.

By adapting new practices and giving more thought to their daily work, as far as management and production of the dairy farm is concerned, the dairyman will gain two-fold: initially, by higher production per cow through herd recording, therefore more income for the same labour; and again, by a better quality article being produced. This is due to more time being available for essential cleansing, rather than being spent on unprofitable and irksome chores in the milking shed.

These few items of dairy practice are worth a try. Have your milking machine checked by your Dairy Officer. Begin to train your cows to non-stripping as they calve. Wash the udders well for stimulation before using the machine. Use the strip cup to detect disease.

Plan your cleansing so as to do it thoroughly and easily, in the shortest time.

Make certain that you have plenty of hot and cold water. Lock up that bull, and do something about having a holiday. Generally organise your shed routine to make the job easier.

Evidence Favours 4-9 Weeks' Dry Period For Dairy Cows

By C. H. CLARK, Dairy Adviser.

Evidence from surveys of production-recorded cows indicates that cows with dry periods of 4 to 9 weeks have higher production than cows with longer dry periods.

Opinions vary considerably on the period a cow should be given between calving dates. The ideal length of her dry period is also discussed frequently. The Herd Recording Section has attempted to provide information on these aspects by examining records of calvings. During the investigations, records of 20,000 cows which completed lactations in 1955-56 were computed, together with the records of 26,000 and 13,000 cows which completed their lactations in 1956-57 and 1957-58, respectively.

Periods between calvings and lengths of dry periods of cows were examined in relation to their productions in the subsequent lactations. A summary of data on the period between calvings is given in Table 1.

It may be seen that the percentages of cows according to their calving intervals remained fairly constant in each of the three years of the survey. These figures are expressed in another way in Table 2. In this table the period between calving has been expressed according to the time of conception.

Then it appears that, on the average, approximately 90 per cent. of our recorded cows calve at intervals of 10 to 14 months. The cows which calve in the 10 months period (18 per cent. of recorded cows) go in calf on their first heat period. About half of the cows conceive on the 2nd to 4th heat period, while the 4th to 6th heat period is the time of conception for about ⅓ of the cows. Cows which re-calved at 15 months or more were probably affected by a disease which reduced their fertility.

Except in the 1955-56 year, the period between calving did not seem to influence the production of cows during their following lactations. In the 1955-56 year, cows which had a period between calving of 10 months produced approximately 10 lb. butterfat less than cows which re-calved at intervals of 11 to 14 months.

In the 1956-57 year the average length of dry period of cows was tabulated according to their period between calving. The result is expressed in Table 3.

TABLE 1

PERCENTAGE OF COWS CALVING AT VARIOUS PERIODS AND THE AVERAGE PRODUCTIONS OF THEIR SUBSEQUENT LACTATIONS.

Recording Year.	Period Between Calving (Months).								
	10			11			12		
	% Cows.	Av. Milk.	Av. Fat.	% Cows.	Av. Milk.	Av. Fat.	% Cows.	Av. Milk.	Av. Fat.
1955–56	19·4	3,685	160	25·5	4,421	175	28·3	3,971	171
1956–57	16·2	3,635	153	26·0	3,732	158	27·2	3,774	161
1957–58	18·0	3,494	143	25·9	3,594	148	26·6	3,697	153
Totals 1955–58 ..	17·7	3,621	154	25·8	3,930	161	27·4	3,825	163

Recording Year.	Period Between Calving (Months).								
	13			14			15–20		
	% Cows.	Av. Milk.	Av. Fat.	% Cows.	Av. Milk.	Av. Fat.	% Cows.	Av. Milk.	Av. Fat.
1955–56	10·2	3,918	170	6·2	3,724	169	10·3	3,977	172
1956–57	12·9	3,778	161	7·3	3,723	159	10·2	3,738	158
1957–58	12·7	3,723	153	7·1	3,654	150	9·8	3,619	151
Totals 1955–58 ..	11·9	3,805	162	6·9	3,707	160	10·2	3,795	161

TABLE 2

PERIOD BETWEEN CALVING AND TIME OF CONCEPTION DURING 1955–58 YEARS.

Period between Calving Months.	Time of Conception.	Percentage of Cows.
10 ..	1st heat period ..	18
11 ..	2nd heat period ..	26
12 ..	3rd or 4th heat period	28
13 ..	4th or 5th heat period	12
14 ..	6th heat period ..	7
15 or more	7th heat period or later	9

TABLE 3

PERIOD BETWEEN CALVING AND LENGTH OF DRY PERIOD 1957–58.

Period between Calving (Months).	Average Length o Dry Period (Months).
10	3
11	3
12	3¼
13	3½
14	4
15 and over ..	4½

An examination of the figures in this table indicates that the average length of dry period of cows which

had a calving interval of 12 months was much the same as that of cows which calved in 10 or 11 months. Although the average length of dry period is fairly constant in each case, a critical examination of the figures, as in Table 4, shows that the actual length of dry period affects production during the following lactation.

TABLE 4

EFFECT OF LENGTH OF DRY PERIOD ON PRODUCTION 1955–58.

Length of Dry Period (Weeks).	Percent- of Cows.	Average Milk lb.	Average Butterfat lb.
1– 3 ..	2·4	3,854	168
4– 6 ..	9·0	4,179	181
7– 9 ..	20·7	4,078	176
10–12 ..	25·9	3,916	167
13–15 ..	14·2	3,745	157
16–18 ..	14·1	3,531	148
19 and over	13·9	3,246	137

As the length of dry period increased beyond 6 weeks the average production per cow decreased. Table 3 shows that the cows in the 1957-58 year had an average dry period of 3 months or more irrespective of the calving interval. This is also reflected in the figures for the three years which are given in Table 4. That is, about 60 per cent. of cows had a dry period of 1–12 weeks and approximately 40 per cent. were dry for 13 weeks or more.

Possibly, the length of dry period of our cows is too long and productions would be better if their length of lactation was increased and a dry period of 4 to 9 weeks only was maintained.

A summary of the survey is as follows:

(1) Information from herd recording results shows that the period between calving for 90 per cent. of cows during the 1955–58 period was 10 to 14 months. Many of the remainder were probably affected by a disease which reduced their fertility.

(2) Except in one year, productions of ensuing lactations were not affected by periods between calvings.

(3) The length of dry periods of cows varied slightly according to the calving interval.

(4) It appears that most cows have an adequate length of dry period. Productions during their following lactations seem to be affected by very short or long dry periods.

(5) The average length of lactations appears to be too short. Longer lactations and shorter dry periods would result in increased production per cow.

Keep Your Tyre Costs Low

The basic principle of the pneumatic tyre is that the load imposed on it is supported by the air within the tyre. A tyre is therefore built to certain dimensions, together with requisite tensile strength which is expressed in ply rating to withstand the air pressure required.

For maximum efficiency a tractor or implement tyre must be used at the deflection for which it was designed. The correct deflection is obtained by keeping to the pressure recommended in the instructional manual by the manufacturer of the tractor or implement.

These pressures should always be used and regularly checked in order to ensure the best possible tyre performance. Both under-inflation and over-inflation are exceedingly costly errors. Correct deflection is essential for maximum tyre efficiency, longer life, and lower overall costs.

—C. G. WRAGGE,
Agricultural Engineer.

Bucket and Bail

Reduce Risk of Bloat—Spraying tallow on pastures and suitable pasture management together offer the best protection against bloat yet tested in Queensland. But these measures will only reduce the incidence and severity of bloat; they won't eliminate the danger completely.

Spraying pastures with tallow has shown great promise in preliminary tests. Two to three ounces of tallow a cow a day is sprayed on the pasture and the cost is 5s. to 7s. a cow per month.

But since pasture spraying can't be guaranteed to prevent bloat altogether, this measure should be combined with pasture management. In pasture management, aim to keep the legume content of the forage below 50 per. cent. of the total bulk. Strip grazing, which forces the stock to eat the more fibrous stalks as well as the succulent tops of the legume is also an aid.

—D. N. SUTHERLAND,
Director, Cattle Husbandry.

Plan Now for August—Commence training heifers to ensure good milk let-down.

Tattoo calves for future identification.

Control grazing on weed-infested paddocks to minimise milk taints.

Join a Herd Recording Group now to find out which cows are profitable.

Overcome low fat milk by correct feeding. Consult your dairy officer.

Graze springers on good pastures and crops.

Ropy Cream can be Prevented—Farmers who have to depend on dams or creeks for watering their stock are often troubled with ropy cream. Cream in this condition is down-graded, and this reduces the farmer's income. The trouble is caused by water-inhabiting bacteria.

Cows pick up the troublesome bacteria on their flanks and udders when they wade into dams or waterholes to drink. The bacteria are found in most stagnant waters. Sometimes they get into the tank attached to the dairy shed.

Attack the problem first by fencing off all dams and lagoons to prevent the cows wading in, and water your stock at a trough. If your water tank is concreted inside, chlorinate the water. Always chlorinate the cold water you use in the dairy, and be sure that the water you use for sterilizing is actually boiling.

—N. E. FOWLER, Dairy Officer.

Dealing with cowpox—Although it's a mild disease, cowpox can be really troublesome in a dairy herd. It causes soreness of the udder and teats and upsets the cows at milking time. Usually heifers being broken in are affected, and their unruliness can sorely try a milker's patience.

The disease begins with small, hard, tender swellings on the udder and teats. These develop into pustules. Raw, inflamed ulcers that heal slowly are formed if the pustules are broken. The ulcers may become infected, and if the bacteria move up the teat canal, mastitis may result.

Cowpox usually clears up in about 10 days. The animal is then immune for life. However, affected cows should be milked last, and by hand. This treatment should be applied at all milkings until the disease clears up. If the sores break, keep them clean with dilute antiseptic and dust them with sulphanilamide or penicillin powder.

—S. G. KNOTT,
Divisional Veterinary Officer.

What the producer should know about insecticides and miticides

By B. R. CHAMP,
Entomologist.

INSECTS and mites reproduce themselves in large numbers to ensure survival. The offset this they are subject to natural control by extremes of temperature, unfavourable rainfall and humidity, as well as parasites and predators.

In many instances this control does not protect crops at an economic level, and must be supplemented by the use of insecticides and miticides.

These chemical controls should be regarded as short-term measures and should interfere as little as possible with natural controls.

Most insecticides and miticides in common use today are contact poisons which kill parasites and predators as well as particular pests. Unfavourable sequels to use of the materials are resurgences of the pest in the next generation or in succeeding seasons; increases may also occur in the degree of troublesomeness of other insects and mites which are present.

The major factor in such happenings appears to be the destruction of beneficial insects and mites.

Pest Control Programmes

Treatments are timed so that the smallest dose of a poison may be used against a pest at its most susceptible stage, and before infested material has been damaged appreciably. This requires an accurate knowledge of the biology of the pest species concerned, which, with consideration of natural control factors, enables a programme of treatment to be drawn up for the use of the producer who is troubled by pest and mite damage in his crops.

In assessing pest kills, it should be remembered that there is often a considerable time lapse between treatment and death. As examples, large caterpillars may continue feeding for 12 to 24 hours after intake of a lethal dose; four weeks may elapse before dead and alive red scale can be recognised as such, and up to six weeks before a final estimate can be made.

Again, with some insects and insecticides, treatments applied just before pupation will not result in either disability or death until some time during the pupal stage or when the insect emerges as the adult form.

Susceptibility to chemical treatment of many pest species varies both within and between different stages of development. This may be due to differences in physiological state—as between small and large caterpillars of the same species—or differences in availability of poison, as with certain scale insects which at particular stages of development have relatively insecticide-impervious coverings.

In addition, generations in many pest species overlap. Where such patterns exist, a number of applications will be necessary to ensure adequate control.

The interval between these is adjusted so that the first coincides with the peak occurrence of the pest in the susceptible stage, and follow-up applications deal with those individuals which were not in a susceptible state when the early treatment was applied. Control of red scale with white oil is an example of this type of treatment.

When the species being controlled has an active free-living stage and a short life cycle or indefinite breeding period, control will be of little use unless measures can be taken to prevent reinfestation. The residual properties of certain insecticides and miticides are of value but often give inadequate protection where injurious stages of the pest feed within the treated material.

For economy, most spray programmes are designed to reduce pest incidence to proportions where further control is not justified. Knowledge of the biology of the species will determine when and if further measures should be taken.

Some species appear fairly regularly in certain seasons, particularly in temperate zones, and control programmes become routine. Others appear spasmodically and control is not always required. In all instances, however, timely inspections are necessary for economic use of pesticides.

Sometimes a number of species is involved in pest outbreaks. Then, if possible, a material and method to deal with all the pests should be used.

In commercial practice, control programmes must be interpreted by the user and his technical adviser with due regard to local conditions.

Toxicity to Bees

Many insecticides, particularly BHC and the arsenical and organophosphate compounds, are extremely toxic to bees. Pest control programmes should be designed to interfere as little as possible with the activity of these beneficial insects.

In the first instance, however, it must remain the responsibility of the progressive beekeeper to familiarise himself with pest control programmes in use in his district and adjust his activities accordingly.

Compatability of pesticides depends on formulation as well as stability of the active ingredient. With the diverse range of formulations marketed, the onus for compatability recommendations must rest with the formulator and distributor.

"Resistance" to Pesticides

"Resistance" to pesticides has been recorded in insect and mite species in many countries following the use of most organic pesticides. The correct term is acquired "resistance" of a population (as an increase in resistance over that natural resistance present before exposure to pesticides) and represents an increase in the proportion of resistant individuals present in successive generations of the population by survival of "resistant" strains.

The high order of resistance of these strains is inherent in the species and occurs normally in an extremely low proportion of individuals.

The mechanisms of "resistance" are by no means clear, but certain well-established features enable planning of effective counter measures.

1. The development of "resistance" to one particular pesticide confers on insect and mite populations a measure of high level "resistance" to related pesticides.

Low level resistance to unrelated series of pesticides may also be developed concurrently.

2. Where "resistance" to a particular series of pesticides has been developed, these tolerant populations will develop high level "resistance" to unrelated series with greater facility than would populations previously unexposed to pesticides.

3. "Resistance" in field populations is lost on removal of the populations from exposure to pesticides. The rate of loss depends on the intensity of selection for "resistant" strains and dilution by individuals of normal susceptibility from unexposed populations. If intensive selection has continued from large-scale use of materials at high concentrations, loss of "resistance" will be very slow and in exceptional instances stable "resistant" strains may be produced.

Replacement

Where "resistance" to pesticides has been observed, the pesticide in use should be replaced by one of an unrelated series and attention given to efficient utilization. This change in the pest control programme must be planned recognising the liability to further development of "resistance" and the availability of reserve types of pesticides for emergencies (the latter applies particularly where pests involved are vectors of human and animal diseases).

The occurrence of "resistance" in plant-feeding insects and mites is related frequently to excessive use of pesticides. Chemicals are often applied as a form of crop insurance, and, in other instances, mixtures of chemicals are used where one would suffice. These practices must be kept to a minimum if continued pest control is desired.

No authentic instances of "resistance" in insect and mite species of either agricultural or horticultural importance have been reported in Queensland.

Breakdown of controls due to any of the following factors does not constitute true "resistance":

1. Use of pesticides that have deteriorated in storage.

2. Incomplete coverage of material due to inadequate equipment or treatment. When pests are in plague proportions, survivors may be sufficient to cause considerable economic damage.

3. Use of unstable preparations, and disregard of compatibility recommendations.

4. Variations of pest susceptibility with temperature. Dosage levels effective at normal temperatures may be inadequate during extremely hot or cold weather. With certain species, humidity can have a similar effect although to a somewhat lesser extent.

5. Under conditions of extremely hot weather and intense sunlight, pesticides may be decomposed or otherwise lost at abnormally high rates.

Control of Usage

Many compounds with insecticidal or acaricidal activity have been developed. The greater proportion of these has not appeared on the market and few have shown properties superior to materials in common use.

All these compounds are toxic in some degree to man and livestock and considerable health hazards may exist in handling and application, and from persistent residues. With the limited knowledge available of the hazards associated with pesticide use, particularly with regard to long-term, low-level exposure, it is not in the public interest to allow indiscriminate use of these chemicals. This is supported by (1) considerations of

interference in natural controls of pests; (2) the possibilities of development of "resistant" strains; (3) the role of formulation of the active material in the efficacy of a treatment; and (4) the adverse effects of particular formulations on the material being treated, for example by phytotoxicity, tainting, and staining.

In Queensland, sale and use of pesticides are regulated by provisions of *"The Agricultural Standards Act of* 1952" and *"The Health Acts,* 1937 *to* 1947." These provisions enable responsible authorities to ensure that all products offered for sale have a specific role in pest control under local conditions, that label claims are accurate, and that health hazards are at a desirable minimum.

Formulations

Formulations of insecticides and miticides are described as follows:—

Concentrates. This category includes all compounds, solid and liquid, used in the commercially pure form. Paradichlor-benzene and naphthalene are examples.

Concentrate Solutions. These are prepared by taking up the active ingredients in solvents which are usually inert. Some solvents, however, have slight pesticidal properties, for example, diesel oil and kerosene. Concentrate solutions may be used as paints, sprays, and dips, and in suitable vaporising or dispersing equipment to produce the finely divided, liquid-in-air suspensions known as mists and fogs.

Aerosol Preparations. Aerosols are relatively stable air suspensions of solid or liquid particles of submicroscopic size. These are used in treatment of enclosed areas such as glasshouses and buildings, and more recently for large-scale spraying outdoors where conditions are suitable.

In the liquified-gas method of producing aerosols, active material is formulated in a low-boiling solvent held under pressure in a suitable container. When released, the contents are ejected as a fine spray from which the propellent solvent immediately vaporises leaving a finely divided air suspension of active material. Carrier non-volatile oil is added to the solvent to determine particle size of the suspension. Common propellents are Freon 11 and 12, methyl chloride and propane.

Insecticidal smokes are produced by combustion of solid flammable preparations containing active material. Because of the large losses of active material involved in this method, smokes have never come into extensive use.

Various modifications of vaporising and dispersing equipment used to produce fogs from concentrate solutions have been developed to enable these solutions to be used for aerosol spraying.

Emulsifiable Concentrates. An emulsifiable concentrate contains an active ingredient, an appropriate solvent and if necessary an emulsifying agent for readily dispersing the insecticide solution as a suspension in water. Modern emulsifying agents usually possess wetting and sticking properties and are adjusted for use in hard or soft water areas. Other additives, however, may be required when the surfaces to be treated are thickly wax-covered and water-repellent.

With certain insecticides, stabilizers are necessary to prevent deterioration of active ingredients when concentrates are held in storage.

Emulsifiable concentrates are the common formulations and are usually used by diluting to required strengths with large volumes of water. For low-volume spraying, a minimum of

water is used and in air-assisted methods a high velocity air stream acts as the bulk carrier.

Emulsion Concentrates. Emulsion concentrates are emulsified preparations of concentrate solutions in which the water carrier has been reduced to a minimum for storage and transport purposes. These have a cream-like texture and after primary dilution, disperse readily in water.

Emulsion concentrates and emulsifiable concentrates have similar applications, but the former are considerably cheaper to produce as a minimum of solvent and emulsifier is used.

Special formulations have been developed for low-volume spraying so as to obviate nozzle blockage which occurs when flow of spray liquid is interrupted.

The consistency of an emulsion concentrate is not related primarily to its composition but is determined by the amount of homogenising given by the formulator; this is adjusted to suit consumer requirements.

Emulsion concentrates are not stable over long periods of storage and extremes of temperature, as the emulsion may break and release free concentrate solution from which the solvent evaporates. Stabilizers may be added to delay this tendency. Because of lower solvent content, emulsion concentrate sprays, when fresh, are less toxic to plants than sprays made from emulsifiable concentrates.

Miscible Oils. These are a limited range of formulations in which the solution of insecticide mixes directly with water without formation of the suspension found in emulsions. A wetting and spreading agent is usually necessary to ensure adequate coverage of treated surfaces with a limited affinity for water.

Dispersible and Wettable Powders. In instances where liquid formulations of active materials are not practicable or for reasons of solvent phytotoxicity use of emulsified preparations is undesirable, suspensions in water of solid particles impregnated with active material may be substituted. These suspensions are prepared from dispersible and wettable powders, that is, finely ground solid materials to which dispersing and wetting agents have been added. The finely ground materials may be active ingredient alone, as, for example, sulphur, or if the active ingredient can be taken up in volatile solvents the toxicants are impregnated on high-grade dust diluents. Wettable powders are less finely ground than dispersible powders, contain a minimum of wetting agent, are comparatively difficult to disperse in water, and settle readily.

Dispersible and wettable powder formulations when used near harvest have the disadvantage of leaving residues frequently visible, and in excess of those obtained from all-liquid treatments.

Dusts. Dusts are dry, finely ground preparations of active ingredient either undiluted or diluted with suitable carriers to extend coverage, reduce phytotoxicity and /or alter physical and chemical properties of the final product. Carriers may be inert or may exhibit a degree of insecticidal activity.

Dusts are prepared by either physical or chemical impregnation of carriers or by mechanical blending of finely divided active material with diluent. Carriers are classified according to their absorptive capacity, and frequently dust formulations are based on impregnatnon of a primary absorptive material (for example, bentonite or botanical flour) followed by mechanical dilution with a relatively low absorptive carrier (for example, pyrophyllite).

The size of dust particles is related inversely to biological activity and

affects susceptibility and carrying power in air. The shape influences flowability, adherence to surfaces, and uniformity of mixing. The density of the individual particle controls carrying power and settling properties in air. Finally, hardness of dust particles together with size and shape determine their abrasive properties, which are particularly important in dusts formulated into dispersible or wettable powders, as the diameter of outlet orifices in nozzles is of critical importance. Bulk density and flowability are important properties which are determined by the previous factors and other considerations such as age of the formulation and packing and handling methods.

Dusts are used extensively in the protection of stored and bagged products, and in the field where ease of handling is an important consideration.

Granulated Insecticides. These are large particle, dry formulations suitable for control of some soil-infesting insects. They may be applied with conventional dusting equipment. The particles do not adhere to dry surfaces and will penetrate through heavy leaf cover to the soil beneath.

Application Methods

The first essential for efficient spraying and dusting is adequate coverage, which must be accomplished with least loss of material from run-off and drift. Details of methods depend on the pest to be controlled, the crop to be protected, the most suitable insecticide for the purpose, equipment and capital available, and nature of the terrain. Each method must be evolved for its own circumstances.

All liquid spraying methods are distinguished by the volume of spray applied, and the methods of application are classified as lance, automatic hydraulic and air-assisted spraying.

In *Lance spraying,* hand-operated spray lances with either fixed or adjustable nozzles are used for individual treatment of trees in orchards, or in some ground crops.

Automatic hydraulic methods involve fixed arrangements of spray nozzles either as spray booms for field crops, or in suitable combinations for row crops and in orchards.

Air-assisted spraying has increased in popularity both for high- and low-volume applications. It is essential for low-volume work in orchards, either as air blast spraying using 50 gal. to the acre, mist-blowing using 20 to 35 gal. to the acre, or concentrate spraying using 3 to 6 gal. to the acre.

Machines available for air-assisted spraying are of three types:

In the first, air speed is approximately 100 m.p.h. and a large volume of air is used which in theory replaces the air within and about the treated tree. This type of machine can apply from 30 to 500 gal. to the acre and usually requires a separate power unit.

In the second type, air speed is increased to 150 m.p.h. and air volume reduced considerably. Spraying rates are from 20 to 250 gal. to the acre and power take-off drive is sufficient.

In the third type, an air speed of 250 m.p.h. is used, delivering from 3 to 50 gal. to the acre.

The latter types depend on complete mixing of insecticide-laden air with the air within the trees.

Allied to the low volume air-assisted "misting" machines are the fog generators. These produce a smaller sized particle, usually in some form of heat generator. Fog generators

depend to a large extent on air currents for dispersion. For small crop and plantation use, portable low-volume equipment is available.

Particular methods adopted depend to a large extent on personal preference, though the present world tendency is to low-volume spraying and its end point, concentrate spraying using particles in the mist size range (fogs have a smaller particle size and do not give satisfactory deposits). This has been brought about by increasing costs and shortage of labour and the associated saving of time. In severe infestations, however, high-volume methods are found necessary and current work indicates that deposits from these high-volume applications have a greater residual life than those obtained from low-volume methods. Low-volume methods are unsatisfactory in orchards and ground crops where dense cover is encountered, and if these methods are to come into general use, agriculturists and horticulturists must modify their cropping procedures accordingly.

Dusting, essentially an air-assisted method, is popular for certain crops. Dust particles penetrate heavy foliage better than spray droplets, and treatments are considerably easier to apply. Losses due to drift, however, are great and electrostatic and spray-coated dust methods have been developed to improve coverage and retention. These methods have found limited use.

Aerial spraying and dusting methods have a definite place in pest control practice, enabling large areas to be treated rapidly and economically.

Aerial treatment is a contract service and has the advantage of eliminating many preparatory tasks necessary for pest control by the farmer and orchardist.

Other convenient aspects include saving in labour requirements and use of trained operators in application of dangerous materials. Treatments can be applied when land-based equipment cannot be used, though difficulties may arise in seasonal treatments particularly after interruption by adverse weather, the demand greatly exceeding availability of the interrupted services. For this reason, some adequate conventional equipment should be maintained when using aerial contract services, particularly if treatment times are critical.

Airplanes appear at present to be the practical proposition, as helicopters, though potentially superior, represents a considerably higher capital outlay and have very high running maintenance costs.

It should be appreciated that the level of control from aerial spraying and dusting methods is in most instances inferior to that obtained with conventional equipment and in many instances is completely unsatisfactory (for example, in tobacco). These methods should be used only after careful consideration of all factors involved.

Insecticides are used also for *soil-inhabiting pests,* the active material being either incorporated directly into soil or premixed with fertiliser.

Seed dressings with dusts or dispersible powders find application in control of pests of newly sown and germinating seed. Methods for use of *systemic insecticides* and *fumigants* will be discussed in later issues.

Protect Pigs From Scours ...And Save Money

By G. W. OSBALDISTON,
Assistant Husbandry Officer.

Two previous articles on scours in young pigs have appeared in the Journal this year, the first, on the causes of scours, being printed in January, and the second, on treatment, in February. This present article points to economically sound measures for the prevention of the complaint.

The causes of scours and recommendations for their prevention, may be summarised as follows:—

Cause.	Prevention.
A Filth-borne diseases	Improve sanitation, accommodation and hygiene.
B Nutritional disorders—	
(i.) From deficiency	(*a*) Allow the sow and litter frequent access to parasite-free pasture when the litter is 5 to 7 days old.
	(*b*) Sprinkle ferrous sulphate on the floor of the farrowing pen when piglets are a few days old or place a clod of clean earth in the pen.
	(*c*) Administer iron to the mouth of the piglet.
	(*d*) Inject iron into the body cavity of the piglet.
(ii.) Digestive disorders—	
(*a*) Sudden overfeeding of a sow that has a weak unthrifty litter	Improve management practices.
(*b*) Allowing starving piglets access to lush pasture	
(*c*) Sudden alteration of the composition of the piglet's feed	
C Lowered resistance of the piglet ..	Improve accommodation

What Can You Do?

The old adage, "prevention is better than cure," very aptly fits the scour problem and only the pigman with poor sow and litter accommodation, or a poor sanitation programme, is seriously involved. Scours can occur on any piggery and in any season but on the better piggeries they are due only to altered management practices and consequently are usually only temporary.

The recommended method of prevention is to build good accommodation and to keep it in inspection order.

In most cases, the cheapest and best way to solve the problem is to build new sow and litter pens. Most farmers consider this uneconomic and so they keep the problem alive with makeshift alterations. The main objection to building new pens is the fear that the added return due to the better growth of the pigs reared will not justify the capital involved.

Does the increase in efficiency and the number of pigs reared compensate the cost of the increased production?—The immediate capital cost alarms some farmers because they fail to consider the advantages of better accommodation. The main advantage of good accommodation is increased profit from the pig enterprise. Do the increased profits counterbalance the capital involved? Only the farmer can answer that question for himself. A way to solve the problem is given later in this article. However, farmers can be reassured that where suitable sow and litter pens have been built, the returns have more than compensated the outlay.

Scouring affects the piglets in the following ways:

(1) Loss of condition and strength —as scouring increases in severity this becomes more pronounced.

(2) Poor growth—if severe, there may be loss of weight.

(3) Loss of appetite—starvation if severe.

(4) Inefficient digestion of the food consumed.

(5) Death—due to filth-borne bacteria or starvation.

By eliminating baby pig scours from the piggery, more piglets per sow are reared and they are more likely to develop into thrifty animals. Therefore the cost of production of each pig marketed is reduced and more pigs are marketed.

Consider The Economics

The net return from a piggery is the gross or total income less the cost of production. Gross income is dependent on the number of pigs marketed and the price realised by each pig. If the number of pigs marketed increases, the gross return will increase provided the price remains constant.

Cost of production will be considered in two phases:

(*a*) Running costs, for example, labour, feeding costs of the growers and,

(*b*) Maintenance costs, for example, feeding costs of the breeding herd, replacement of breeding stock, and depreciation of housing and equipment.

Irrespective of the number of pigs reared, the maintenance costs remain the same provided the size of the breeding herd remains the same. Thus if one, two or three piglets more were reared in each litter the maintenance costs of the pig enterprise would not be affected.

With good accommodation, labour costs will be minimised and work will be done with a more enthusiastic attitude. Few farmers consider time as shillings per hour, but any time saved on piggery chores means that more

time is available for other work on the farm.

The total cost of growing pigs is dependent on:

(*a*) The cost of the foodstuffs,

(*b*) The quantity of foodstuffs fed,

(*c*) The number of pigs.

The quantity of foodstuffs fed is influenced by the efficiency of utilisation, or digestion, and the time taken to grow to market weight. The longer the pig takes to reach market weight, the more food it consumes and so the more it costs to produce.

Research has shown that from the viewpoint of feed efficiency, healthy thriving weaners generally grow into efficient quickly growing animals. Thus the healthy weaner costs less to grow to market weight. As "the scours" results in unthrifty weaners, the prevention of this disease will give enhanced profits.

The number of animals weaned per litter will increase with good housing, management and feeding, and so more animals will be marketed. This is a particularly important point, because a farmer is only paid for the animal that he markets and so the more animals that he sells the greater will be his gross return. If the average cost of producing a bacon pig is less than the return for the pig, then the greater the turnover of pigs the greater is the total profit.

The net return is, therefore, dependent on three factors:—

(*a*) Market value of the pig;

(*b*) The turnover of pigs, that is, number of pigs marketed;

(*c*) Cost of production of a pig.

With improved accommodation and sanitation, the effect on an income and expenditure account for a piggery would be as shown in Table 1.

So far the approach has been theoretical. Each farmer must supply

TABLE 1

INCOME AND EXPENDITURE ACCOUNT.

Expenditure.		Income.	
Labour costs—reduced		More pigs marketed—increase gross income	
Feeding cost per pig—reduced			
Maintenance cost—same			
Balance—increased profit			
	£1,000		£1,000

the information to fill in the income and expenditure account. The information to complete the account must come from farm records. So to make the decision as to whether an improvement in the accommodation of the present pig enterprise would result in an increased profit, accurate and reliable farm records are essential.

The records should show the following:

(1) Number of pigs born;

(2) Number weaned;

(3) Number marketed;

(4) Returns from pigs;

(5) Total food costs—

(i) of growing pigs,

(ii) of breeding stock.

These are simple records but they are essential to gauge the financial results of good accommodation. They will show that the increased profits which result from the greater efficiency and larger number of pigs reared will exceed the cost of obtaining this increased production. In other words, it is possible to predict accurately how much good accommodation and sanitation do pay.

Effects of Scouring

Considering a litter of eight pigs at weaning time in which three of the piglets were affected with scours, and weigh on the average 7 lb. lighter than their litter mates. Four or four-and-a-

half months later, if the litter is examined, it will be found that the five healthy pigs at weaning are now ready for market and the three pigs affected with the scours are still 20 or 30 lb. off market weight. These three particular piglets must be kept on the farm for a few weeks longer and they are six-and-a-half or seven months old and consuming 6 lb. of food daily.

These piglets, affected by "the scours" when young, will cost 20s. or 30s. more by market time and so they have reduced profit by this amount.

Generally, piglets which suffer setbacks such as scours in early life, cost more to grow into a baconer than piglets which did not receive any setback. They are more expensive to rear because they require a longer period to grow to bacon weight.

Two factors affecting the profit of a pig enterprise are the rate of turnover and the cost of production of each pig. When pigs are slower growing than normal, they reduce the rate of turnover and they cost more to grow.

Thus "scours" have a definite influence on the profit of a pig enterprise, and always result in decreased profits.

New Treatment For Poultry Disease

Queensland veterinary workers have shown that the antibiotic drug, streptomycin, is an effective weapon against chronic respiratory disease in poultry.

The drug has been found to be of special value in treating the disease in layers, pullet chickens and growing cockerels. The birds are treated by injecting streptomycin into the breast muscle.

In five trials, treatment resulted in the disappearance of symptoms in most birds within two days. This improvement was accompanied by brightened appearance and increased appetite. When layers were treated, egg production commenced to rise four or five days later.

Chronic respiratory disease (C.R.D.) is widespread in Queensland poultry flocks. It reduces egg production in laying hens. In growing chickens, loss of weight is a common feature of C.R.D., and in young cockerels, the proportion of unmarketable birds is high.

Australorp pullets treated early in a C.R.D. outbreak laid 70 per cent. more eggs in the first month than untreated pullets. Production of the treated birds was also 49 per cent. higher in the second month and 6 per cent. higher in the third month. In two other trials, treated layers produced over 70 per cent. more eggs than untreated birds.

Pullets treated in the pre-lay stage started to lay at the same time as untreated birds, but laid 13 per cent. more eggs in the first 14 weeks of lay.

Treated cockerels gained ½ lb. more weight than untreated cockerels over a five-week period although they were all housed together. At the end of the trial, the market weight of the treated group was 16·7 per cent. higher than that of the untreated group.

—*P. D. RANBY,*
Veterinary Officer.

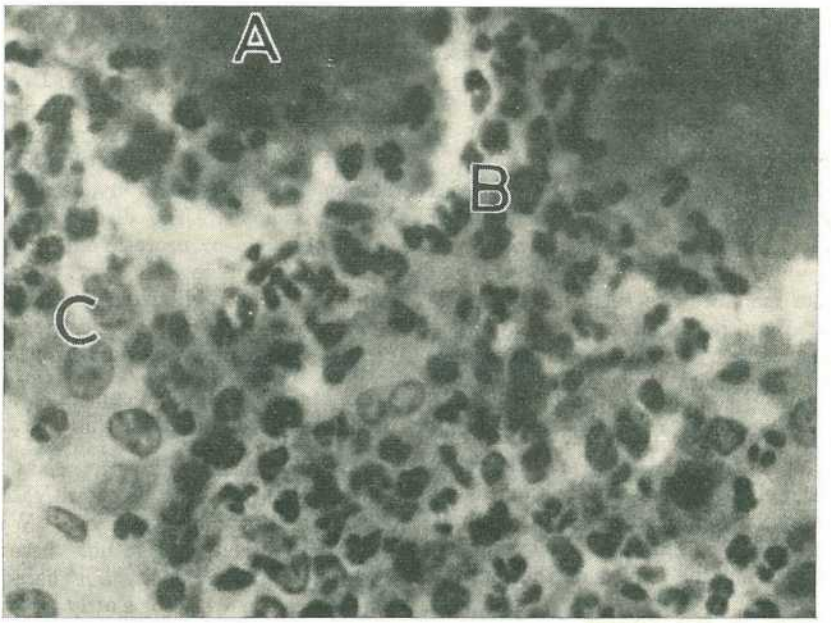


Plate 1: High Powered Photo-micrograph Showing the Battlefield in the Animal Tissue. Note: (A) The Invaders, which are masses of bacteria and debris; (B) The Defenders, which are the white cells, and (C) The Stretcher-Bearers, or phagocytes, as they are technically known.

The Unseen Enemy

By D. J. WEBSTER, Assistant Veterinary Officer.

The surgeon in his gloves and mask; a veterinarian taking your cow's temperature; or your wife pouring disinfectant down an evil-smelling drain. All these people are taking up the fight against that unseen enemy—the germ or microorganism. The story of this battle could read like a war novel.

Who is He?

The air and the soil around us are inhabited by millions and millions of these tiny organisms, too small to be seen by the naked eye, but quite readily distinguished under a microscope. Some of these germs are useful to man, such as the ones that convert fodder into silage, or the ones which live in the brewer's vats producing beer. Others live quietly along, harming no one and helping no one.

There are others, though, which, if given the chance, attack man, animals, and plants causing sickness and death.

These organisms which attack animals are called pathogens to distinguish them from their relations which do not. There are numerous forms of pathogenic germs and they come in all shapes and sizes. There are the bacteria, viruses, fungi, and protozoa. Each germ is usually a single cell which may be round or

rod-like. They multiply by dividing in half and thus it may be realised why they are present in such large numbers.

Living Conditions

Like all living things, these germs require certain climatic conditions in order that they might survive and increase. A certain temperature and some moisture are their most important requisites. Many people when preserving foodstuffs will have had experience with these requirements of germs. Thus we boil preserves generally under pressure, to kill any germs. You will have noticed also, how well beef keeps if it is dried out thoroughly, or when it is salted. Possibly the salt acts by removing water from the bodies of the germs.

Where is He Found

We now have a picture of the enemy and how he likes to live. Now we may ask where does he live? There are, in general, two places where we may find these pathogenic germs. One is in the ground, and the other is in animals themselves. It is not usual for them to float around in the air for any length of time.

If they are on the ground they have a great enemy to contend with. This is the sun whose heat will kill them, and whose rays will also dry out the moisture they need for life. Some germs can, therefore, only survive in shady moist places. Others have adapted themselves so that they can withstand the sun's effects to some extent. One of these is the germ which causes tetanus. This organism can live for some time in the dry dust of yards directly exposed to sunlight.

Some germs cannot live on the ground at all. They prefer to live and multiply inside an animal's body. The animal concerned is not affected by the germs generally, because it has suffered an attack by them and developed what is called an immunity. It is called a carrier animal. Many of you will have read about "Typhoid Mary," the woman who spread typhoid fever wherever she went in the United States. She was a carrier of typhoid fever. Similarly we have carriers of animal diseases. The germs known as Salmonellas are spread by seemingly healthy animals. The disease known as paratyphoid or necrotic enteritis in pigs is spread in this way. Many poultry farmers will have had experience of pullorum disease and the tests carried out to pick up carrier birds.

Contagious pleuropneumonia and brucellosis, are spread in this way.

In a somewhat different class is tuberculosis. This is what we call a chronic or slow-moving disease. With this the animal does not become immune to tuberculosis, but because the disease moves so slowly it has time to spread the germs round among other animals before eventually dying.

Where and How They Attack

The animal body has a natural barrier to attack by these germs. This is the skin. But through necessity and sometimes by accident, there are breaks in the barrier; the mouth, eyes, nose, and cuts are vulnerable chinks. Some germs are swallowed in the food. Others are breathed in and some may invade cuts or breaks in the skin. So an infection, as we call it, begins.

As has been said before, these germs are living organisms. In every tiny body, substances are being produced, possibly waste products, and these are excreted through their skin. Whether by chance or design, these substances are poisons. They enter the blood stream of the animal attacked, seriously affecting the workings of the body, in some cases to such a degree that they cause death.

Incubation Period

After the invasion of the body, it is generally some time before the fight between the body and the germs really gets under way. This period between

invasion and the first outward signs of infection is called the incubation period. During this stage the germs are multiplying and producing more and more poison.

Now germs have two methods of continuing the attack. Some want to invade the body themselves, producing poison as they go. Others are content to stop at the place where they broke the barrier and produce copious quantities of poison which invades the body and does the damage.

Firstly, considering those germs which invade the body themselves.

Defences

As in any battle, once the outer defences are broken, in this case the skin, the aim is to localise the attack or stop it spreading farther. It is now that we see the cardinal signs of an attack by germs. These signs are a direct result of the body's defence mechanisms. They may be listed as redness, heat, swelling, and pain. The redness is caused by an increase in blood supply to the area. The blood of an animal contains red cells which give the blood its red colour, and carry oxygen and white cells which may be called the home guard. It is these white cells which attack the invading germs.

Thus the body rushes in white cells to stem the attack. These cells leave the blood vessels and wander about in the tissues attacking and killing germs. Heat is caused also by the increase in blood supply. The swelling is caused by the increase of white cells and fluid in the tissues and the pain by the pressure of this fluid on nerves in the area.

If the white cells are completely victorious and kill all the germs, next on the scene are the stretcher bearers or phagocytes as they are technically known. These pick up all the dead germs and white cells and remove them from the battle field to be assimilated by the body. Gradually all signs of the infection will disappear and the area will return to normal.

If things are not going too well and the white cells are just managing to hold the germs, the body may decide that the easiest way out is to take some prisoners. Thus it may decide to build a wall of hard fibrous tissue around the fighters. Unfortunately the body cannot withdraw its own troops so must wall them up with the enemy. So we have the formation of an abscess. The material inside an abscess, or pus as it is called, is in fact composed of white cells and germs.

If the germs win this first battle, their easiest avenue of advance is along the blood stream, and it is along here that they run into the animal body's second line of defence.

This line is made up of the lymph glands, which are filters. It is the job of these lymph glands to trap the germs and hold them till a force of white cells can come up and kill them. As a result of the fight which goes on inside them, they may also swell up. Many people may have had experience of this when, after having had an infected finger, they get a swelling under the arm. This is caused by a lymph gland in this area trying to stop the spread of infection.

If the lymph glands are defeated, the body is really in trouble. The position now is that the germs have overrun the whole of the animal. We now say that the animal is suffering from a septicaemia. By this time two new reactions have occurred. Firstly the poisons secreted by the germs have caused a rise in temperature of the body, and secondly another line of defence has come into action.

It has been said that the poisonous chemical substances that are secreted by the germs are the things which really do the damage. Each particular

type of germ produces its own special poison. As soon as the body finds out which type of poison is being produced, it begins manufacturing substances which will neutralise it. This, of course, generally takes some time and these anti-bodies as they are called, cannot be thrown into the battle until some time after the initial invasion.

Now we have a complete picture of the battle. We can see the animal's body with its temperature increased, using the anti-bodies to neutralize the poison, the white cells to kill the germs, and the lymph glands to trap and hold the germs till the white cells arrive. We can see the germs multiplying all the time and continuously producing their poison. So the battle rages, perhaps the germs getting the upper hand for a while, and then the body.

In the case of the germ which is content to stop at the place where it first broke through the skin and let its poison do all the work, the body will have a different defence strategy. In this case the production of the neutralizing chemical anti-bodies takes on prime importance. Of course some white cells will be dispatched to endeavour to kill off the germs, but the speed with which the anti-bodies can be thrown into the fight is the limiting factor.

Result

If the germs win, the animal dies and this would be the end of the story. But if the body wins, what then?

Things will gradually return to normal, but the fate of the anti-bodies is interesting. After all infections, these anti-bodies persist in the body for a variable length of time, sometimes only for a few weeks, but at times for the remainder of the life of the animal. Thus, if the same germ attacks the body again while these anti-bodies are still in existence the animal can easily cope with it, because as soon as the poison is produced it can be neutralized immediately. Thus the germ has little chance. We say then, that the animal is immune to this germ, or the disease which it produces.

Sometimes the immune animal will not allow any of the germs to which he is immune live in his body. But sometimes he might not be so fussy, and will allow them to remain and multiply. They cannot hurt him, but he is continuously passing them out. In this way he becomes the carrier animal about which we have spoken.

You, the owner of animals, can participate in a number of ways in this battle.

(*a*) *Prevention.*—Where you cannot prevent germs living and multiplying in damp shady conditions, give your animals adequate first aid treatment in times of injury. A pamphlet on first aid treatment is available from the Department of Agriculture and Stock. If you are carrying out surgical operations, be as clean as you can, and use recommended antiseptics liberally and at the correct strength. Try to give these animals a grassy paddock to run in after surgery.

Do not keep carrier animals on your place.

Try not to buy carrier animals from properties known to be infected.

Numerous vaccines are prepared for the prevention of disease. These work by causing the production of anti-bodies without producing the disease. Tetanus is one disease against which you can vaccinate.

The well-fed, well-cared-for animal is more resistant to attack by germs.

(*b*) *Help the Animal Win the Fight*—

(1) Nurse him well.

(2) Call in a veterinary surgeon.

Stock and Station

Hair Worms in Sheep—Black scours in weaner sheep usually increase in autumn and winter. Prevention of this condition, which is caused by the sheep hair worm, calls for drenching to remove the worm burden.

In Queensland, hair worms are most common on the Darling Downs and in the Goondiwindi, Roma and Central Highlands districts. The pest also extends as far west as Jericho, Barcaldine and Blackall. Moderate infestations can lower wool production by as much as 40 per cent., while heavy infestations can cause death.

To kill hair worms, drench with a bigger dose of phenothiazine than that used for nodule worms. Dose rates are: For grown sheep, 20 sheep to the pound of phenothiazine; for sheep 12 to 18 months old, 25 to the pound; and for sheep four to eight months old, 30 to the pound.

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

Tapeworms a Burden—Light infestations of sheep with tapeworm are of little or no consequence, but very heavy burdens may cause scouring, dejection and loss of condition.

Phenothiazine, the best drench for most sheep worms, is ineffective against the tapeworm. As many Downs farmers use only phenothiazine for drenching, the need to treat their young sheep for tapeworms may arise.

Bluestone-nicotine drenches are the most effective in dealing with sheep tapeworms. But in dosing young sheep, be careful to follow strictly the dose rates recommended by the manufacturer. Be careful, also, not to blame tapeworms for troubles caused by other internal parasites.

—C. SMITH,
Senior Adviser, Sheep and Wool.

Keeping Pigs Warm—A good stockman will make sure his piggery is warm, before low temperatures and biting westerlies arrive. Sheds should be free from draughts and have a warm, dry floor. A little bedding provides extra comfort.

If baby pigs are unable to keep warm in the first few weeks of life, they are likely to develop diseases or fail to grow satisfactorily. The easiest and cheapest way to keep them warm is to build a hover board in each farrowing pen.

The piglets soon learn to snuggle under the board. Their body heat warms the small volume of air in their snuggery, keeping them warm and contented in the coldest weather. They're also less likely to be trampled by the sow, as they'll spend most of their time between feeds under the hover board.

—T. ABELL,
Senior Adviser in Pig Raising.

Blackhead in Turkeys—Blackhead can cause losses of 50 per cent. or more in turkey poults. Farmers should take every precaution to keep it out of their flocks.

For the blackhead organism to complete its life cycle it requires the presence of the caecal worm. For this reason, the attack on blackhead should start before the youngsters arrive with the treatment of all the older birds for worms. An effective

and cheap treatment is to supply phenothiazine in the mash for two days at ½ lb. of phenothiazine to 12 lb. of mash.

Enheptin-T should be fed to the young poults in their mash or drinking water for the first eight to 12 weeks of life. The cost is only about 1s. to 1s. 3d. a bird. Range the turkeys as much as possible and don't rear young turkeys near older birds.

—P. D. RANBY,
Veterinary Officer.

Danger to Sheep—Winter rain can be a big danger to off shears sheep. Last year there were some considerable losses both in road sheep and paddock sheep caught unexpectedly by winter rains and bleak conditions. Much of the loss in these cases is due to hypocalcaemia, a sudden drop in the blood calcium level when the sheep is subjected to sudden stress. Many sheep could be saved under these conditions if supplies of calcium borogluconate and a syringe to administer it were ready to hand.

Seven ounces of calcium borogluconate are dissolved in 35 fluid oz. of hot water, and when cooled to blood heat 30 to 50 ccs. are injected beneath the skin.

Any sheepman planning to shear in winter when there is a possibility that sheep may have to be turned out off shears into rainy cold conditions, should carry syringe and calcium borogluconate as an elementary precaution against possible loss from hypocalcaemia.

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

Timely Tips for August

AUGUST could be called "parasite" month. For worms in all animals a treatment in August is a vital one. It reduces right through the season the burden of worms that animals carry. It may seem odd to treat for worms during August, when animals won't normally be carrying a lot of worms. But when dealing with the worm, it doesn't pay to be sporting —Kick Him when He's Down!

For ticks, August is the time to start "strategic dipping". Three quick dippings at the right time will help keep ticks off your cows right through the season. Get details from your nearest veterinary surgeon and start doing it this month.

If the weather is warm, buffalo fly will soon start to be active again. Watch for cattle rubbing, and for the bare areas of skin around the eyes. Prompt treatment as soon as the fly comes about will save your animals suffering and be profitable for you. Buffalo fly irritation certainly lowers milk production, and pulls condition off beef cattle.

Watch for this small, black, biting insect, especially if you're not dipping for ticks.

Point to remember—if you treat your cattle, the buffalo fly may then attack horses, which he doesn't normally worry. Might be best to treat them at the same time.

Another point—if cattle are rubbing and you can't see signs of buffalo fly, look for lice! These small active insects can also worry cattle and they are often overlooked.

August may also be the month to get your neighbours together and arrange with your vet. for "group" vaccination with Strain 19. Strain 19 will prevent one of the three serious "breeding" diseases of cattle. It's a shame to miss the chance of eliminating a disease.

If you're preparing cattle for the "Show," feeding troubles may occur. Watch for bloat scouring, abdominal pain and nervous excitement. These are signs of troubles caused by feeding which will need veterinary attention if the value of the feed and production are not to be lost.

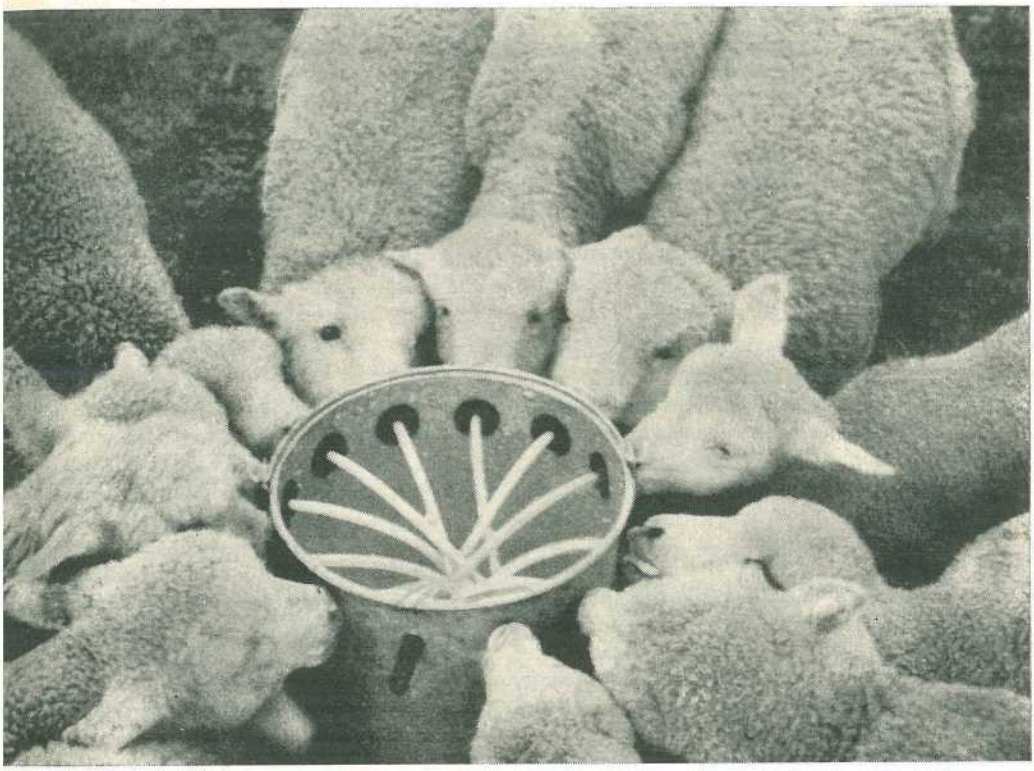


Plate 1: Coping With a Dozen Orphan Lambs at Once Almost Calls For the Services of a Dairy Herd.

Pets Worth £8,000 A Year

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

ALMOST every sheep station in Queensland carries its quota of pet lambs. No census or survey has ever been taken at any given time of the number of these pets. But, we do know that Queensland has about 4,500 sheep flocks. The overall number of "rescued" lambs would increase in droughty seasons. This is because at such times many lambing ewes die during parturition, and others, having little milk, often desert their new born lambs.

So that, judging by the number of sheep properties where you see one, two, and sometimes a string of pet lambs, there could well be 5,000 "pets" being reared on sheep properties throughout the State in most years. If all were put together, quite an appreciable flock would result; perhaps one big enough to grow into sheep that would yield annually about 140 bales of wool.

Even at subdued wool values of approximately 47d. a lb., and £61 a bale, that wool would be worth about £8,500 a year. Many of the reared pets would be ewes and would as the years passed by help to swell the lambing percentages in the State.

So pet lambs have a considerable economic value.

Perhaps just as important, but in a more abstract way, they form a source of inspiration and companionship and have, for thousands of children, an education value in the sphere of animal husbandry. Not only do you find these popular pets around station homesteads; most bush towns and some cities have their quota. Many a Brisbane suburban backyard has its "four-legged lawn mower," whose lusty cry, contrasting strangely with city noises, can bring a touch of nostalgia to the shearer, the boundary rider, or the sheep-owner down for a visit to "the big smoke."

Recently such a suburban sheep-owner made inquiry from the Sheep and Wool Branch, asking what she could do with a three-month-old pet whose 4-feeds-a-day milk ration was costing her £50 a year!

Most farmer's drafts of fat lamb that are sent to Cannon Hill sale-yards average about 50 lambs, but there are plenty of occasions when lots of one or two lambs are sold. Suburban dwellers with insufficient grazing to allow weaning and further grazing of pet lambs can best arrange disposal by contacting one of the stock agencies, who will advise when delivery at saleyards is required, and make sales for the owner.

Are Poddy Lambs Worth Saving?

Are poddy lambs on sheep stations worth saving? With the amount of cow's milk required to rear them, and the labour and time involved, the cost aspect is quite important. Perhaps we should say—in small numbers—yes, no station should be without them; but "by the dozen"—no!

By the second week of a merino lamb's life it makes call on its mother to the extent of about 35 fluid oz. of milk daily, about 2 pints. If the lamb is an orphan you must substitute cow's milk for this. If you were to try to rear 12 lambs you would need to provide about 420 fluid oz. of cow's milk a day for quite a while. That is about 3 gal. daily. Additionally, there would be labour to milk the cow or cows, feed the lambs, and ensure that milk containers and utensils were kept scrupulously clean after each feed. Perhaps trying to rear three or four lambs would be a more sensible and economic project than trying to rear a dozen or more.

The following tables refer to milk yields of ewes:—

TABLE 1

MILK YIELDS IN A MILK YIELD TRIAL OF 17 MERINO EWES OVER THE FIRST 9 WEEKS OF LACTATION.

Weeks	1.	2.	3.	4.	5.	6.	7.	8.	9.
Yield (oz. day) ..	36	39	37	33	29	26	24	20	18

Early Care of the Orphan

Often a lamb that has never had a drink from its mother may die even if attempts are made to rear it on cow's milk. It is likely that the death of the lamb is accelerated because it has never received the valuable first-milk or colostrum.

TABLE 2

LACTATION TABLE OF MILK YIELDS FROM VARIOUS TYPES OF SHEEP SHOWING DAILY YIELDS.

Type of Sheep.	Lactation Period.	Average Daily Yield.
	Weeks.	Oz.
Border Leicester x Cheviot (high plane of nutrition and suckling twin lambs)	16	63
Australian merino (suckling twins)	10	53
New Zealand Romney	12	49
Border Leicester x Cheviot (high plane of nutrition and suckling single lambs)	16	44
South African merino cross breeds	12	36
Welsh Mountain (high nutritional plane)	10	36
Australian merino (suckling singles)	10	35
Cheviot (high plane of nutrition)	13	35
Hampshire	12	32
South African merino	12	26
Welsh Mountain (low nutritional plane)	10	25
Cheviot (low nutritional plane)	13	19

TABLE 3

SHOWING COMPARISON OF EWE'S MILK AND COW'S MILK.

—	Fat.	Sugar.	Protein.	Total Ash.
	Per cent.	Per cent.	Per cent.	Per cent.
Ewe's Milk	7·4	4·8	6·1	0·97
Cow's Milk	3·75	4·75	3·4	0·75

The colostrum contains nutritious and protective elements that fill the needs of the newborn animal for the first few days, and make its body capable of dealing later with the normal milk. In addition it is likely to contain antibodies which give the newborn lamb a passive immunity against many bacterial diseases. Scouring is a common feature in many young animals deprived of first milk. It is likely that antibodies in colostrum normally protect them against bacteria causing this, and similar diseases of the young such as arthritis.

A recipe for an artificial colostrum mixture, for use with orphan lambs that have never had a drink from their mothers is:

26 oz. of warm cow's milk in a bottle.

1 beaten egg.

1 small teaspoon cod liver oil (or castor oil).

1 dessertspoon of sugar.

The dose rate is up to 6 oz. per feed of this mixture, four times a day for the first two days. It is considered that the lamb will then thrive on cow's milk. It is likely that the artificial colostrum helps to expel the meconium, or first faeces, of the young lamb, thus preventing stagnation of bowel contents, with multiplication of toxin-causing bacteria.

Observations have shown that lambs born of poorly fed ewes have a lessened sucking vigour. Also the temperature of lambs born from underfed ewes is lower at birth than that of lambs from well-fed ewes. Practical application of these findings when related to the early care of orphan lambs calls

Plate 2: A Pet Lamb is a Source of Education for the Young.

for treatment to keep the lamb warm, and to assist its early intake of nourishment.

When the lamb is first brought in it should be kept near a kitchen fire and covered with a corn sack or old blanket.

The first feed of artificial colostrum mixture should be given immediately after bringing the lamb in. The mixture is warmed and fed to the lamb down the finger. Later, feed the lamb with an infant's bottle and rubber teat.

Following the two days' feeding with artificial colostrum, bottle-feed the lamb with warmed cow's milk. Ewe's milk is stronger than cow's milk, as Table 3 shows. It contains about twice as much fat, equal sugar, and about twice as much protein. However, in practice, cow's milk is rarely supplemented.

If you want to bring cow's milk more nearly to the nutritional standard of ewe's milk, add 1¼ oz. of whole cream dried milk powder to every pint of cow's milk.

Feeding Methods

After the first two days of artificial colostrum feeding, in which the lamb is fed 6 oz. four times a day, feed with warm fresh cow's milk to the following schedule:

Up to 4 oz. every three hours, say first feed at 6 a.m. with the last feed at 9 p.m. As soon as possible encourage the lamb to drink from a vessel by placing the finger in the mouth after putting the knuckles of the finger well down in the milk. Later, after a few lessons, withdraw the finger as the lamb becomes accustomed to draw up the milk without the aid of the finger for a guide.

At two weeks, feed three or four times a day, giving up to 8 oz. of milk per feed, or 1½ pints of milk per lamb per day.

At the same time start encouraging the lamb to eat more solid food. This can take the form of:

Bran	2 parts.
Pollard	2 parts.
Buttermilk powder	1 part.

This is given in the form of a warm porridge with milk, gradually increasing the solid, and lessening the milk until the lamb learns to eat the mixture just made into a not-too-liquid mash with milk. This will reduce the quantities of milk required.

All utensils used for feeding should be well scoured and scalded between meals, and kept in a fly-proof gauzed-in safe.

Weaning and Pasture Feeding

Within six weeks or so of birth, lambs will turn to pasture grass and herbage, and feeding of milk and mashes can be greatly decreased.

Plate 3.

More Than a Few Pet Lambs Can Become a Handful, and Then Labour-Saving Devices, Such as Multi-Feeders, Become Necessary.

Water should be provided from three weeks on, and shade and shelter given from sun, wind and weather.

Lambs reared well through the early stages often persist with their early feeding knowledge and try to share all the scraps that are going around the homestead. Garden vegetables should be securely fenced off from lambs, and they should not be allowed to rob the fowls of their due ration.

Because of good feeding and a contented outlook, they generally grow into bigger-than-average sheep, and sometimes grow prodigious fleeces.

Grown pets are useful for teaching flock sheep to eat grain or similar rations, and as decoys and leaders to take sheep into yards or shearing shed.

During the rearing period they should be protected from worm infestation and fly strike. Drenching should be carried out when the flock sheep receive their usual drenches. They should be crutched when the crutch wool appears dirty or overlong, and jetted before spring and autumn fly trouble.

It must be remembered that at times when there is a demand at the station homestead for milk for orphan lambs this often coincides with seasonal conditions when the station's milkers are hard put to supply enough milk for the humans. Nevertheless there are few stations on which it would not be economical and sound to raise a few orphan lambs at every lambing.

Tuberculosis-Free Cattle Herds.

(As at 1st July, 1959.)

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
E. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
Sullivan Bros., "Valera" Stud, Pittsworth
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
L. R. Dennis, Diamondvale, Mundubbera
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
B. Goddard, Mt. Tyson, *via* Oakey
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
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnston, "Windsor" Jersey Stud, Beaudesert
S. A. Cramb, Bridge street, 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, Mulgildie
R. N. Burrows, Box 23, Wondai
W. T. Tatnell, Cedar Pocket, *via* Gympie

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

The Lady Finger Banana

By K. B. McRAE,
Horticulture Branch.

Under the most favourable conditions and with efficient management, a Lady Finger banana plantation will produce profitable crops almost indefinitely.

The origin of the Lady Finger banana as a commercial variety in Queensland is rather obscure but we know that plantations were established at Pinkenba in the early days of settlement.

The coastal districts of south-eastern Queensland subsequently became, and still remain, the main areas of production. The Lady Finger banana has played an important part in the economy of districts such as Buderim, Pinkenba and Redlands where, at one time or another, it has been grown almost to the exclusion of other varieties.

Tall Growing

The Lady Finger is a tall-growing variety and the mature plant normally reaches a height of 12 to 16 ft. The pseudostem is very broad at ground level and tapers gradually towards the throat of the plant. The colouring is generally light-green with little of the dark pigmentation found in some other varieties.

The leaves average 8 ft. in length and up to 28 in. in width. They are light-green in colour, have a slight drooping habit and are widely spaced along the pseudostem. The leaf stalks are characteristically long.

Plate 1.

Lady Finger Banana Plantation in the Redlands District. The plant has a vigorous root system and throws its bunch well clear of the throat. Bunches carry up to 8 hands of fruit of excellent quality.

The bunch is slightly tapering and of moderate size with five to eight hands which are carried on a very sturdy stalk. The fruits are comparatively short and normally fill well

but, when the bunch is cut at the green mature stage, may be somewhat angular.

Hardiest

The Lady Finger is by far the hardiest banana variety grown in Queensland and produces fair bunches with good quality fruit even when the plantation is under stress through lack of rain.

The root system of the plant is both deep and extensive. The strong fibrous roots have been known to exploit an area of 20 sq. ft. to a depth of 3 ft. but root development in any particular plantation is, of course, dependent on the soil type. Maximum penetration occurs in a deep, friable, sandy loam.

With such a vigorous root system, the plant can effectively use nutrients and moisture in the soil. Under favourable conditions, growth is very rapid. During times of stress, growth is certainly slower but the plant does not "go back" as quickly or to the same extent as in dwarf varieties. Conversely, the plant recovers quickly after rain.

An additional characteristic of importance in the Lady Finger banana is its ability to throw the bunch clear of the throat of the plant at all times. Choke throat—a well known disorder in dwarf varieties—is almost unknown.

The strong root system radiating from the large corm provides a very firm anchorage which enables the plant to withstand reasonably heavy winds. Bunch props are seldom needed in a Lady Finger plantation and this alone represents a worthwhile saving in labour and material. However, high winds particularly cold westerly winds, can do considerable harm to the young bunch as it moves up the pseudostem or when it is emerging from the throat of the plant. The effect of these winds—internal break-down of the fruit accompanied by finger shedding—was forcibly brought to notice following the July 1954 cyclone.

In Queensland, the Lady Finger is chiefly grown on coastal flats many of which are subject to cold temperatures and even light frosts in winter. The ability of the variety to tolerate such temperatures has made possible the establishment of the banana industry in areas which, though accessible and reasonably close to markets, are unsuited to dwarf and semi-dwarf varieties such as Cavendish and Mons Mari.

Fruit Quality

The Lady Finger banana ripens to an attractive golden yellow and the flesh possesses an agreeably sweet flavour which is characteristic of the variety and quite distinct from that of Mons Mari and Cavendish. During summer, the fruit keeps well and remains in a firm, edible condition considerably longer than do other varieties. Lady Finger is therefore invaluable for the country trade at that time of the year.

Nevertheless, the skin is somewhat tender and marks easily, particularly when the fruit is ripe.

Number of Strains

Rarely are all plants in the Lady Finger plantation uniform in bunch type. Some of the more obvious differences are obviously inherited but others are influenced by both soil and location.

In the past, selected plants have been propagated by some growers and this could be the origin of the strain which is popularly referred to as Improved Lady Finger. However, little or no systematic testing of these alleged strains has been carried out.

The so-called Improved Lady Finger has not been preserved as a separate entity and a number of strains exist in almost every plantation. For this reason no distinction is made in commercial practice between Improved Lady Finger and the standard Lady Finger banana.

Disease

The Lady Finger banana seems to be less susceptible to bunchy top than Cavendish and Mons Mari although outbreaks have been recorded from time to time in some areas.

During recent years, the acreage under Lady Finger bananas in old districts such as Redlands and Myrtletown has declined owing to the ravages of Panama disease which does not attack Cavendish and Mons Mari. Panama disease produces a form of wilt and a discolouration in the tissues of the pseudostem is characteristic.

Most of the better soils in the Redlands district are now infected with Panama disease and, on many farms, it is economically unsound to replant with Lady Finger bananas. Even after other crops have been grown for several years on the infected land, replanting is hazardous. Curiously enough, in some districts such as Buderim which are well suited to the variety, production of the Lady Finger banana is still commercially practicable although Panama disease has been present in the area for many years.

Under the most favourable conditions and with efficient management, a Lady Finger plantation will produce profitable crops almost indefinitely. Some plantations, at least 40 years old, are still in production. However, in areas where Panama disease is prevalent, the productive life of a plantation may be reduced to 3 to 5 years.

Lucerne Ensilage

Several inquiries have been received concerning the ensiling of lucerne.

Answer: Lucerne can be made into silage provided it is handled correctly. Once the lucerne has been mown, allow it to wilt for at least two hours, or longer if the weather is not hot.

This wilting is important as the moisture content is too high to make it into silage straight from the mower. If ensiled when too moist, the resultant silage will be dark, unpleasant and unpalatable.

The addition of up to 80 lb. of molasses to each ton of lucerne will help produce a good pleasant and palatable silage.

Mexican Poppy

"D.J.," of the Kingaroy District, has been troubled with infestations of Mexican Poppy.

This summer growing weed is quite common in many districts. It is most frequently observed growing in sandy or silty areas along creeks and rivers. However, it is also found in cultivation and run down pastures.

Stock are not attracted to the weed as it is too unpalatable. Some suspicions are held of calf poisoning when the weed has been present in hay.

In ploughed areas, the weed is best eradicated or controlled by cultivation. Several such cultivations may be necessary during the crop's growth.

When the plants are growing vigorously, Mexican Poppies will succumb to spraying with 2,4-D at the rate of 2 lb. per acre.

Brucellosis-Tested Swine Herds. (As at 1st July, 1959.)

Berkshire.

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, "Tayfield" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
V. F. Weier, "La Crescent," Clifton
N. Rosenberger, "Nevrose," Wyreema
L. P. Orange, "Hillview," Flagstone Creek
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
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
P. F. Pfrunder, Pozieres
A. Wolski, "Carramana," Warra.

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
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
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. Sturmer, 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
J. C. Lees, "Bridge View" Stud, Yandina.
C. Assenbruck, Mundubbera
A. J. Mack, Mundubbera
J. & S. Kahler, East Nanango
C. P. Duncan, "Hillview," Flagstone Creek

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
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
J. D. Booth, Swan Ck., Warwick

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
A. J. Mack, Mundubbera
J. Ashwell, "Greenhill," Felton South

Large Black.

E. Pointon, Goomburra

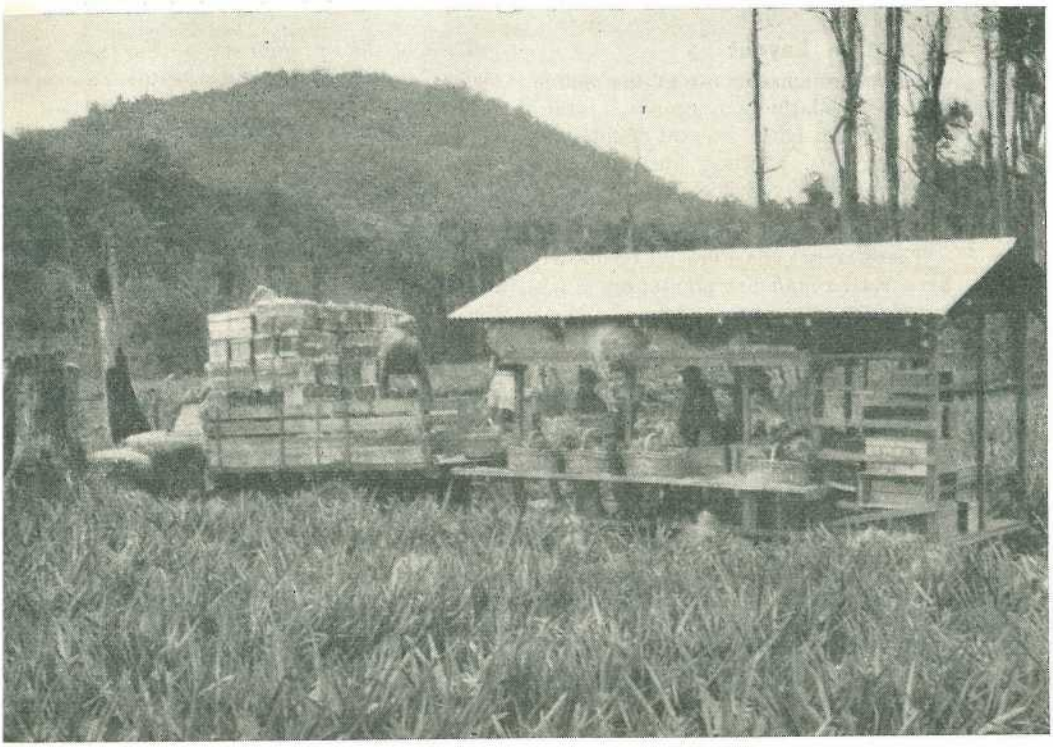


Plate 1: Mobile Packing Shed for Pineapples. The shed is mounted on an old discarded truck chassis. Traction is provided by a 5-ton truck on which the cased fruit is loaded direct and transported to rail.

Mobile Packing Shed Saves Money For Pineapple Grower

By V. C. BEAN,
Adviser in Horticulture.

A prominent pineapple farmer, Mr. A. E. Biggs of Bartle Frere, North Queensland, has cut his labour costs in half at harvesting time by partial mechanisation of harvesting and packing. He has done this by building a mobile packing shed.

Production is based on a summer crop which is all consigned to the fresh fruit market in the south. It is usually unprofitable to grow pineapples in North Queensland as a winter crop, for, at this time, fresh market prices are low. Southern cannery prices are unprofitable at any season owing to high freight costs.

Plantation Layout

To ensure efficient use of the mobile packing shed, the plantation was established on flat land. Normal double-row planting was adopted but the rows were cut at every 2 chains by roadways across the plantation.

These crossroads were all connected by a road round the plantation which gives easy access to every block.

The roads are wide enough for the pickers to move freely between the sides of the mobile shed and the growing plants.

Shed Specifications

The packing shed is built on the chassis of a discarded 2 ton truck purchased at a reasonable price complete with four wheels and tyres.

The shed is of wood and iron construction, 22 ft. long, 9 ft. wide, with sides 7½ ft. high. The floor is of hardwood timber and the roof is galvanised corrugated iron. The sides, back and front are left open for coolness.

Each of the uprights supporting the roof of the shed is braced with 2 in. x ½ in. right-angle, iron braces to ensure a rigid framework.

The shed includes four packing bays —two on each side of a central passage way in which the packers can operate freely. In each bay, a framework is constructed to hold three cases in the form of a square, open at one side. Each packer can handle three cases at a time and can pack different grades of fruit.

The rear portion of the shed holds about 70 empty cases, which have been branded beforehand by the farmer, with all necessary brands other than the count.

Above and within easy reach of each packer, shelves hold bales of woodwool and lids for the cases. On the upright at the back of each packing bay are containers for nails and holders for hammers and marking crayons.

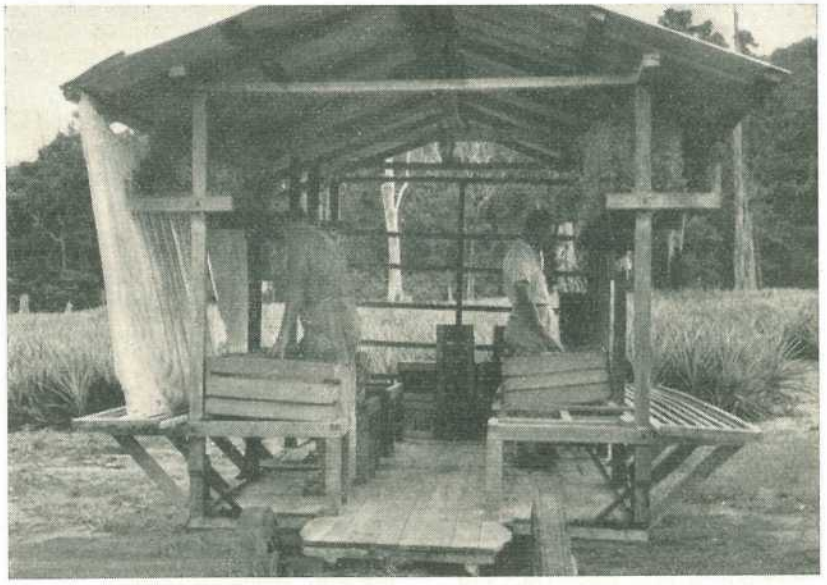


Plate 2.

Structural Features of the Mobile Packing Shed. There are four bays, two on each side of the central passage. Pickers place baskets of fruit on the slotted shelves in front of the packers.

On the outside of the shed and running lengthwise along each side is a slotted shelf at the level of the packing bays. These shelves take six baskets of pineapples each of which holds the equivalent of one case of fruit. Three cases of fruit are therefore readily accessible to the packer in each bay.

The cost of the chassis and the completed shed was £150.

Operation of Shed

The motive power for the shed is a 5-ton truck. This, coupled to the front of the shed, hauls it along the headlands and roadways in the plantation.

A picker works ahead of the shed, cutting and trimming the ripe fruit, and laying them on top of the plants. He works only to the middle of each row; a series of markers divide the rows into two sections each of which is 1 chain.

Another man works along the rows opposite the mobile shed and collects the fruit into a basket. This basket is supported by a strap over the shoulder that clips on each end. He walks out to the centre line of the block and picks up the fruit on his return trip to the shed. The full basket is placed on the packer's shelf and an empty one is taken for the next trip.

The shed is moved forward about six rows at a time and is always near the ends of the rows being harvested.

When all fruit has been harvested from both sides of one land, the shed is moved to the next headland or roadway and the same procedure is adopted. The maximum distance the carrier has to operate is 1 chain.

The fruit is packed direct from the baskets, the packed cases are lidded where they stand and then loaded on to the truck. The fruit is only handled three times from picking to the completed packed case.

The 5-ton truck has a capacity of 140 cases and, when fully loaded, is uncoupled and transports the fruit to the railhead. The shed is moved to another portion of the plantation before the truck is uncoupled so that picking and packing can continue when the truck is away.

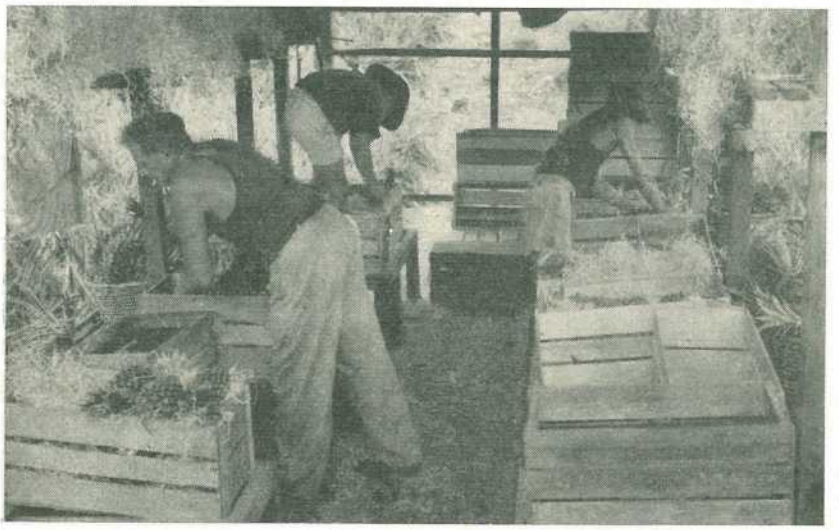


Plate 3.

Packers Operating in the Mobile Packing Shed. Packers have ample room and ready access to fruit, woodwool and case lids.

Economic Importance

The saving in labour costs is not the only advantage of the mobile shed. The farmer also has time available for other farm operations that tend to be neglected during the rush period normally associated with conventional methods of harvesting.

The mobile packing shed now in use has demonstrated its value. It was, however, essentially a pilot model and it is now planned to erect an improved version of the shed, with several modifications which should lead to even greater efficiency.

Growers who have seen the shed in operation are impressed and there can be little doubt that others will be built for use in the larger plantations situated on more or less flat land.

Orchard and Garden

Don't Over-Water Papaws Now—Over-watering in the winter can cause heavy tree losses in papaw plantations. Tree growth is rather slow during the cold months, and when the soil is excessively wet at this time, root rots and other diseases can develop.

Most of the papaws grown in southern Queensland are irrigated. Usually the greatest call for irrigation is in August and September. Then, temperatures are rising and good growth responses can be expected.

But during the cooler months of May, June and July, growers should be careful not to over-water. Young trees, it should be remembered, are particularly susceptible to injury from wet feet. Drier weather can be expected during the next few months and irrigation will probably be needed. At this time, light, infrequent waterings are preferable to heavy, frequent applications.

—J. B. DAVEY,
Experimentalist.

Protect Winter Beans—Winter bean crops in southern Queensland are usually very profitable, but to get the highest yields, some protection from the cold is essential.

Cold westerly winds or near-frost temperatures cause poor setting and badly formed pods. These troubles can be greatly reduced by planting winter beans on sloping land, well protected from westerly winds.

If you have no warm, high, sheltered land for your winter beans, cow cane or a similar perennial crop planted in strategic positions around the bean plot will be helpful. These crops should be planted in the previous spring and at right angles to the more destructive winds. Windbreaks should be angled across the slope. In this way, they will not only give protection against the westerlies but will also permit the downward flow of cold air on still nights when frosts are likely.

—L. G. TRIM,
Adviser in Horticulture.

Right Soil for Avocadoes—Think of land for an avocado orchard in terms of protection from strong winds, ample depth of soil and efficient drainage and you can't go far wrong. Taking a risk on any of these requirements is a horticultural gamble that seldom pays off.

Avocadoes are sensitive to cold at and shortly after flowering and to lack of soil moisture after the crop has set. A warm, sheltered site for the orchard is essential.

The avocado has the deepest root system of all the Queensland fruits. For this reason, it's very susceptible to waterlogging. Three days in a saturated soil are sufficient to damage the roots permanently. Poor soil drainage is one of the greatest hazards in avocado growing. Test borings with a soil auger on the proposed orchard site will give a good picture of the soil type and help you make the right decision.

—W. V. MUNGOMERY,
Horticulturist.

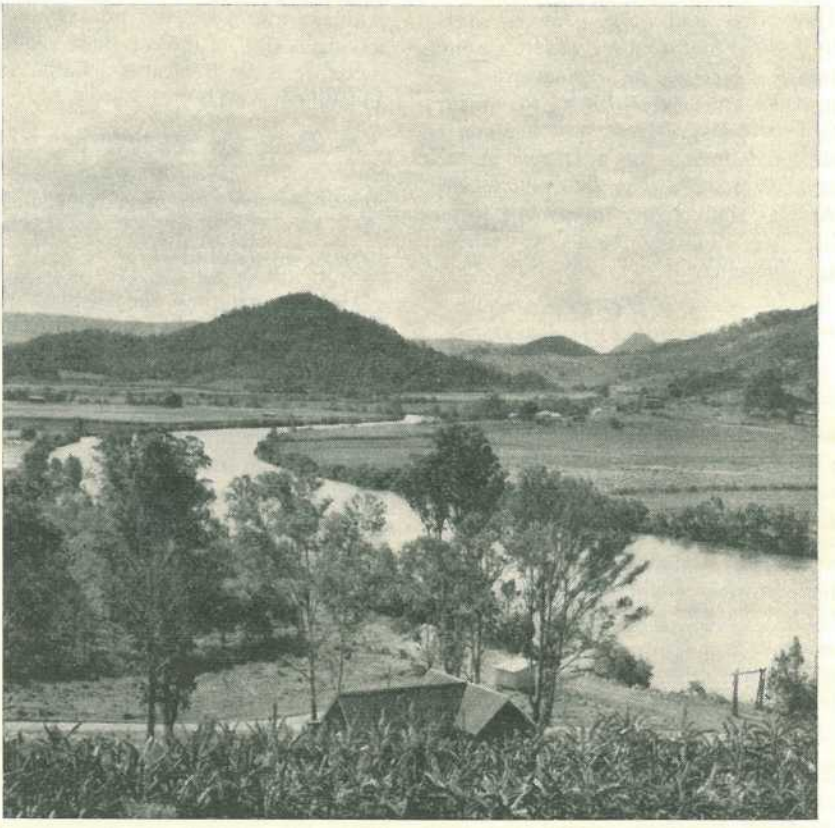
Buy High-Budded Citrus—High-budded citrus trees, with the union of the stock and scion at least 4 inches above the ground, are recommended for Queensland orchards.

The old practice of budding trees at ground level originated in the cool climates. There the winters are severe and the nurserymen are able to mound the soil above the bud union as a protection against frost.

But in Queensland's warm climate, the practice has nothing to commend it. The bud union is the weak point in a citrus tree when it's planted in the orchard. If this part of the trunk is covered with soil or is injured in cultivation, the chances of infection with collar rot or similar diseases are high. Use of high-budded trees removes this risk. Queensland nurserymen are now producing high-budded trees in quantity. Don't use anything else.

—R. L. PREST,
Senior Adviser in Horticulture.

Bananas and Sugar Cane



Bananas and Sugar Cane Growing on the Banks of the Maroochy River.

Potted Facts—VI.

COTTON—
Sausage Skins To High Fashion

By D. R. LEWIS, Marketing Branch.

THE word "cotton" is derived from the Arabic word "qutun" or "kutun." This locates the plant early in that section of the Old World. Cotton was in India before Alexander, and samples found in tombs there date it back to 3,000 B.C. It was certainly grown and spun by the ancient Egyptians and Chinese wise men wrote about it.

Cotton has been found in the prehistoric "pueblo" ruins of Arizona, and the oldest cotton fabrics now existent are the grave cloths of pre-Inca Peru. Cotton was mentioned in Hindu hymns 15 centuries before Christ, and it was the subject of legend and myth in the Middle Ages.

Improved Varieties

The fibre cotton in its present physical structure is the result of civilisation and seed selection. The plant has adapted itself to its various homes and it is now cultivated in more than 60 countries. For instance, in the tropics there are perennial types, some species attaining a height of 15 to 20 ft., and being known as tree cottons.

However, it is generally treated as an annual to insure the production of cotton of the best quality and to keep insect and fungoid pests in check. In Australia and other countries where cotton is cultivated commerically, the plant is grown as an annual in the form of a shrub, with a strong main stem up to 6 ft. high, with numerous branches, some of which carry the bolls.

The United States produces far more cotton than any other country. Up to the end of the thirties, about 90 per cent. of the world's commercial cotton production came from six countries—United States, India, Russia, China, Brazil, Egypt. Since that time the increase of cotton growing in numerous widely separated countries, and its decrease in the United States, has tended to make the world output more stable. World cotton crops, however, fluctuate widely, due chiefly to changes in the yield per acre.

Average annual yields in Queensland have fluctuated from 290 lb. to 538 lb. of seed cotton per acre. The average yield in the United States has gone from 640 lb. to over 1,200 lb. of seed cotton per acre.

Ginning and Grading

Before cotton can become commercially valuable it must go through the process of ginning—the separation of the seed from the lint. Ginning is by means of roller-gins or saw-gins Most American cotton is ginned by saw-gins, whilst in Egypt roller-gins are used exclusively. This process is gentler than saw-ginning and is more satisfactory for the long-staple crop of Egypt, the lint pulling easily from the seed. The Queensland Cotton Marketing Board uses saw-gins only,

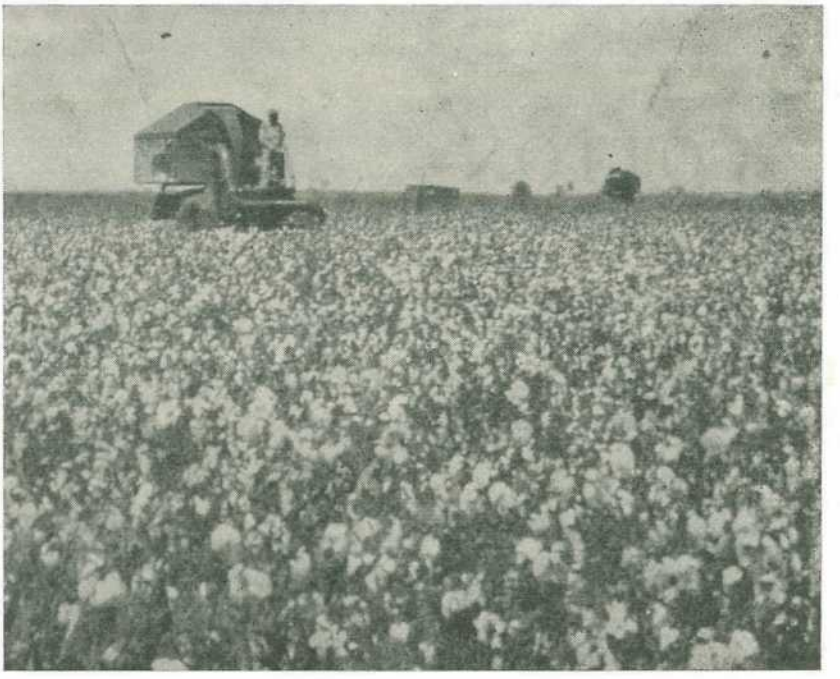


Plate 1.
A High-Yielding Cotton Crop Being Harvested Mechanically.

of which it has 10 stands at Whinstanes and 10 at Rockhampton. Each stand has 80 saws.

The classification of cotton is a very important operation in cotton marketing. Difference in staple length, amount of foreign matter, colour and other physical properties greatly affect its spinning quality. The poorest quality of cotton of any given variety may be worth less than half as much as the best quality of that variety. Consequently every bale of cotton has to be put into its own quality category.

In the cotton trade, "grade" means a given classification of cotton, from the standpoint of foreign matter and colour; it does not cover length of staple or other characteristics. In America, for example, there are nine grades of classification for white cotton, and almost as many for non-white cotton such as yellow-stained or grey. Here in Queensland we work on eight grades. As an illustration, cotton graded SM would be Strict Middling White. Similarly, SMLS is Strict Middling Light Spotted, and SGM refers to Strict Good Middling White.

Growers will realise, therefore, how important it is to produce clean cotton, free from foreign matter, if they are to expect a good grade for their cotton, and consequently a better price.

Staple is a measurement of the quality of fibre in wool or flax or cotton. It indicates the length, strength, fineness or coarseness of the spinning quality of the fibres. Raw cotton fibres vary in length according to variety, from $\frac{3}{8}$ in. to about $1\frac{3}{4}$ in. Staple is classed to 1/32 in. for marketing. There is little demand for the very short staple lengths. In Australia, spinners normally require a staple length from $\frac{15}{16}$ to $1\frac{1}{8}$ in.

Cottonseed

The production of cottonseed is determined by the prevailing demand for cotton, although in several countries, notably the United States, the seed is an important source of income to growers. In Queensland, too, the seed increases the returns to the grower.

The commercial utilization of the seed depends greatly on the availability of suitable processing plants. In India, for example, due to the shortage of suitable plant, the bulk of the cottonseed is burnt as fuel or used as fodder. Cottonseed, as harvested, contains about 15 to 25 per cent. of oil, according to variety.

In weight, cottonseed averages about 3,500 to the pound, and for each pound of fibre, cotton plants produce about two pounds of seed. The commercial importance of the seed lies in four principal products which can be obtained through processing—oil, cake or meal, linters and hulls. Processing consists of (1) cleaning, (2) removal of linters—the fine hairs on the seed, (3) de-hulling, (4) cooking of kernels to facilitate oil recovery, and (5) extraction of the oil.

The delinting machine is very similar to the cotton gin, but with much finer teeth in the saw.

Oil is the most valuable product obtained from the cottonseed. Crude oil is dark red in colour and contains impurities, and is refined by bleaching and deodorising. The chief use of the refined oil is for edible purposes, mainly in the manufacture of margarine and shortening. The acid residues remaining after refining are used in soap manufacture and for other industrial purposes.

The cake and meal produced are high protein, easily digested cattle feed. The hulls also are used as a livestock feed. Cotton linters are used for many purposes, for example, in mattresses and in coarse cotton yarns. After treatment, linters are used in plastic manufacture, in rayon and other high quality cellulose products, and in the manufacture of sausage casings.

The following table indicates some of the many uses to which the cotton plant is put:—

TABLE 1.

RAW COTTON.

Wearing Apparel.	Household Uses.	Industrial Uses.
Shirts, piece goods, suits, coats, shoes, women's dresses, sportswear, sewing thread, knitting yarns	Bedclothes, curtains, upholstery, fabrics, oilcloth, table linens	Motor car tyres and upholstery, tents, bags, cheese coverings, cordage, felts, fish nets, medical and military supplies and equipment, plastics

Marketing

So much for cotton itself; what of the marketing situation in Australia?

Australian consumption of cotton is about 80,000-90,000 bales each year, of which only about 3,000 bales are home-grown. Apart from cotton goods, linters and oil, imports of raw cotton alone cost over £6m. each year.

This is a measure of our dependence on imported supplies, and of the scope for greater home production. This would make a worthwhile contribution

to improving the balance of payments situation, and would also increase the diversification of farming, thus reducing the dependence of many farmers on one type of production.

All cotton produced in Queensland is marketed by the Queensland Cotton Marketing Board, which has been in existence since 1926. The board provides ginning and storage facilities at Brisbane (Whinstanes) and at Rockhampton, and operates an oil mill at its Brisbane depot.

COTTONSEED

Kernels	refined oil	shortening, margarine, salad oil, packing oil (sardines), medicinal preparations, cosmetics
	foots	washing powders, acid oil, soap, candles, waterproofing, insulating materials
	cake and meal	dairy cattle (milk production), beef cattle, sheep, pigs
Hulls	stock feed	
	fertilizer	
	fibre	
	fuel	
Linters	stuffing material	mattresses, upholstery, cushions, quilts
	surgical dressings	absorbent cotton, bandages, gauze
	lower grade yarns	wicks, twine, carpets
	cellulose	paper, cellophane, explosives, plastics (motor car parts, electrical parts, toilet ware, jewellery, safety glass, films), rayons, lacquers and enamels, sausage casings

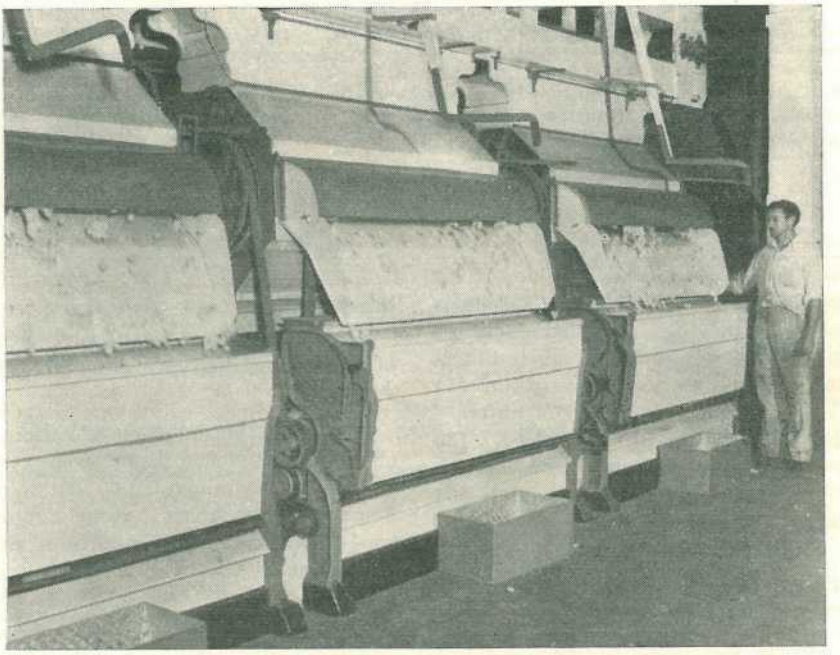


Plate 2.

Ginning Seed Cotton at Whinstanes in 1958.

In addition, the board has for some years operated a fleet of mechanical harvesters and has proved to growers that these machines can be operated efficiently under Queensland conditions. This season the board, in conjunction with the Department of Agriculture and Stock and the Irrigation and Water Supply Commission, is carrying out field trials and experimental work on the St. George irrigation area.

Cotton growers have had the advantage of guaranteed returns for many years, by way of bounty from the Commonwealth Government. The first Cotton Bounty Act was passed in 1926. The present bounty guarantees 14d. per lb. seed cotton for grades above strict good ordinary, and will continue in force for the next five years. This is some encouragement to growers to invest in necessary labour-saving equipment, such as cotton pickers and high-clearance tractors.

The following table shows production and returns to growers since 1934:—

TABLE 2.

COTTON: PRODUCTION AND NET RETURNS TO GROWERS, 1949–50 TO 1956–57, WITH 5-YEAR AVERAGES FOR 1934–35 TO 1938–39, 1939–40 TO 1943–44, AND 1944–45 TO 1948–49.

Season.	Ginned Equivalent in Bales.*	Commonwealth Bounty Paid per lb. Raw Cotton Lint.	Returns to Growers (including Bounty).	
			Per lb. Raw Cotton Lint.	Per lb. Seed Cotton.
		d.	*d.*	*d.*
Average 1934–35 to 1938–39	11,728	3·89	11·61	4·03
Average 1939–40 to 1943–44	8,528	2·39	13·80	4·82
Average 1944–45 to 1948–49	1,434	1·81	16·69	5·86
1949–50	806	Nil	31·46	11·43
1950–51	1,124	Nil	58·16	21·39
1951–52	1,483	Nil	32·43	11·35
1952–53	4,229	2·05	37·81	14·42
1953–54	2,819	4·44	38·57	14·28
1954–55	4,386	7·46	36·83	14·10
1955–56	3,046	19·75	38·60	14·32
1956–57	2,845	13·66	40·32	15·83

* Bales of approximately 500 lb.
(Source: The Cotton Marketing Board).

Irrigation Spray Efficiency

Uneven distribution of water is a common fault in spray irrigation plants. It can be caused by inefficiency in the plant itself, by having the spray lines too far apart or by operating the sprays at the wrong pressure.

This is a simple method of testing the efficiency of a spray irrigation plant: Place a number of small tins with sharp edges in chequer-board fashion and 12 ft. apart between two sprinkler lines.

Operate the spray system for an hour, then measure the water in each tin. Calculate the amount of water collected in all the tins, then work out the average amount collected in the 25 per cent. of tins with the lowest registration. The distribution efficiency is the ratio between the low 25 per cent. average and the overall average.

If this check shows that your spray efficiency is low consult your local Adviser in Agriculture.

—*A. NAGLE,*
Irrigationist.

Good Leaders Learn By Experience

By J. PARK,
State Organiser, Junior Farmers.

In the previous issue, consideration was given to a list of characteristics which it was suggested contained some of the qualities of maturity. Before we attempt to relate these characteristics to the needs and interests of young people, let us summarise them briefly:

To have an open, inquiring mind; to be ready to accept responsibility for one's actions; to acknowledge the debt we all owe to the community in which we live; to be able to deal with people and with situations; to be articulate; to be steady and purposeful; to have a satisfactory attitude to the opposite sex; to have outgrown the self-interest of the young.

Would you agree that these characteristics are those of a mature person? Further, would you agree that it should be an objective of the Junior Farmers Organisation to assist its members to become mature persons?

Assuming that we are in some measure of agreement on these matters we can proceed to take a look at the needs and interests of youth.

No one will deny that youth is a time of experiment and adventure. The transition from the world of childhood to that of the adult calls for knowledge and experience. Knowledge the youth will certainly attain; it is our responsibility as parents, advisers and leaders to ensure that worthwhile knowledge is provided, and that it is put to good use.

There is no substitute for experience, and sooner or later the youth must walk alone. His early footsteps will be uncertain, and his progress often painfully slow. All that we can do is try to ensure that his environment is healthy, stable and conducive of constructive efforts, and that when his progress falters we are there to guide and advise.

Learn to Act Alone

Once our members have begun to act alone in this adult world, we must encourage and train them to accept responsibility for their actions. It is futile to expect young people to accept responsibility without some training, or before they have had an opportunity to experience the consequences of their actions.

Where untrained youth acts without guidance, and when youth is permitted to escape the consequences of its actions, the outcomes are usually antisocial, to say the least.

Learning to live with people in a manner which shows consideration for the rights and privileges of the individual, forces us to accept sooner or later (sooner if we receive enlightened training) that we owe most of what we are, or what we are likely to become, to the community to which we belong. Acceptance of this fact is usually accompanied by some desire to serve that community, especially if what we are satisfies us.

The boundaries of our community will depend upon the breadth of our experience. As our horizons widen so our own community becomes larger, until the fully mature adult ceases to think only in terms of his own parish, and projects his thoughts on a State, national or international level.

Must Get Along with Others

As the boundaries of our community are widened so is our ability to deal with people and situations put increasingly to the test. Our member must first learn to "get along" with his fellow club members, and to adjust himself to the various situations in which his active participation in club affairs will place him. As he gains in club experience his value as a member will be recognised, and his responsibilities will be increased.

These increased responsibilities will lead him outside his own club environment, and require him to meet, and win the respect and liking of members from other clubs.

So the circles widen until the limits of his own particular abilities have been reached.

Must Speak Clearly

Our member's ability to make his own wishes and desires felt, and to bring his thoughts to bear upon the problems associated with running his club or his community will depend in a great measure upon his ability to express himself clearly and concisely. To be inarticulate is to have one's usefulness in contemporary society reduced almost to the level of impotency. The Press, Radio and Television have shattered most of the barriers to communication, and to be an alive and useful member of society requires our member to be able not only to express himself adequately, but to be able to understand what the other man is trying to say. Whilst the media of communication have improved to a degree beyond man's imagining a generation ago, man's own ability to communicate has not made commensurate progress. This is a problem which confronts all those concerned with education, and it is one which must be overcome at all costs.

Self-Discipline

In this age of speed and change, the ability to concentrate, and to pursue a chosen course steadfastly will be hard won. Our member will be subject to stimuli from many sources, and only by the acquisition of self-discipline will he be able to receive them with equanimity. Self-discipline can only be learned. It is society's responsibility to ensure that its members are given the opportunity to learn it.

This learning process should, of course, proceed in a controlled environment, preferably one in which boys and girls will be able to grow up together. Only in so doing will each be able to make a correct evaluation of the other's rights and privileges. Where mutual respect among members of society prevails, the self-interest of the individual will be reduced to a desirable minimum. It is wrong to hope that self-interest will be eliminated. Without it, initiative and worthwhile ambition would have no existence.

Hints For Club Members

The School Project Clubs and the Scholarship Grade pupils are the natural reservoir from which clubs should draw their members. We suggest that each club should seek permission from head teachers to speak to those pupils who will be leaving school this year. Tell them about the organisation, and try to make them feel that you are anxious to have them in your club.

Debating plays an important part in club activities. Its real value lies in the stimulus it provides for members to think about current problems, and the encouragement it gives to efforts in oral expression. However, the newer members must be given time to find their feet before they are asked to debate. In this activity, hasten slowly.

"The National Parks of Queensland"

A booklet issued by the National Parks Association of Queensland describes many of our State's beauty spots that are protected and preserved for the nation. It is well illustrated with more than two dozen excellent photographs. These give a fair idea of the glories of nature that are in store for those who visit any of our national parks, and furnish visible proof that holidaying and bush walking in any of these areas would be a most rewarding pastime. As the booklet states: "Natural Parks here are regarded as national domains belonging to all the people. They are not the special property of any particular section or locality, but are available for use and enjoyment by all." The price of the booklet is 3s. 6d.

Spraying Noogoora Burr

Preparing for Aerial Spraying of Noogoora Burr on Verastan Station, Muttaburra.

The Farm Family

Thought For Food

Why Do We Need Food?

Because tissues used up by the body in work, play and exercise must be replaced. Only by eating food can we replace these tissues—and the better the quality of the food, the more efficient the replacement and the greater the health and strength of the body.

- We need foods rich in the "builder" elements for growth and repair.
- We need foods that contain "protective" elements to arm us against infection.
- We need the "fuel" foods to give us warmth and strength.

Fortunately we do not need to worry about balancing these food needs in our diet. Doctors and dietitians have worked out our needs and given us this list of seven food groups, which contain all we must have for health.

How Much Do We Need?

As a general rule, people who work at a desk need less than others in more active occupations. For instance, a coal miner would need to eat twice as much as an office worker.

Some people need more food than others, simply because they use energy at a faster rate. Aim to serve three square meals each day, and leave it to natural appetite and hunger to determine the amount eaten. Preserve health and normal weight by eating regular and sensible meals—and don't eat in-between-times just to satisfy a social custom.

How Often Should We Eat?

Convention seems to have established a routine for eating, and the routine is logical and convenient. First thing in the morning—in the middle of the day—and the end of the day are the right times for taking the nourishment to sustain us for the day's work and play. Children's after-school and between-meal snacks should be restricted to milk and fruit.

Cooking to Retain Nutriment

If you're thoughtful and thrifty in the selection of foodstuffs—carry on the good work in the kitchen. Careless cooking robs food of flavour, destroys nutriment and wastes the pennies you've saved on shopping.

Here are some cooking and food storage pointers aimed at health and economy:—

(1) Prepare vegetables just before cooking; use BOILING water and cook as quickly as possible, in a tightly covered pan.

(2) Use as little water as possible —and don't throw it away. It's too valuable. Serve it, rich in vitamins and minerals, as a simple soup base.

(3) Don't overcook. Cook food long enough to make it tender —but no longer.

(4) Don't keep food hot. Serve it as soon as possible after cooking.

(5) When oven-cooking meats and meat dishes—follow an authoritative recipe book.

(6) Store eggs in a cool place—and don't wash before storing.

(7) Keep vegetables in a cool place. Vegetables to be eaten raw will remain crisp if they are washed and drained, wrapped in damp cloth and wax paper, and stored in ice chest or refrigerator.

(8) Dry foods, such as cereals, flour, and dried vegetables should be stored in tight containers to be safe from moisture, dust and vermin.

Food Preparation and Hygiene

Most infection enters the body through the mouth! Knowing that, we must be scrupulously careful with hygiene in meal preparation. A thorough hand-washing with nail-brush and soap before handling food is a vital safeguard for family health.

Simple Facts About Vitamins

An elderly lady was once heard to remark: "I think we were a lot better off before they invented vitamins!"

The point is that no-one invented Vitamins.

We simply discovered that certain elements now called Vitamins A, B, C, and so on, were contained in the foods that have been eaten and enjoyed for centuries. We also discovered that various vitamins have specific jobs to do in the maintenance and safeguarding of health.

The discovery of vitamins does not make nutrition any more complex. No scientific knowledge is needed to plan for the inclusion of vitamins in our meals. Vitamins occur naturally in the foods from which we chose our "balanced" diet. If we eat a little every day from each of the seven food groups listed in this pamphlet we are sure to include all the vitamins and elements essential to good health.

Enjoying Our Meals

Food is—and should be—one of our pleasures. Pleasant meal tables make for serene digestions and happier people. Tension and hurry are enemies of your digestive system, and thus your health. Plant to have regular, well-organised meals, and be relaxed at the meal table. Be efficient and far-sighted beforehand so that you can give your attention to your own and your family's pleasure round the meal table.

Here are the DAILY Food Needs for Each Person.

Milk—Not less than ½ pint of milk for adults. Not less than 1 to 1½ pints for children.

Potatoes—One serving. OTHER VEGETABLES: A leafy green or yellow vegetable. A third vegetable adds variety.

Fruits—One serving of citrus or tropical fruits, or tomato.

Meat, Fish, Cheese, or Poultry—At least one serving.

Eggs—One; if available.

Cereals and Breads—One or both at every meal.

Butter and Other Fats—A little according to personal requirements.

Sugar, honey, jam, and syrup contribute fuel only, and should be used as a supplement and not as a substitute for the above foods.

When each day's menus include food from all seven groups we're sure of a "balanced" diet, and also take all the roughage needed for regular elimination.—Queensland Health Education Council.