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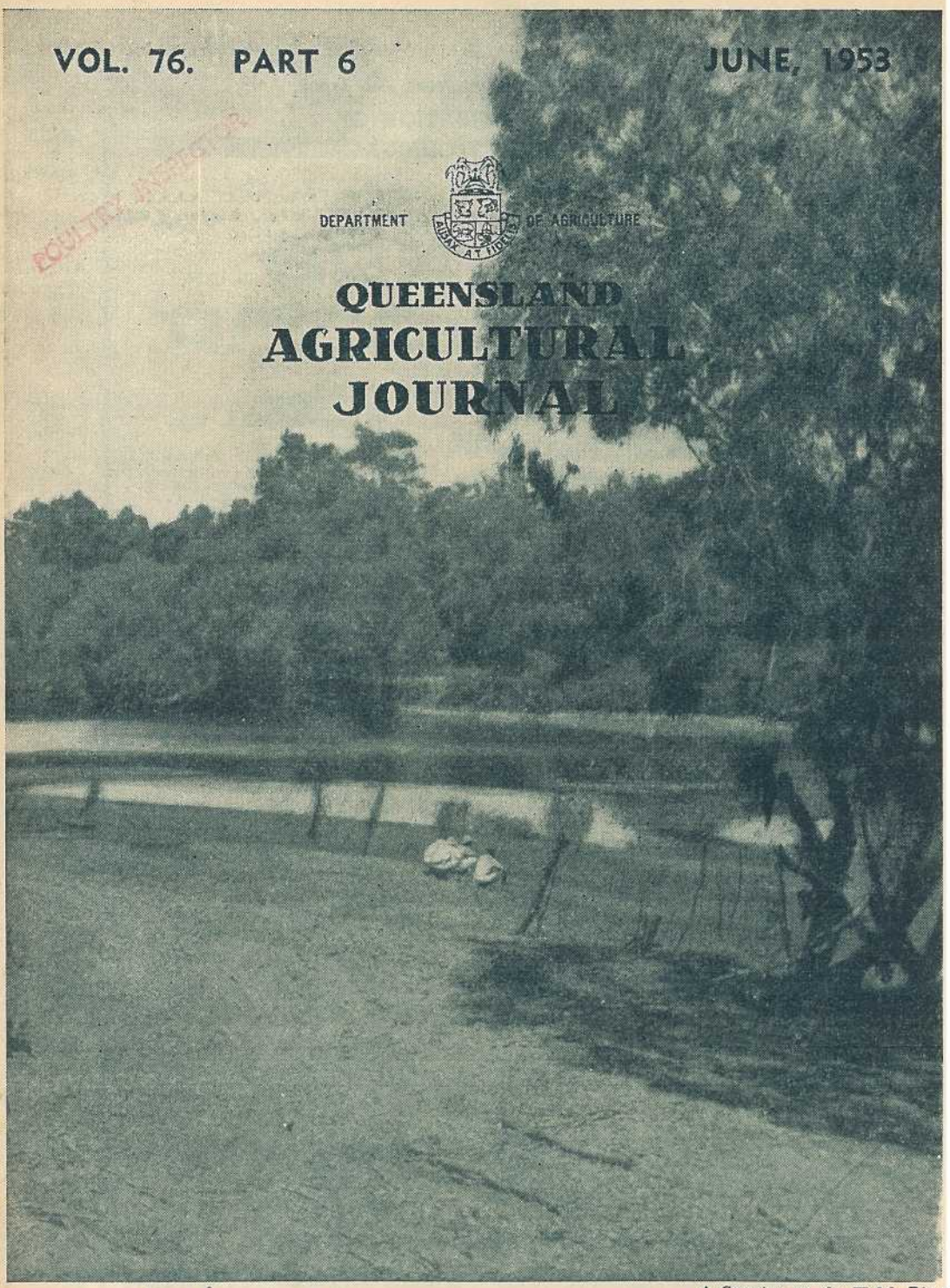
POULTRY INSPECTOR

DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



A Crossing on the Walsh River

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Dairying on the Downs
Can Washing
Market Milk Testing
Honey Flora

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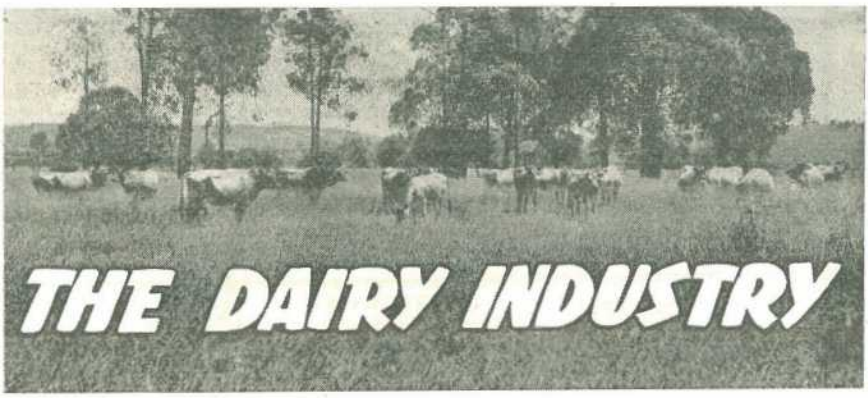

Dairy Farming on the North-Eastern Darling Downs.

P. ROUND, Senior Adviser in Cattle Husbandry.

THE dairying industry on the Darling Downs has grown from small proportions into a major industry, and the mechanisation of dairy farming has made rapid progress during the past 15 years. Prior to mechanisation, dairying was carried on with family labour, and was the means whereby many families, with little capital, were enabled to commence farming on their own account.

Small proprietary butter and cheese factories were erected throughout the Downs in the early years of the industry and milk and cream were transported by individual farmers in horse-drawn vehicles, or in wet weather, often by pack-horse. As the industry developed, co-operative factories were started and mechanisation was introduced to the factories and dairies. With the improvement of roads and road transport, many small factories were closed and a swing to centralised factories took place, the object being to reduce manufacturing costs and improve manufacturing methods as well as the quality of the produce.

Although a large proportion of the State's cheese is still produced on the Downs, many dairymen have diverted their supplies to butter and pasteurised milk in recent years. Much Downs milk is being supplied to Brisbane for household use and processing into ice cream and other milk products. This is carried by road in fast motor tankers.

Although some suppliers still transport their own milk and cream to the factories, most areas are well provided with organised services by carriers who collect the product at the farm and convey it by motor transport direct to the factory. A small proportion is still carried by rail.

Factories are well equipped with sufficient modern machinery to handle a much greater supply of raw material than is available.

Most dairy farms are equipped with milking machines, and have tractors with sufficient complementary machinery to perform all necessary operations.

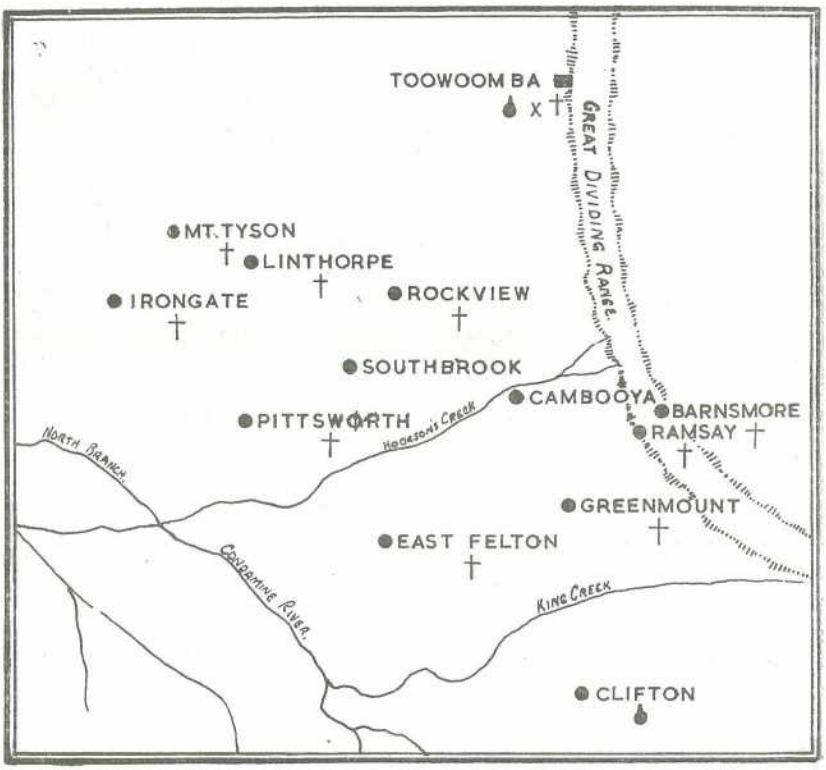

Plate 1.

Sketch Map of the North-eastern Darling Downs.

A progressive stud industry has assisted materially in raising the production potential of dairy cattle on the Downs, and milk production is limited not so much by the production capacity of the cows as by the feed available.

Fodder for cows varies in both quality and quantity from month to month and frequently it is below the requirements for normal production. This is particularly serious at times when cows are in the early stage of lactation.

The *Queensland Agricultural Journal* of October 1897 records a statement by the late John Mahon (Government Dairy Expert) which reads as follows:—

"We are only too well aware of the fact that in this colony, as is the case in all the Australian colonies, we have dry seasons periodically, and during a period of the year the natural pasturage is unreliable, and in consequence the cows go off their milk and become reduced to such a low state of poverty that, when the next season comes on, the animal, instead of producing milk, requires all the food given her to build up her weak constitution, and is unprofitable to the dairyman.

"A little knowledge in feeding and a small amount of extra labour would be the means of placing thousands of pounds that are now being lost in the pockets of the Australian dairymen each year.

"There can be but one opinion as regards the urgent necessity of adopting better methods of feeding, sheltering, and treatment of our dairy herds, and it behoves every person engaged in the business to give special attention to these matters. The slipshod method of allowing the animal to provide for herself has passed long ago. It must be apparent to all observant persons that our dairymen have not yet risen to the fact that success in dairying is dependent on the breeding, feeding, and treatment of dairy cattle. We can no longer afford to waste food and labour on cows that will yield a few pints of milk daily. The yield of milk per cow is of the greatest importance to dairymen, and until raised to a higher standard we may expect to hear of unprofitable results from those engaged in the business. The most essential point, and one which demands the immediate attention of all dairymen in this colony, is to reduce the cost of milk production, which must be done to place ourselves on equal footing with dairymen in other parts of the globe.

Plate 2.

Dairying is Conducive to Longevity. The driver is 72 years old, the horse 30 years.

"The object of every dairyman should be to obtain a maximum flow of milk at the lowest cost. A 'Babcock' milk-tester should be kept in use, and the animal that will not pay for her food and labour in milking should be no longer kept in the herd. By judicious culling, carried out by the aid of the 'Babcock' tester, the standard of our herds could be raised very considerably. Too much stress cannot be laid on the necessity of testing each cow. Feeding inferior cattle is ruinous."

This message of 55 years ago is still largely true, and where dairymen cannot or do not provide sufficient food and feed it to cows with a high production potential, production of milk per acre must remain low.

In this article, dairying in the local authority areas of Pittsworth, Cambooya, Clifton and Toowoomba is dealt with, as these portions of the Downs are somewhat similar in topography, soils and vegetation.

CLIMATE.

Generally speaking, the eastern portion of the area under discussion has a slightly better rainfall than the western part. This is indicated by Table 1.

TABLE 1.

METEOROLOGICAL DATA FOR TOOWOOMBA AND PITTSWORTH.

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average
TOOWOOMBA.													
A.	81·6	80·5	77·8	73·7	67·1	61·8	61·1	64·5	70·8	76·1	80·4	82·5	73·2
B.	60·7	60·9	58·3	52·5	46·2	42·5	40·2	41·6	46·9	51·8	56·4	59·5	51·5
C.	506	451	381	254	219	252	203	169	214	257	319	431	3,656
PITTSWORTH.													
A.	85·7	84·7	81·8	76·5	68·5	62·8	61·6	65·4	72·4	78·9	84·1	85·8	75·7
B.	62·4	61·7	59·2	53·8	47·0	43·5	41·2	42·8	48·2	53·6	58·6	61·2	52·8
C.	387	315	319	152	143	185	177	124	166	216	270	349	2,803

A = Mean maximum temperature; B = Mean minimum temperature; C = Average rainfall in points.

The mean maximum and minimum temperatures for Toowoomba and Pittsworth are based on 25- and 23-year records, respectively, and rainfall averages on 59- and 44-year records.

Storm rains, which provide about half the annual rainfall during the summer, are erratic, and dry spells of two or more months' duration, usually accompanied by heat waves, are not uncommon.

Winter rainfall is also unreliable, although of a more general nature.

TOPOGRAPHY, SOILS, AND VEGETATION.

The city of Toowoomba and the eastern portions of the shires of Cambooya and Clifton are situated on the western slopes of the Great Dividing Range. Consequently, the country consists of ridges and valleys running out into the plain country of the western portion of the two shires and the shire of Pittsworth.

A large variety of soil types are found, ranging from the steep stony ridges with brown and chocolate soils to black soils on flats and plains and the red loamy soils of the extreme eastern and north-eastern fringe.

The undulating country around Toowoomba comprises open eucalyptus forest and red loam soils formed from basalt. The soils derive their colour from the free iron oxide formed during the process of weathering. They are free-working and permeable, fairly fertile, but not as fertile as black soils nor with the same moisture-holding capacity.

A black soil which is shallower than the black soil of the open Downs exists on the undulating and hilly country of the eastern and north-eastern Downs. It is a fertile soil, well supplied with plant food.

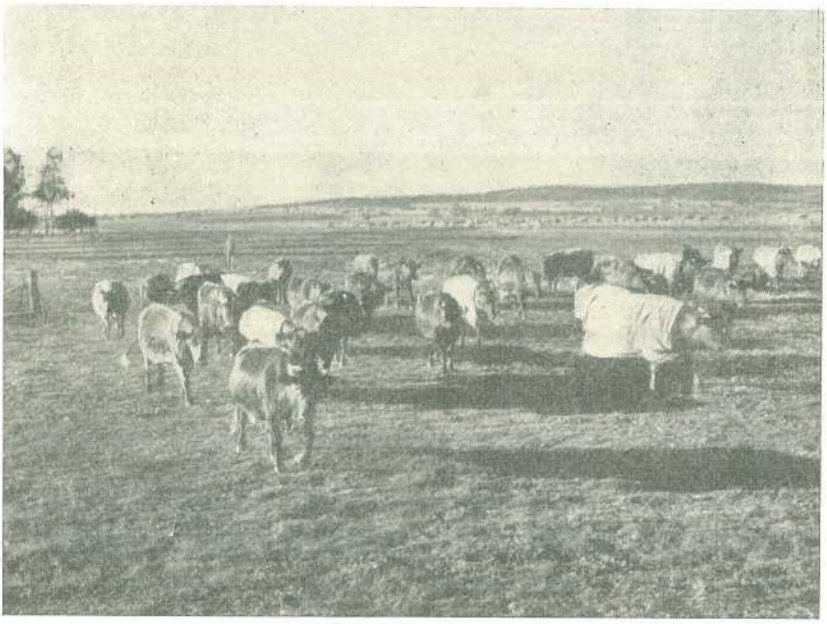

Plate 3.

Stud Masters Appreciate the Value of Rugging High Producers in Cold Weather.

The country is open forest, timbered with gums, stringy-bark, box and ironbark. Much of it has been cleared and cultivated for many years and has now become subject to erosion. Steps are being taken by the soil conservation service of the Department to counter this and an increasing number of farmers are becoming soil conservation conscious.

The open plains of the Downs proper consist of self-mulching black soils, devoid of timber and grassed principally by Queensland blue grass (*Dichanthium sericeum*) and pitted blue grass (*Bothriochloa decipiens*). The soils are fairly well supplied with organic matter and the major mineral plant foods, lime, phosphate and potash. Owing to their high clay content, these soils retain moisture very well and once crops are established growth is reasonably well assured if ample subsoil moisture has been stored.

Although good production can be obtained from the flat and treeless plains, they present difficulties to the dairyman, as cattle suffer from weather conditions in both summer and winter. In wet weather, the paddocks and yards become very boggy, causing great discomfort for the cattle and the dairyman. This condition can, of course, be overcome by having yards and lanes raised with gravel. Shade from the sun and shelter from cold winds can be provided by planting appropriate trees.

Fertilizers and other soil requirements are not greatly used, but a number of farmers are beginning to plant legumes in an effort to improve soil fertility.

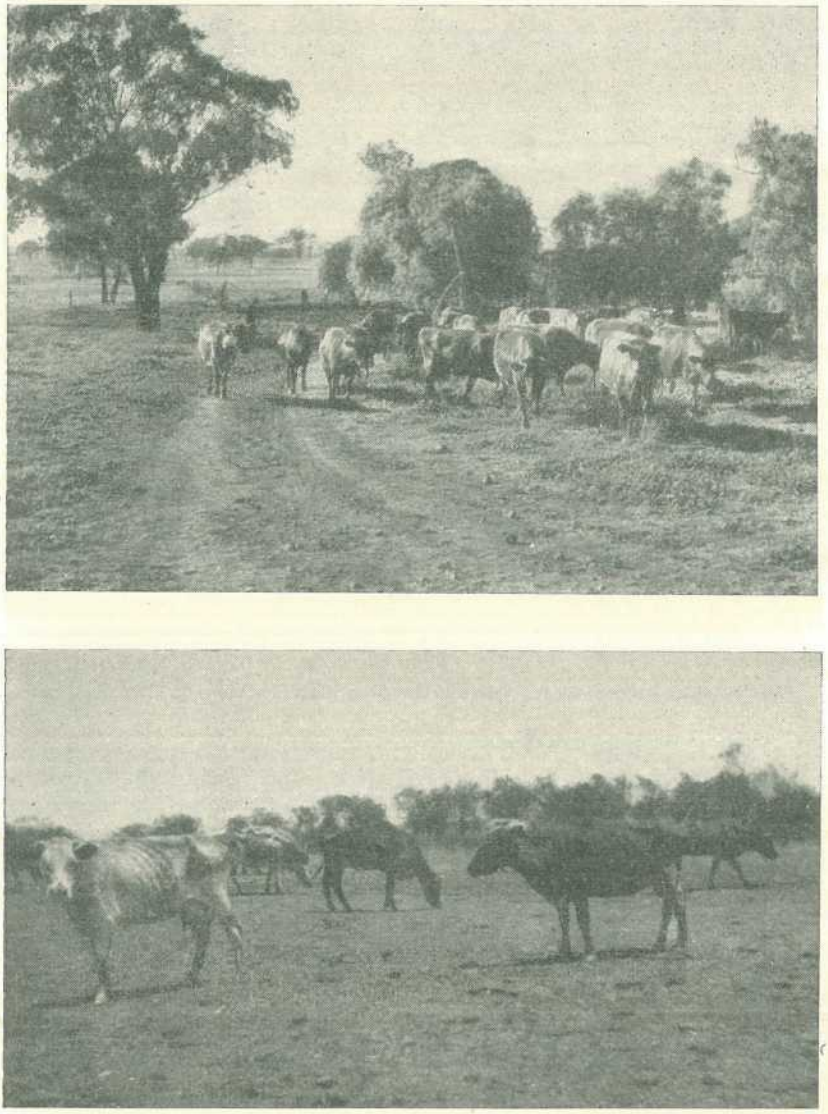

Plate 4.

Good Husbandry Pays on the Dairy Farm. Top, a herd provided with ample water, food, shade and shelter walks contentedly to the bails. Bottom, a starved herd stands about waiting for death.

WATER FACILITIES.

A few natural watercourses such as creeks exist, but the principal water supply of this area is obtained from sub-artesian bores. Good stock water can be obtained at depths ranging from 50 ft. to 400 ft. and most dairy farms have bores. These are usually equipped with windmills and troughs. Electrically driven pumps are replacing windmills on a few farms.

Although the sub-artesian water is usually suitable for stock, it is often unsuitable for irrigation and difficulties are sometimes experienced when it is used for cleaning dairy utensils because the water is hard. The latter condition can mostly be overcome by the use of approved softeners.

PASTURES.

Native pastures consisting of Queensland and pitted blue grasses predominate, but love grass, kangaroo grass, oat grass and native millets are also widely dispersed. These are mainly summer grasses. Under intensive grazing conditions they tend to become eaten out, being replaced by inferior varieties, but controlled grazing overcomes this.

Prairie grass, burr medic and various herbage plants grow prolifically in wet winters and springs but make little growth in dry winters.

Many varieties of grasses have been tried on the Downs in an endeavour to provide permanent pastures, but owing to the erratic rainfall and hot dry spells, complete success has not yet been achieved. Mixtures of Rhodes grass and lucerne, green panic and lucerne, and buffel grass and lucerne seem to offer the most promise. Urochloa grass makes a very good summer pasture but requires an early wet spring with good following rains to ensure growth. In some areas it is viewed with disfavour, as it can interfere with cultivation.

To ensure continuous grazing and profitable dairying, cultivation is necessary, and most dairying is carried on by grazing the herd on crops. The grass country is generally reserved for dry cows and heifers, which thrive quite well on it in normal seasons. In adverse seasons, progressive dairymen supplement the grass with crop or grain, thus "steaming up" the springers prior to calving.

The areas of natural pasture also provide a supplement of roughage to be grazed in conjunction with succulent crops, protecting milking cows from metabolic and digestive upsets.

CROPS FOR GRAZING.

Summer Crops.

Sudan grass and sweet sorghum are grown extensively, and provide a large bulk of nutritious grazing. Although these crops are low in protein when maturing, dairy cows produce reasonably well on them when grazed in the young and growing stage. By growing Poona pea in conjunction with the crop, the fodder value of these crops can be improved and the soil fertility will be raised.

Varieties of the millet family are also extensively grown and provide good dairy feed.

Lucerne is grown to some extent but the irregular seasonal conditions experienced preclude this from being a main crop for grazing dairy cows in this part of the State.

Maize is grown on the eastern fringe but has largely been superseded by sorghums in the western and drier portion of these shires.

Plate 5.

Well Reared Calves Have a Much Better Chance of Becoming Profitable Producers Than Neglected Youngsters.

Winter Crops.

Oats, wheat and barley are usually grown for winter feed and in favourable seasons some grain can usually be harvested in addition to grazing.

Legumes such as Golden vetch and Grey and Dun field peas are sometimes planted with cereal crops for winter grazing to increase the nutritive value and improve soil fertility. Where a crop is intended for grain after a preliminary grazing, vetches or peas should not be planted, as they may interfere seriously with harvesting.

Planting and growth are largely controlled by weather conditions, but in average seasons a continuity of grazing can be achieved by planting both summer and winter crops at judicious intervals. Sorghum planted in late summer gives a good stand of roughage for winter grazing in conjunction with oats or other cereals.

The grazing of crops, although necessary for profitable dairying, may cause severe illness or death unless properly controlled. Sorghum at a young stage of growth or in its second growth often contains dangerous levels of prussic acid. Lucerne will frequently cause bloat. Cereals may cause milk fever, grass tetany and other troubles due to mineral imbalance.

Controlled feeding will usually prevent the occurrence of these troubles. Hungry cattle should never be turned into a suspected crop. Efforts should be made to first fill them with hay, grass or other roughage. Cattle unaccustomed to sorghums should have access to the crop only when it is mature or semi-mature. A supply of photographic "hypo" should be kept on hand for drenching any cows which become affected.

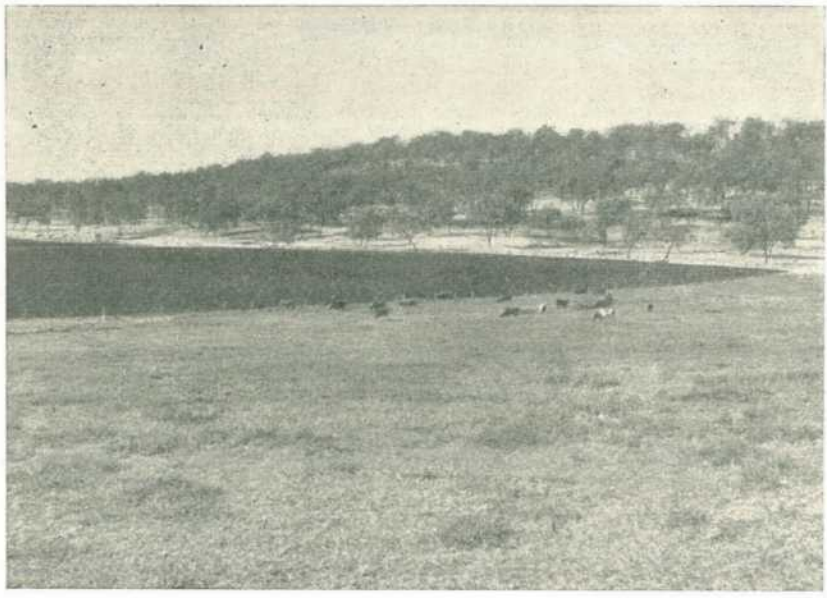

Plate 6.

A Dairy Herd Grazing on Oats. The adjoining paddock is fallowing for a summer fodder crop. The timbered ridge provides shade and shelter, as well as natural grasses which help to balance the diet.

Lucerne appears to be more dangerous when young and succulent. Here again, hungry cattle should be first fed on dry or semi-dry roughage. Strip grazing by the use of temporary fences is also desirable, as animals are thus compelled to eat a fair proportion of stalk to leaf. Suitable drenches, a trocar and cannula, and constant vigilance are necessary adjuncts to lucerne grazing.

Cereals in a lush stage of growth should always be grazed in conjunction with mature grass or other mature crop such as sorghum. Failing these, a ration of hay should be fed. This practice also prevents scouring.

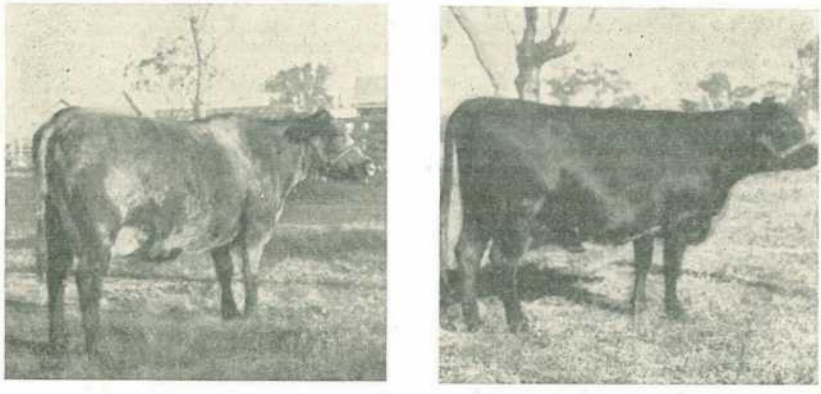

Plate 7.

Cows Steamed Up Prior to Calving Get Away to a Good Start.

NOXIOUS WEEDS.

The main noxious weeds in the area are Bathurst burr, Noogoora burr, lantana, thornapple, purple top, variegated thistle, khaki weed, Mexican poppy, galvanised burr, Scotch thistle, African boxthorn, capeweed, blueweed, saffron thistle and Paterson's curse.

Many of these can now be controlled by spraying, and except in a few cases, little loss of production is occasioned by noxious weeds.

FODDER CONSERVATION.

A prerequisite to full production in dairy cattle is that the cow should have access to all the good roughage she can eat during her lactation period. Dairying on the north-eastern Downs depends chiefly on the production of green crops for fodder, but there are times in every year when there is a scarcity of fodder because one crop is eaten out and the next is not yet ready to graze. In this area, therefore, the conservation of feed, particularly roughage, to be fed at these times of scarcity is essential if full production is to be maintained.

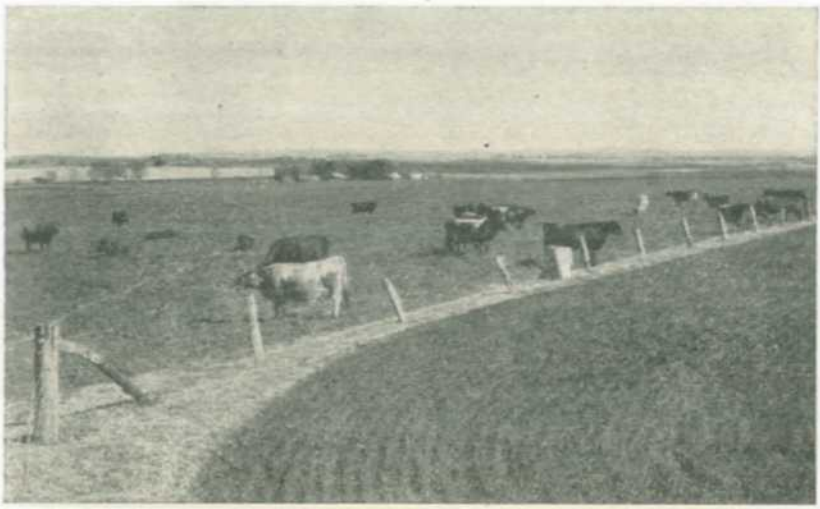

Plate 8.

Waiting for Water. Production is lowered when stock do not have free access to water.

Very few dairy farmers conserve fodder, taking the view that in the average season it is not required. For many years labour on dairy farms has been scarce, and normal farm operations absorb all available labour.

In seasons of average rainfall, farmers are fully occupied in cultivation and planting operations between milkings and they claim, with some justification, that time spent on fodder conservation could be better employed in planting other crops. This is probably true during seasons of plenty, but unfortunately the odd season occurs when crops do not grow. A reserve of fodder is then essential if production is to be maintained or stock kept alive. The purchase of fodder in drought years is always uneconomical. On the other hand, the loss of stock is not only uneconomical for the individual owner but has a disastrous effect on the food supply and economy of the country.

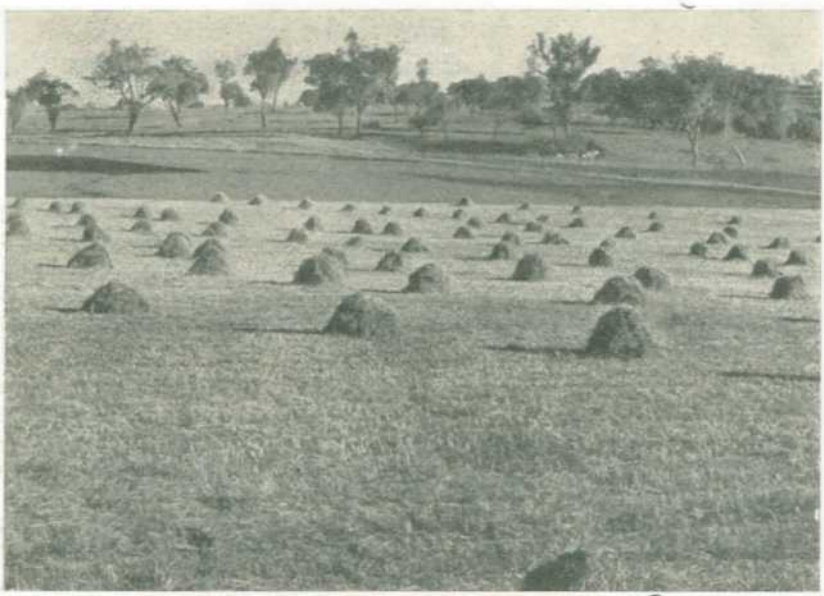

Plate 9.
The Fertile Downs Grows Good Hay.

Plate 10.
A Good Stand of Oats Provides Succulent Feed for Winter Grazing.

Fodder conservation is definitely essential, but in the past has provided many pitfalls. Losses of conserved fodder through inadequate protection from the elements and rodents has often nullified the efforts of the farmer. It is useless to spend money and labour storing surplus crops unless the feed can be conserved long enough to be of use in a dry period. Consequently, provision must be made for adequate storage. Hay can be stored with little loss of nutrients if effectively protected from the weather and rodents.

Hay.

In the area at present being dealt with, the principal hay crops are sorghums, cereals and lucerne.

Sorghum for hay is usually cut when the grain is forming, and as anything up to 30 tons of green feed per acre can be grown it provides a valuable crop. The usual method is to harvest with a reaper and binder, the sheaves then being stooked. Depending on weather conditions, the sheaves are cured in stooks for periods ranging from 6 weeks to 12 weeks before stacking is commenced, the stacks being built on raised platforms provided with mouse baffles. If properly stacked, sorghum hay has been known to keep in good condition for periods exceeding 14 years.

This hay, when it contains a fair proportion of grain, constitutes a good maintenance ration. A disability in curing sorghum for hay is caused by having the stooks in the paddock for long periods. This precludes the use of stubbles for grazing, or alternatively delays subsequent cultivation. This disability could, of course, be overcome by carting the sheaves off the paddock and stooking in an enclosed area near the stack yard, but double handling is thus incurred.

The costs of growing and conserving crops varies very widely on different farms and in different localities.

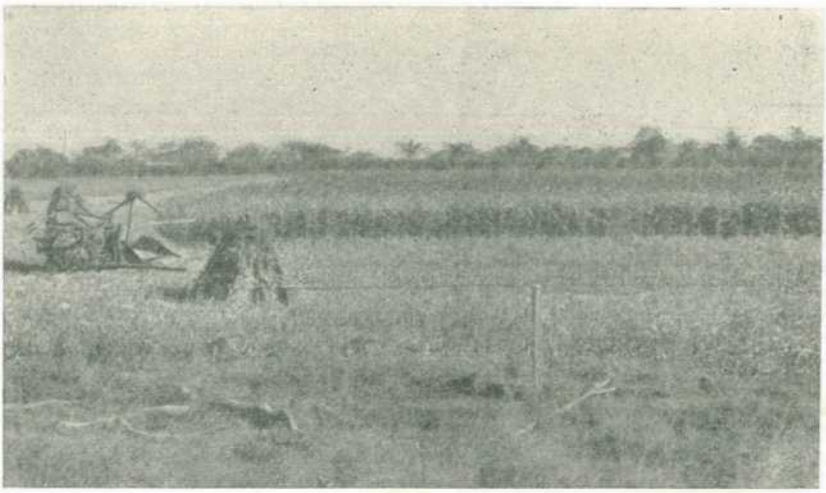

Plate 11.

Sweet Sorghum, Whether Used for Grazing, Hay or Silage, Provides a High Tonnage of Feed.

The following tables of costs taken from Downs farmers' accounts in 1950 give some indication of actual costs and will provide a guide to present and prospective dairymen.

In evaluating the cost of conserved fodder, where *surplus crop only is harvested*, the cost of *growing* need not be considered. If a farmer plants sufficient crop to feed his herd in a normal season, he has a surplus in a good season which if conserved, and fed in lean years, will stabilise production.

Sorghum Hay.

The following costs of growing, binding, carting and stacking sorghum hay are based on a conservative yield of six tons per acre. The plant required for haymaking consists of a maize binder or reaper-binder, a tractor and a motor truck. Three men are required to operate the plant, and they would cut, cart and stack the produce from two acres (12 tons) in one day. The capacity of the maize binder is half an acre per hour.

COST OF MAKING SORGHUM HAY.

GROWING COST PER ACRE.

	£	s.	d.
Wages	1	13	0
Stores	0	8	0
Repairs and Replacements	0	11	0
Tractor Fuels at 2s. per gallon	0	6	1
Petrol at 4s. 2d. per gallon	0	1	8
Oils and Grease	0	1	5
Sorghum seed at 7d. per lb. (18 lb. per acre)	0	10	6
General Expenses (Overhead)	0	1	8
Depreciation	0	13	7
Insurance, Pay Roll Tax, Shire Rates, Land Tax, Workers' Compensation	0	4	8
Interest on Capital Outlay and Improvements at 4 per cent.	0	5	9

COST OF BINDING, CARTING AND STACKING PER ACRE.

Wages and Keep	3	0	0
Tractor Fuel	0	10	0
Fuel and Running Expenses of Truck	1	6	0
Binder Twine	0	10	0
Depreciation on Plant	1	0	0
Total Cost of Making Sorghum Hay per Acre	11	3	4
Total Cost of Making Sorghum Hay per Ton	1	17	3

Cereal Hay.

Oats and wheat are the two main cereal crops used for hay. They are cut with a reaper and binder when coming into head and stooked. As they give lighter crops than sorghum, curing takes less time and stacking can be carried out much sooner. Where side-delivery rakes and pick-up balers are available, these crops can be baled. Here again, if grain is present, care must be taken to protect the stacks against rodents. Good wheat and oaten hay also provide a good maintenance ration for cattle.

In the absence of green feed, the feeding of hay only requires the addition of salt and some other laxative food to the ration to avoid digestive upsets. Where cereal or sorghum hay alone is used, access to a salt and ground limestone lick should be given.

COST OF MAKING OATEN HAY.

GROWING COST PER ACRE.

	£	s.	d.
Wages	1	13	0
Stores	0	8	0
Repairs and Replacements	0	11	0
Tractor Fuels at 2s. per gallon	0	6	1
Petrol at 4s. 2d. per gallon	0	1	8
Oils and Grease	0	1	5
Oats seed at 17s. per bushel (1¼ bushels per acre)	1	1	3
General Expenses (Overhead)	0	1	8
Depreciation	0	13	7
Insurance, Pay Roll Tax, Shire Rates, Land Tax, Workers' Compensation	0	4	8
Interest on Capital Outlay and Improvements at 4 per cent.	0	5	9

COST OF HARVESTING BY CONTRACT PER ACRE.

Mowing	0	5	0
Raking	0	2	0
Baling at 1s. 8d. per Bale (Estimate of 46 Bales)	3	16	8
Total Cost of Making Oaten Hay per Acre (30 cwt.)	9	11	9
Total Cost of Making Oaten Hay per Ton	6	7	10

Lucerne Hay.

Where lucerne can be profitably grown, it provides the best hay, as it contains all the required nutrients. It is actually higher in protein than a maintenance ration requires.

The advent of the pick-up baler and side-delivery rake has simplified haymaking, and both lucerne and cereal crops can be readily handled by these machines. Baled hay can also be stored more compactly than loose hay, thus reducing the possibility of damaging and economising on shed space. Such machines are usually too costly for individual farmers, but by co-operative effort much can be done. In some cases contractors undertake the operations of mowing, raking, baling and carting. Consequently, if a farmer grows a crop he can have it conserved at a very small cost. Lucerne hay has the added advantage that it carries no grain and is not so attractive to mice. Very little lucerne hay is made on the north-eastern Downs for feeding back to dairy cows: most of the hay which is made is sold as a cash crop.

Silage.

Very few farms are equipped with silos and the few tower and pit silos which do exist are seldom used. During every minor or major drought, farmers' thoughts turn to fodder conservation, but when it rains the urge disappears, and under the pressure of other work, fodder conservation is deferred indefinitely. On the other hand, while the fear of drought still exists fodder is frequently hurriedly conserved without adequate protection.

For some years, many dairymen made sorghum silage in trenches. This proved to be quite economical and satisfactory, but the practice fell into decline through lack of labour during the war years and subsequent good seasons gave farmers a sense of false security.

At the present time very little silage is made, but sorghum is the most suitable crop for this purpose. If legume crops such as lucerne and Poona peas are ensiled with sorghum, a good balanced ration can be made. Silage fed when other feeds are dry and fibrous helps to prevent impaction.

Sweet Sorghum Silage.

The following costs of growing and ensiling sweet sorghum are based on a normal yield of 12 tons of green material per acre. The plant required for binding, carting and ensiling comprises a maize binder or reaper-binder, a tractor and a motor truck, with three men to operate the plant, cutting, carting and ensiling 24 tons of green material per day. Twelve tons of ensilage occupies a space of 720 cubic feet; taking the cost of excavating the trench silo by contract as 2s. 6d. per cubic yard, the excavation required for 12 tons would cost £3 6s. 8d.

COST OF MAKING SWEET SORGHUM ENSILAGE.

GROWING COST PER ACRE.

	£	s.	d.
Wages	1	13	0
Stores	0	8	0
Repairs and Replacements	0	11	0
Tractor Fuels at 2s. per gallon	0	6	1
Petrol at 4s. 2d. per gallon	0	1	8
Oils and Grease	0	1	5
Sorghum seed at 7d. per lb. (18 lb. per acre)	0	10	6
General Expenses (Overhead)	0	1	8
Depreciation	0	13	7
Insurance, Pay Roll Tax, Shire Rates, Land Tax, Workers' Compensation	0	4	8
Interest on Capital Outlay and Improvements at 4 per cent.	0	5	9

COST OF BINDING, CARTING AND ENSILING PER ACRE.

Wages and Keep	3	0	0
Tractor Fuel	0	10	0
Fuel and Running Expenses of Truck	1	6	0
Binder Twine	0	10	0
Depreciation on Plant	1	0	0
Cost of Excavating Trench Silo (Contract)	3	6	8
Total Cost of Making Sweet Sorghum Ensilage Per Acre	14	10	0
Total Cost of Making Sweet Sorghum Ensilage Per Ton	1	4	2*

* Plus cost of covering with soil.

Grain.

Sorghum and winter cereal grains grow well in most of the area, and maize can be grown in the better rainfall portion near the range.

A few farms are equipped with tanks for grain storage; by this means grain can be kept in good condition for many years. The majority of dairymen, however, use grain as a cash crop and dispose of it immediately after harvesting. Grain is such a concentrated form of food that it is well suited to conservation as a drought relief fodder. Six months' maintenance ration could well be conserved on each farm, and if not required, sold when a new crop is assured. Any loss of weight thus incurred would be cheap insurance.

The few farmers who make provision for using grain as a supplement ration during normal dry spells find that it pays by keeping their stock in condition and maintaining production, thus enabling them to continue production when other feed becomes available.

COST OF OATS FOR GRAIN.

GROWING COST PER ACRE.

	£	s.	d.
Wages	1	13	0
Stores	0	8	0
Repairs and Replacements	0	11	0
Tractor Fuels at 2s. per gallon	0	6	1
Petrol at 4s. 2d. per gallon	0	1	8
Oils and Grease	0	1	5
Oats seed at 17s. per bushel (1¼ bushels)	1	1	3
General Expenses (Overhead)	0	1	8
Depreciation	0	13	7
Insurance, Pay Roll Tax, Shire Rates, Land Tax, Workers' Compensation	0	4	8
Interest on Capital Outlay and Improvements at 4 per cent.	0	5	9

COST OF HARVESTING PER ACRE.

Labour	0	3	8
Bags (10 at 6s. 8d. each)	3	6	8
Twine	0	0	6
Machinery, Fuel, &c.	0	5	0
Total Cost of Growing and Harvesting Oats Per Acre	9	3	11
Total Cost of Growing and Harvesting Oats Per Bushel (at 30 bush. Per Acre)	0	6	2

TYPE OF DAIRYING.

For many years cheese production predominated in this area, but a gradual swing to cream and processed milk has taken place, although a considerable amount of milk is still used for cheesemaking.

Cheese factories operate at Toowoomba, Ramsay, Barnsmore (Sugarloaf), Greenmount, Felton East, Rockview, Pittsworth, Linthorpe, Mount Tyson and Irongate.

Butter factories are established at Toowoomba and Clifton, and two pasteurised milk factories at Toowoomba supply a considerable amount of milk to the Brisbane milk and ice-cream trade.

Pig raising is mainly carried out as a sideline on dairies supplying cream to butter factories or milk to cheese factories, thus utilising separated milk and whey.

Cash crops of grain sorghum, wheat, oats, barley, canary seed and linseed are also grown extensively on many dairy farms, and owing to the ease of cashing grain crops, a tendency has developed among some farmers to utilise the dairy herd as scavengers rather than the means through which the crop is sold. A more equitable balance between the value of milk per acre and grain per acre is gradually remedying this.

On the larger farms a considerable number of heifers are raised, the surplus above herd replacements being sold to dairymen who have insufficient country to rear any young stock. The greatest number of calves are, however, sold as bobbies, for which there is a steady demand by meatworks operators.

Culled cows are sold as either tinners or fats, and no difficulty is experienced in getting good values for these.

PRODUCTION.

Farm production averages for 1950-51 are as follows:—

Local Authority.	Average Number of Cows in Production.	Average Yearly Milk Production.	
		Per Farm.	Per Cow.
		Galls.	Galls.
Clifton	18	7,200	400
Pittsworth	26	11,856	456
Cambooya–Toowoomba . ..	26	11,310	435
Queensland	..	..	284

The seasonal production varies rather widely, but in average seasons the Toowoomba, Cambooya, and Clifton areas often show up to 28% increase in the summer months, while Pittsworth district increases by approximately 17%.

SIZE OF FARMS.

The size of dairy farms also varies widely. A few in the environs of Toowoomba range from 60 acres to 100 acres, and some in the outlying areas of the shires are up to 700 acres. The greater number, however, would be in the 150-350 acres range. The following is a summary of information on herd size.

—	Cambooya–Toowoomba.	Pittsworth.	Clifton.
Number of Farms	399	349	321
Number of Dairy Cattle	16,114	13,482	9,482
Average Number of Cattle per Farm	40	40	40

BREEDS.

Australian Illawarra Shorthorn cattle predominate on the larger farms, especially in the milk-producing area, but Jerseys are also quite popular. Ayrshires and Guernseys are not so numerous as the two breeds mentioned, but Ayrshire and A.I.S. crosses are fairly popular.

HUSBANDRY METHODS.

As in every district, considerable variation in husbandry methods is noticeable, and here again, the high prices received for grain, and shortage of labour, have led to a decline in the popularity of dairying, with a consequent lowering of the standard of husbandry methods.

In many cases the easy way had, of necessity, to be taken, and ultimately has led to slipshod methods. However, there are still a large number of dairymen who regard dairying as their main source of livelihood and these men have maintained a high standard of efficiency.

As most dairymen depend on both summer and winter crops for grazing, and have the bull running free with the herd all the time, calvings take place throughout the year. Some dairymen control services and aim to have cows freshen at suitable periods when good feed can be expected. Approximately 65% of cows calve in the spring and summer months.

As most grazing is on crops, the herd nutrition is on a fairly high plane in normal seasons. There is, however, often a lag between crops, and then natural pasture and hay are very useful. A small percentage of dairymen also use grain supplements during such periods. This is quite economical in the case of fresh cows. Too few farmers consider the dairy herd as a unit through which the products of a mixed farming business should be marketed. Crops, both grain and hay, are frequently grown primarily for sale as cash crops and only incidentally as cow fodder. This method of land utilisation is unsound in principle. Much greater interest must be given to the animal side of the farm production in this area if soil fertility is to be maintained. A greater amount of fodder conservation is essential and a much greater proportion of farm produce should be marketed through the dairy cow.

HERD RECORDING.

Two Departmental schemes are in operation, one for purebred dairy cattle and one for grade herds.

Stud breeders realise that if they are to provide bulls for use in commercial herds which will transmit greater production qualities to their offspring, it is necessary to have factual knowledge of the production of the bulls' female ancestors as well as progeny tests of the male ancestors.

This can only be achieved by regular testing of all cows throughout their lactation periods.

More and more dairy farmers are becoming conscious of the need to use bulls from studs with high production averages and endeavour to purchase bulls from proven studs when they propose to rear heifers for herd replacements. Where all calves are sold as bobbies, beef bulls are often used with the object of securing more weight.

The grade herd testing scheme provides valuable records for the commercial dairyman. A growing interest in herd recording is being evidenced, and grading-up from the higher producing cows mated to purebred bulls from good herds is an increasing practice. The value of herd recording data in demonstrating faults in feeding methods and farm management has not yet been realised by most farmers, but it is probable that the wider acceptance of herd recording will have a most beneficial effect on husbandry methods adopted, quite apart from that achieved by the culling of low producers, which is the chief use to which data are put at the present time.

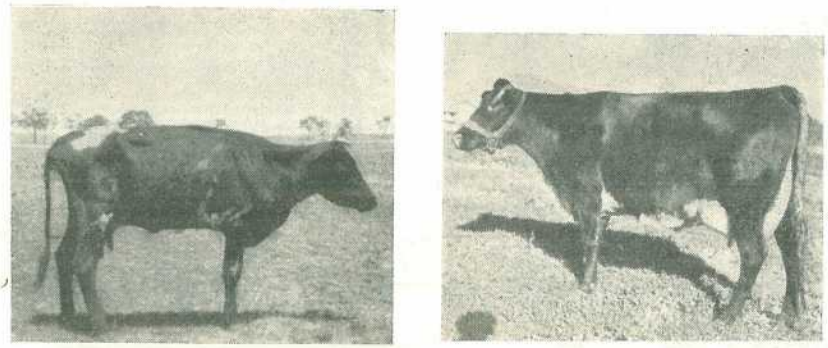

Plate 12.

Which Cow Can be Expected to Prove the More Profitable?

Herd recording units are established at Toowoomba and Pittsworth and owners desirous of having their herds tested for production can do so for a small fee. Many dairy farmers have availed themselves of this service with profit.

In the group herd recording division, the average production for cows of all ages in all Queensland for 1950-51 was 3,312 lb. of milk and 146 lb. of butterfat, the number of herds being 814. For the Eastern Downs, the average production for cows of all ages in 1950-51 was 3,939 lb. of milk and 167 lb. of butterfat, 169 herds having been tested.

Calf-raising methods are crude on most farms and malnutrition and deaths due to digestive disorders caused by haphazard feeding and internal parasites are common.

Where good facilities exist for calf rearing and care is taken to see that the calf is started on colostrum followed by wholemilk and gradually brought onto separated milk or calf meal, fed at reasonable intervals and right temperatures, little trouble is experienced. Any system of calf raising which fails to produce a heifer of approximately normal growth and weight at calving time should be considered inadvisable and poor economy.

STUD BREEDING ACTIVITIES.

The principal dairy breeds are well catered for by stud breeders, who compete keenly in their endeavour to raise the standard of production of the individual breeds to a high level. Many of the highest producing cows have been bred on the Downs and stud masters aim to supply sires which will maintain even if not improve production in commercial herds.

In the local authority areas under consideration, there are 42 registered A.I.S. breeders, representing 9% of the A.I.S. breeders of Queensland; eight registered Jersey breeders, representing 1% of the Jersey breeders; and six registered Ayrshire breeders, representing 13% of the Ayrshire breeders.

Some interest is again being shown by a few dairymen in breeds such as Guernsey and Friesian, but these represent a very minor proportion of the dairy breeds.

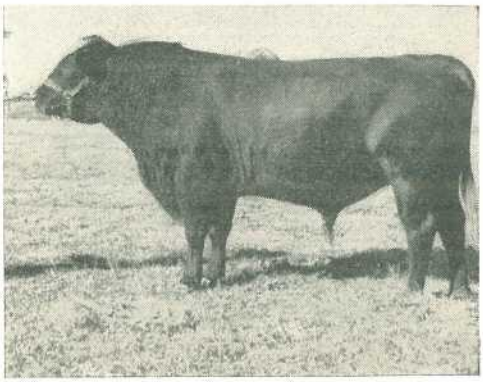

Plate 13.

Darling Downs Studs Contain Much Excellent Breeding Stock.

TRENDS.

Many farmers and graziers in this area commenced as dairymen, finding that that practice enabled them to take the fullest advantage of family labour, but they diverted their activities to other types of farming as these became more attractive or as the labour position for dairying became more acute. Consequently, many of the original dairy farms in the area now produce stock, grain and fodder crops only. Many farmers will not tie themselves to dairying when they can make a comfortable living by growing grain, but where sufficient labour is available, dairying is still profitably carried out.

Many dairy farms are worked on a share basis, the share farmer providing the labour and a portion of the working costs, the owner providing the property, stock and plant.

HAVE YOUR SEEDS TESTED FREE

The Department of Agriculture and Stock examines FREE OF CHARGE samples representing seed purchased by farmers for their own sowing.

The sample submitted should be representative of the bulk and a covering letter should be sent advising despatch of the sample.

MARK YOUR SAMPLE

Sample of ..... seed
Drawn from ..... bags
Representing a total of .....
Purchased from .....
Name and Address of Sender
Date.....

SIZE OF SAMPLE

Barley	8 oz.	Oats	8 oz.
Beans	8 oz.	Peas	8 oz.
Grasses	2 oz.	Sorghum	4 oz.
Lucerne	4 oz.	Sudan	4 oz.
Millets	4 oz.	Wheat	8 oz.

Vegetable Seeds - ½ oz.

SEND YOUR SAMPLE TO—**STANDARDS OFFICER, DEPARTMENT OF AGRICULTURE AND STOCK, BRISBANE.**

Bacteriological Testing of Market Milk in Queensland.

W. F. SCHUBERT and L. E. NICHOLS, Division of Dairying.

DURING the past 10 years, the pasteurisation of milk in Queensland has increased at a rapid rate, with the result that today the majority of the larger towns and centres have modern pasteurising plants. The growth of pasteurisation has stimulated the bacteriological tesing of both the raw and the processed products. In this article, raw and pasteurised milk tests, as conducted at Brisbane, are reviewed at length and the results for the past six years are discussed.

The market milk industry, though not the largest segment of the dairying industry in Queensland, is nevertheless very highly developed. Brisbane, the capital city, has no fewer than four large pasteurising plants catering for a population of approximately half a million. In addition, the major cities and centres in the eastern districts possess modern pasteurising plants. Proceeding from south to north, those near the coast are located at Merrimac, Southport, Nambour, Maryborough, Bundaberg, Rockhampton, Mackay, Innisfail, and Cairns. Pasteurisation centres further from the coast are Toowoomba, Ipswich, Warwick, Murgon and Malanda.

The operational pattern is more or less the same in each case. The milk is produced in the territory immediately surrounding the town in which it is consumed, the area of the "milkshed" depending upon the size of the town, the *per capita* consumption of milk within the particular town and the intensity of milk production in the adjacent farming area. In some instances, the maintenance of continuous milk supplies throughout the year constitutes a serious problem and the milksheds have to be periodically extended to counteract such influences as floods, droughts and the decline in milk production during the winter months. This lack of equilibrium in the milk supply position adds considerably to the problems of quality control.

ORGANISATION OF THE BRISBANE MILK SUPPLY.

The Brisbane Milk Board.

Milk and cream supplied for consumption or use within the Brisbane Milk District are under the control of the Brisbane Milk Board, which was reconstituted under *The Milk Supply Act of* 1952. The Board consists of a chairman appointed by the Governor-in-Council to be the representative of the Government and Executive Officer of the Board, and five other members, two of whom represent the producers, one the wholesale vendors, one the retail vendors, and one the consumers. The new Board operates from July 1, 1953.

The Brisbane Milk District.

The Brisbane Milk District occupies an area of 375 square miles and has a population of approximately half a million. The whole of the city's milk requirements is controlled by the Milk Board. Beyond the Brisbane Milk District the milk supply is controlled by the association or company purchasing the milk for pasteurisation.

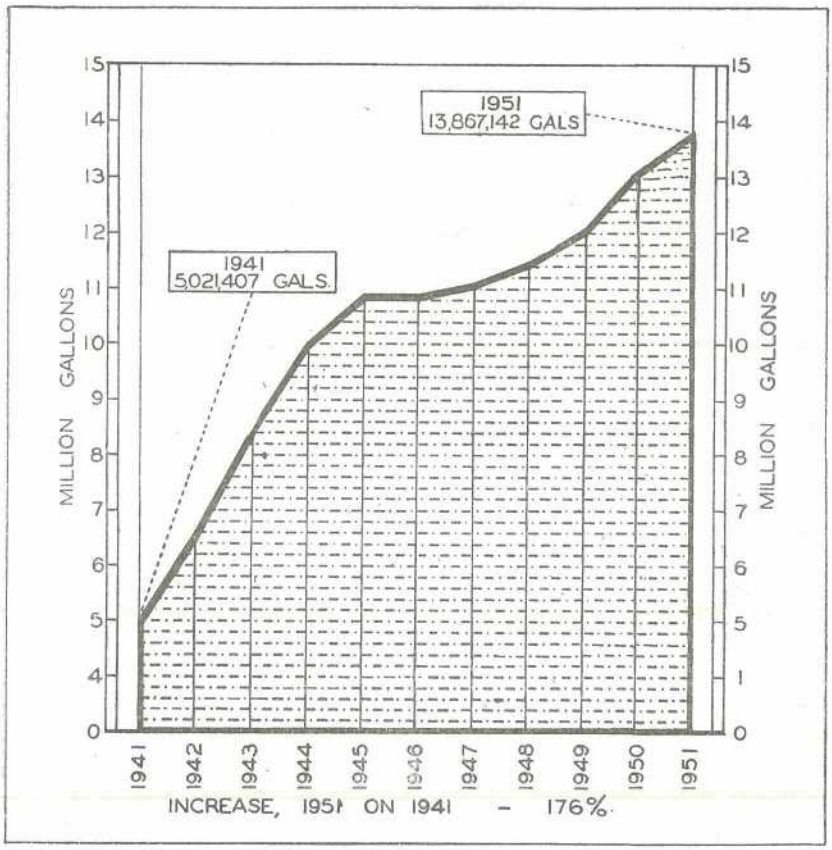

Plate 1.

Graph Showing the Growth in the Supply of Board-Controlled Milk to Brisbane.

Sources of Supply.

The supply pattern for Brisbane is more or less typical of the whole of the State. Plate 2 shows areas from which milk is supplied to Brisbane. Milk may flow to the processing plant through two channels:—

(1) Suppliers may forward milk direct to the city pasteurising plant.

(2) Milk may be collected at a country receiving depot, where after chilling it is loaded into cans or tankers for transport to the city pasteurising plant.

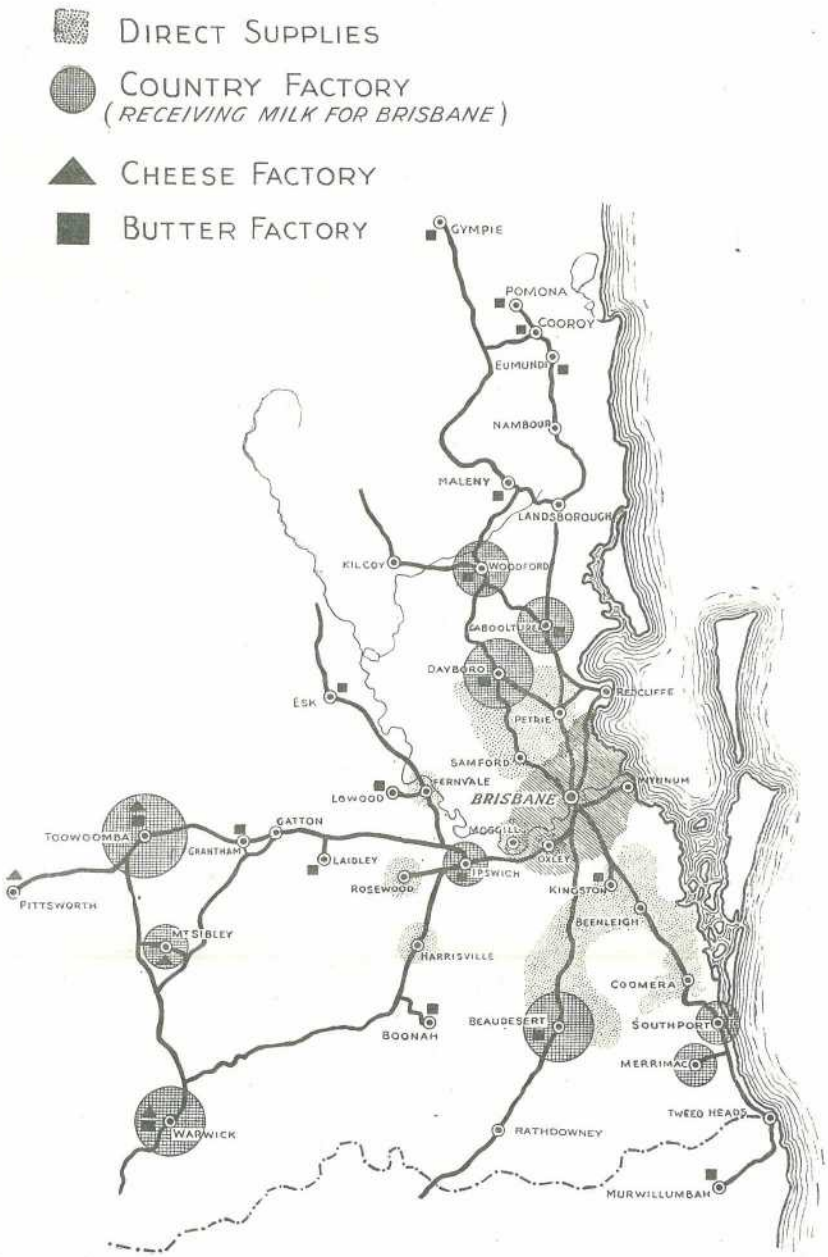

Plate 2.

Map Showing Areas of Supply for the Brisbane Milk Market.

Registration of Suppliers.

Producers supplying milk to pasteurising plants within the Brisbane Milk District are required to register with the Brisbane Milk Board. Such registration has to be renewed annually. A Field Officer of the Board or a Dairy Officer of the Department of Agriculture and Stock investigates each supplier seeking registration. Registration is approved provided the following minimum requirements are satisfied:—

(1) The dairy premises must be in a reasonable state of repair and drained in accordance with *The Dairy Produce Acts,* 1920 *to* 1952.

(2) The dairy must be provided with an adequate water supply.

(3) An adequate supply of boiling water for cleaning and sterilizing equipment must be provided in accordance with *The Dairy Produce Acts,* 1920 *to* 1952.

(4) A regulation wash-up trough and draining rack must be provided.

(5) The dairy utensils, premises and surroundings must be maintained in a clean and sanitary condition.

The fundamental requirements outlined above are considered to be minimum for every milk farm in the State. In centres outside the Brisbane Milk District, Dairy Officers of the Department of Agriculture and Stock constitute the approval authority.

Transport of Milk.

Farmers' milks are picked up by carriers and transported to pasteurising plants in the metropolitan area or to country chilling depots. The routes are gazetted and the cost of transport is borne by the producers. Bulk chilled milk from country receiving depots is mainly transported by tankers.

In a few cases, the milk is heat-treated before being loaded into tankers for transport to the metropolitan area. Such milk is described as processed. The Milk Sellers Regulations define pasteurised milk as milk heated to prescribed temperatures and then bottled.

FIELD STAFF AND LABORATORY SET-UP.

Within the Brisbane Milk District, Milk Board Field Officers and officers of the Department of Agriculture and Stock work in close collaboration. Both groups of officers provide the liaison between the laboratory work performed by the Dairy Research Laboratory, within the Department of Agriculture and Stock, and the field work.

A similar organisation exists at Toowoomba, on the Darling Downs, which supplies a considerable volume of milk to Brisbane.

In other centres of Queensland, quality control work is carried out exclusively by officers of the Department of Agriculture and Stock.

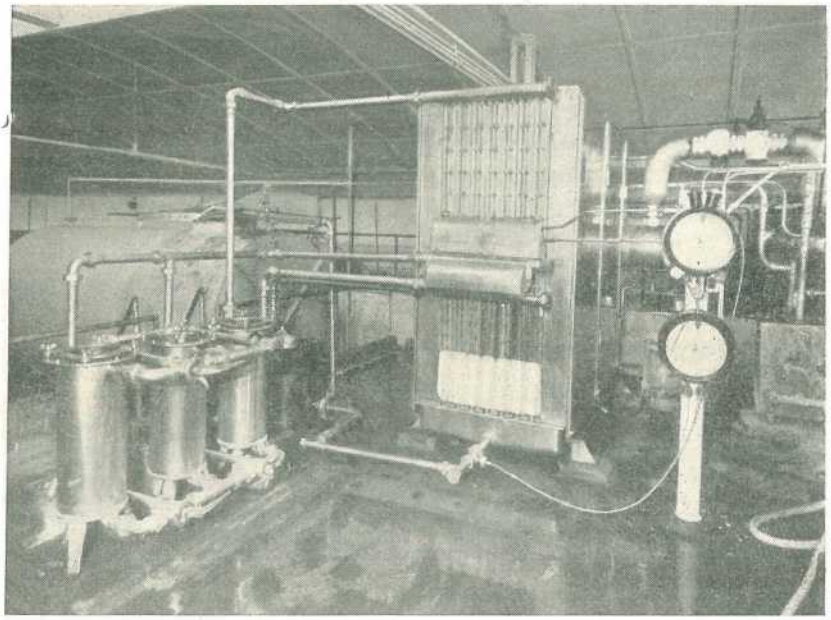

Plate 3.
A Pasteuriser in a Brisbane Milk Processing Factory.

SYSTEMS OF PASTEURISATION APPROVED IN QUEENSLAND.

In Queensland, the Health Department approves the systems of pasteurisation to be used in the market milk industry. Both the high temperature-short time and the holder systems are approved. The H.T.S.T. types of equipment predominate. The systems of pasteurisation approved are embodied in Clause 2 of Section 29 of the *Food and Drug Regulations,* 1939. The clause reads as follows:—

"2. Pasteurised milk is milk which:—

(1) has been treated by one of the following methods:—

(*a*) By heating all of the milk to a temperature of not less than 142 degrees and not more than 148 degrees Fahrenheit and holding it at such temperature for not less than thirty minutes and immediately afterwards reducing it to a temperature below 40 degrees Fahrenheit.

(*b*) By heating all of the milk to a temperature of not less than 162 degrees Fahrenheit, and retaining it at such temperature for at least fifteen seconds and immediately afterwards reducing it to a temperature below 40 degrees Fahrenheit; such milk having been treated by means of apparatus approved by the Director-General, thermostatically controlled and provided with indicating and recording thermometers and with a device which automatically diverts the flow of any milk which has not been retained at a temperature of not less than 162 degrees Fahrenheit for at least fifteen seconds."

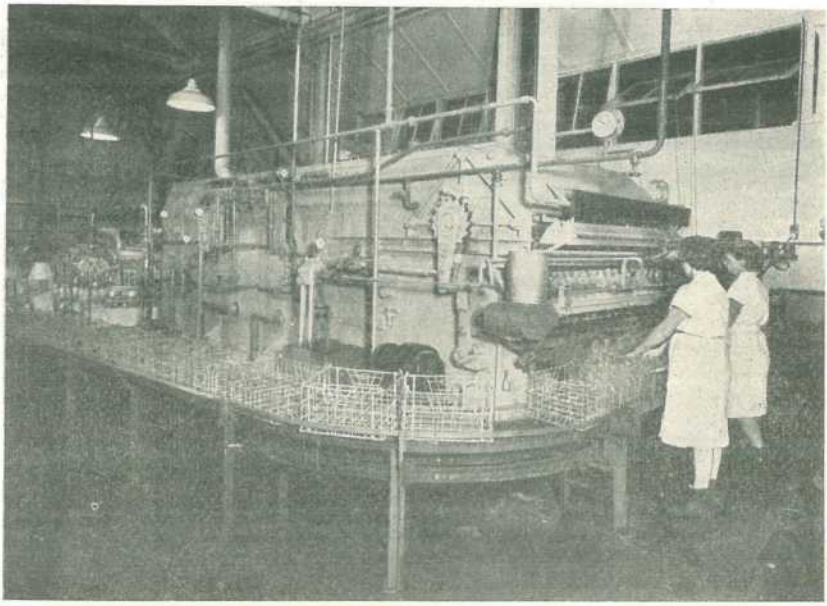

Plate 4.
A Bottle-Washing Machine Capable of Cleaning and Sterilizing 12,000 Bottles Per Hour.

QUALITY TESTS FOR RAW MILK.

Organoleptic Grading.

On arrival at the depot, the raw milk is graded by a factory operative. Experienced graders can detect with a high degree of accuracy characteristic odours in milk associated with—(*a*) mastitis, (*b*) improper cooling, (*c*) dirty utensils, and (*d*) feedy and weed taints. By this means milk of unsatisfactory quality can be rejected before it is mixed with the general supply.

Modified Methylene Blue Test.

The main test used for gauging the bacteriological quality of raw milk in Queensland is the Modified Methylene Blue Test. In the city plants and country chilling depots, each supplier's milk is subjected to this test twice a week. A few plants have elected to perform the test daily on all suppliers' milks.

Sampling.—The sampling is carried out by either of the following methods:—

(1) A weighing-vat sample is taken, using a small dipper (preferably a 10 ml. stainless steel dipper) to dip the sample from the vat.

(2) A can sample is taken (using a 10 ml. dipper) after the contents of the cans have been thoroughly mixed.

Legal Standards.—Queensland Food and Drug Regulations which relate to milk sold for human consumption prescribe that milk shall not decolourise methylene blue within three hours if the sample is taken at any time from 1st October to 31st March, or within four hours if the sample is taken at any time from 1st April to 30th September.

In connection with the milk quality advisory services operated by the Division of Dairying in Queensland, the following tentative standards are used as being ideals of achievement:—

Good Milk—Tests more than 5½ hours.

Fair Milk—Tests between 5½ and 4 hours.

Unsatisfactory Milk—Tests less than 4 hours.

These objectives are laid down with a view to stimulating interest in further quality improvement and to maintain the highest quality milk for human consumption.

Low Quality Milk.—Milks failing the three-hour summer standard or the four-hour winter standard are smeared in the factory on specially prepared alphabetically lettered slides. The slides are then forwarded with the results to the Dairy Research Laboratory. Country depots forward slides and results to the laboratory by mail.

Plate 5.

Vacuum Filling Machines Capable of Filling 6,000 Bottles Per Hour.

At the end of each week, each factory or depot forwards details of all methylene blue tests performed to the central laboratory for record purposes and for examination as to quality trends each month.

Microscopic Examination of Slides.—On receipt at the laboratory, the milk smears are stained and examined microscopically to determine the cause of low quality. The following scheme of interpretation is used, based on the types of bacteria and the number of body cells present.

Symbol.	*Interpretation.*
(A)	Unclean utensils.
(B)	Contamination from the environment (barns, dust, &c.).
(C)	Improper cooling; mixed p.m. and a.m. milk; milk residues.
(D)	Mastitis infection.
D (?)	Suspected mastitis; milk used too soon after calving; late lactation milk; injuries to udder.

Recording of Results.—The results are entered upon the supplier's personal card and a report (see Form 1) forwarded indicating the results and offering suggestions for improvements. In addition, the results are handed to a Milk Board officer or a Dairy Officer for follow-up work. Any supplier who consistently forwards milk of low quality may have his quota suspended.

THE BRISBANE MILK BOARD.

REPORT ON MILK SAMPLE.

FROM DAIRY RESEARCH LABORATORY, DEPARTMENT OF AGRICULTURE AND STOCK, BRISBANE.

Sample No...... **Date Taken:**.....

1. Temperature on arrival.....**°F.**

2. Methylene Blue Test.....**Hours.**

Standards.

Good Milk	**Tests more than 5½ hours.**
Fair Milk	**Tests between 5½ hours and 4 hours.**
Unsatisfactory Milk	**Tests less than 4 hours.**

3. Butter Fat.....

Standard not less than 3.3%.

4. Microscopical Examination—

Please Note: Your main trouble, as indicated by this examination, seems to be

- ☐ A. Utensils not properly cleansed and sterilised.
- ☐ B. Dirty cows—dirt on udder or flanks; or Dust from manure, soil or feed in yards or bails.
- ☐ C. Inclusion of aged or stale milk.
- ☐ D. Udder infection, e.g., mastitis (or mammitis).

REMARKS:

Please note advice on back.

.....
Bacteriologist.

Date:.....

Form 1.

Accessory Grading Tests.

Milks which are unacceptable because of contamination with dirt, manure, &c., or because they contain other impurities, automatically reject themselves. There is obviously no need to subject such milks to the modified methylene blue test. In the final analysis, it has to be admitted that no scientific test at present known can replace palate grading acquired by long experience.

Sediment tests are periodically performed by Field Officers on suppliers' milks. The presence of hair, dust, and body cells in milk can seriously interfere with the efficiency of pasteurisation.

The sediment test is very useful in educating farmers to use cotton-wool filter discs to strain milk at the milking shed, as the visual evidence of failure to do this is readily appreciated by producers.

Pasteurisability Test.

This consists of making a bacterial count of the supplier's milk after subjecting a small sample of the milk to conditions of time and temperature similar to pasteurisation in the factory. The main purpose of this test is to detect the presence of bacteria which are either resistant to heat or can live and multiply at high temperatures. These may be present in such numbers as to prevent the pasteurised product from conforming to the official standards laid down.

The problem of thermobacteria in raw milk is one which should receive more consideration. As far as is known, these bacteria have little effect on the keeping quality of raw milk, but the fact remains that such thermobacteria are usually associated with milkstone on equipment and cause plate counts of pasteurised milk to exceed the legal standard.

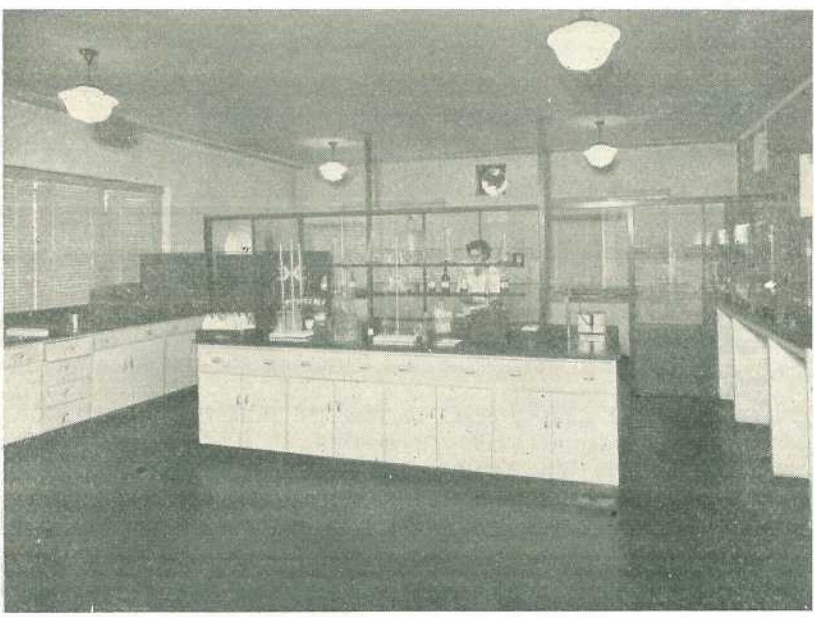

Plate 6.

The Control Laboratory in a Brisbane Milk Processing Factory.

QUALITY TESTS FOR PASTEURISED MILK.

As the quality of pasteurised milk is largely dependent on its bacterial content, the tests used in the laboratory are largely of a bacteriological nature. The following tests form the basis of laboratory control in Queensland:—

(1) The plate count, which gives an estimation of the bacterial content.

(2) Coliform test to detect bacteria which are presumptive evidence of contamination following pasteurisation.

(3) A phosphatase test to ascertain if all of the milk has been efficiently pasteurised.

(4) A methylene blue test for keeping quality and indication of bacterial content.

Official Regulations.

The Food and Drug Regulations lay down the following standards for pasteurised milk:—

(1) Plate count must be less than 50,000 per ml.

(2) No *Escherichia coli* must be found in 0·1 ml.

(3) Phosphatase test must be less than 2·3 Lovibond units.

The Dairy Produce Acts, 1920 *to* 1952, state that pasteurised milk should have a bacterial count of less than 50,000 organisms per ml.

Dairy Research Laboratory Standards.

Under the advisory service conducted by the Division of Dairying, the following tentative standards have been adopted:—

(1) Plate count—less than 50,000 colonies per ml.

(2) Presumptive coliform test—negative in 1 ml.

(3) Presumptive coliform incubation test—negative in 1 ml. after holding a 10 ml. sample for 5 hours at 98°F.

(4) Phosphatase test—less than 2·3 Lovibond units (that is, units of the blue colour developed during the test).

(5) Keeping quality test—pasteurised milk is considered to be of satisfactory keeping quality if it passes a half-hour methylene blue test after 24 hours' incubation at 68°F.

Sampling.

One, two or three bottles of pasteurised milk are picked up daily from the fillers of the pasteurising plants in the city area proper. Plants adjacent to the city area forward two bottles weekly to the laboratory by rail. Plants further afield forward two bottles weekly by air.

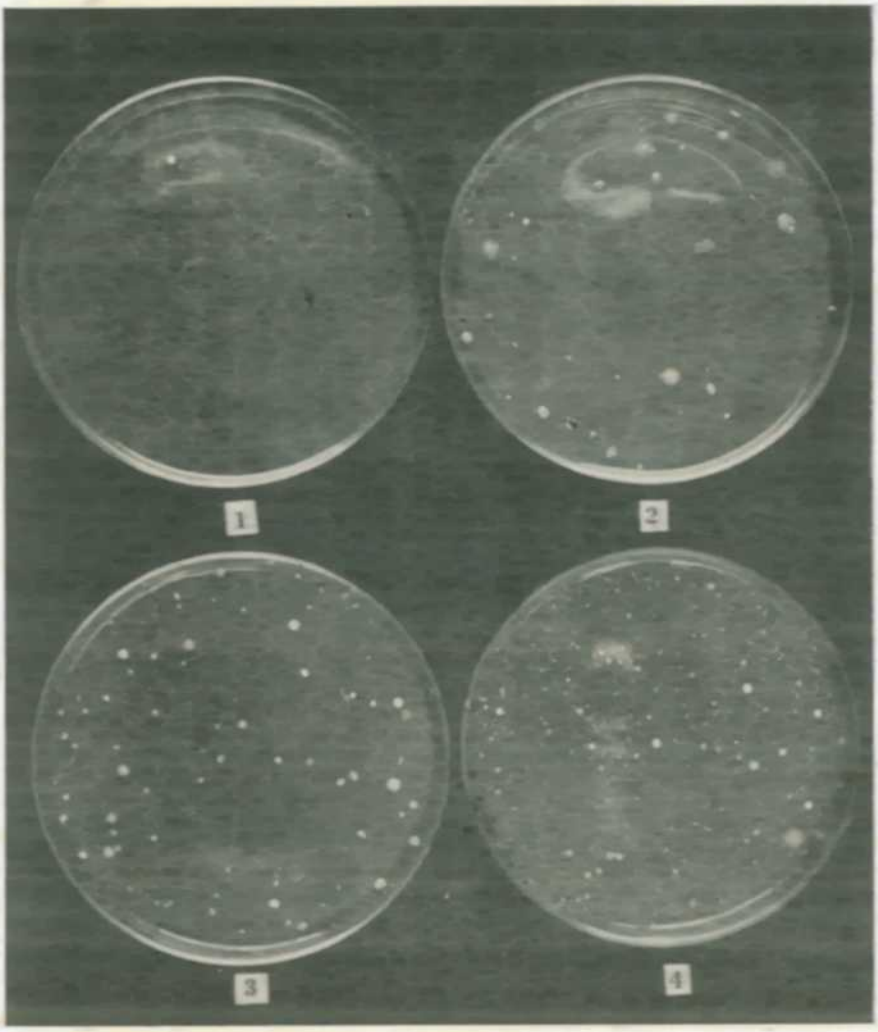

Plate 7.

Plates showing Various Degrees of Bacterial Content of Milk. Each colony has developed from a single bacterium.

Significance of the Tests Performed.

The Plate Count.—This test is performed by adding a small quantity of milk to a specified medium or bacterial food, which is then incubated in a petri dish or plate (Plate 7). Colonies develop from each bacterium present, and a visual determination of the number of bacteria in the milk is thus made simply by counting the colonies. By the shape, colour and specific reaction in different media, it is possible by this test to determine the types of bacteria present. In recent years the test has been subjected to a considerable amount of criticism and some countries have discarded it as a measure of the bacteriological quality of pasteurised milk. Though the many pitfalls inherent in the test are recognised in Queensland, it is still considered of value in determining the efficiency of the various stages of processing in factory surveys.

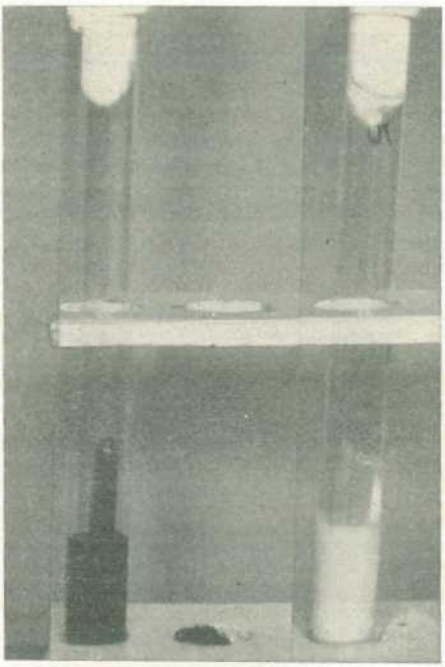

Plate 8.

Positive and Negative Presumptive Coliform Tests.

The Presumptive Coliform Test.—This test is based on the fact that the coliform group of bacteria readily ferment lactose in milk and thus endanger milk quality. Their presence is therefore undesirable. They are, however, readily destroyed at pasteurisation temperatures, but unless strict hygiene is observed, milk is readily re-infected. Their presence is therefore a guide to the degree of after-contamination occurring from milk processing equipment. Their absence is evidence of efficient cleansing and sterilizing procedures in factory operations. (Plate 8 shows positive and negative results). Laboratory experience has shown that well-run plants have no difficulty in attaining the standard of a negative presumptive test in 1 ml. of the pasteurised product.

The Presumptive Coliform Incubation Test.—This test serves as a means of detecting minor plant contamination of the pasteurised product. A 10 ml. sample of milk is incubated at 37°C. for a period of 5 hours, after which it is subjected to the presumptive coliform test.

Here again, well-run plants have little difficulty in satisfying the requirements of this test.

The Phosphatase Test.—This test is based on the fact that the phosphatase enzyme normally present in milk is destroyed at the critical temperatures applied in pasteurisation. Even a trace of raw milk added to properly pasteurised milk is detected by this method. Thus the test is most useful in ascertaining whether all of the milk has been satisfactorily heated.

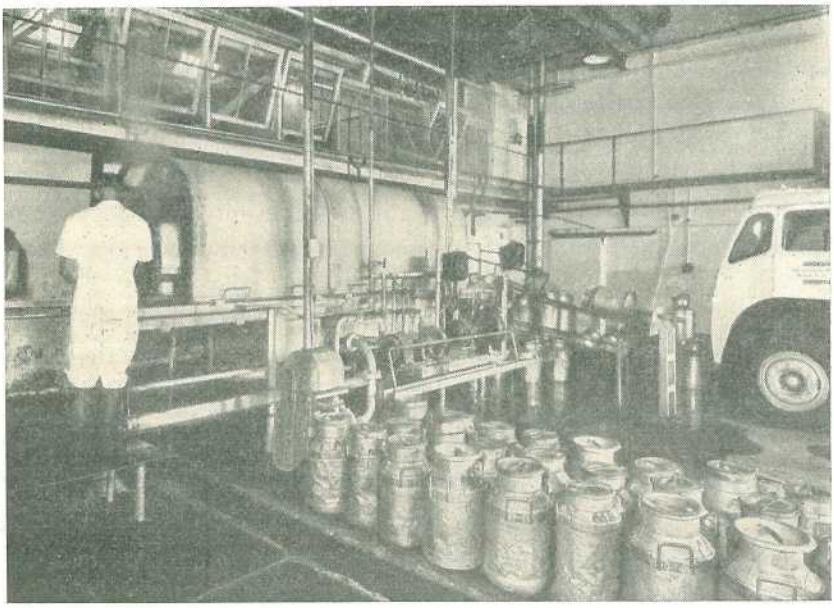

Plate 9.

The "Straight-Through" Type Can Washer Which is Becoming Increasingly Popular in Queensland Milk Processing Factories.

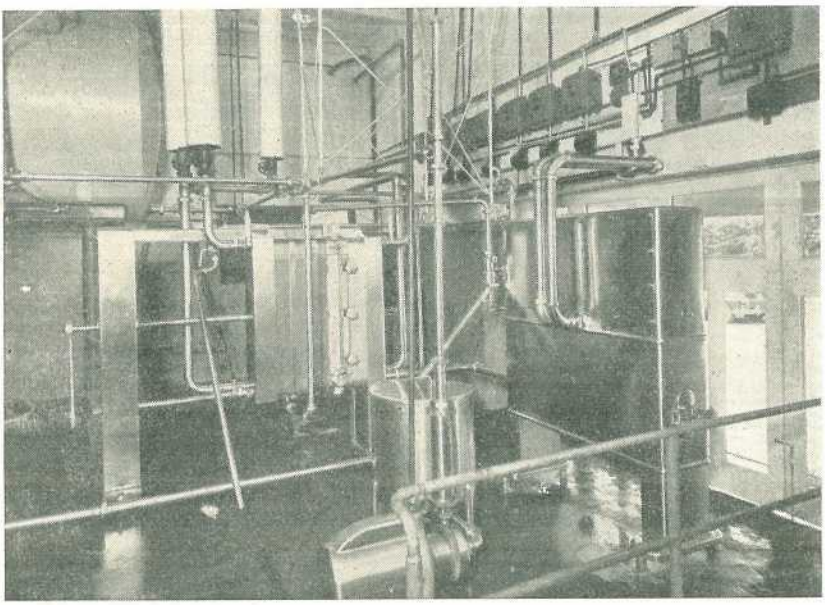

Plate 10.

A Milk Processing Unit in Operation in a Queensland Country Factory.

On the whole, very little trouble has been experienced with positive tests in Queensland practice. On the rare occasions when positives have been recorded, the fault has usually been traced to assemblage or operation of the plant by an inexperienced operative.

Keeping Quality Test.—This test is now gaining favour in overseas countries and is simply performed by storing a bottle of milk at 18°C. for 18-24 hours. Satisfactory keeping quality is indicated by the ability of the milk to last ½ hour on the methylene blue test. Work is proceeding with regard to the adoption of this test under field conditions in Queensland.

Examination of Washed Milk Bottles.

It is most important that bottles should be efficiently cleaned before filling with milk. To check the efficiency of bottle-washing, empty cleaned capped bottles are periodically picked up from the milk plants for examination for "commercial sterility" by means of a plate count on a rinse of the bottle.

A provisional laboratory standard of not more than 200 colonies per bottle has been adopted.

Regular examination of the strength of the solution in bottle-washing machines indicates that often alkalinity is not maintained in accordance with the recommendations of the makers.

Record of Results.

As soon as results are available they are forwarded to the processing plant with appropriate comments (see Form 2). In addition, a running record is kept of the results obtained by each plant.

THE BRISBANE MILK BOARD.

EXAMINATION OF PASTEURISED MILK.

By Dairy Research Laboratory, Brisbane.

Date Received.	Sample.	Bottled for (Day).	Plate Count.	Presumptive Coliform Test. 10 1 .1	Phosphatase Test.	Fat. %

STANDARDS:—1. Plate Count: Not greater than 50,000 per ml.

2. Presumptive Coliform Test: negative in 1 ml.

3. Presumptive Coliform Incubation Test (10 ml.): negative in 1 ml.

4. Phosphatase Test: negative (i.e., not greater than 2.3 Lovibond units).

5. Fat Content: not less than 3.3 per cent.

Senior Dairy Technologist.

Form 2.

MILK PLANT SURVEYS.

A bacteriological survey is made at each metropolitan milk plant at least once monthly. Observations are also made on the condition of equipment, mode of operation of the plant and general factory routine. Additionally, milk samples are taken whenever convenient and sent back to the laboratory for detailed bacteriological examination. The results are forwarded to the plants with appended recommendations. Plants outside the city area are surveyed at intervals, the actual bacteriological examinations being conducted on the spot by means of field equipment.

MONTHLY RECORD OF RESULTS.

On the completion of each month, a summary of all tests performed is prepared and forwarded to the Brisbane Milk Board. These monthly reports are incorporated in an annual report to the same body.

RESULTS COVERING SIX YEARS.

Table 1 is a summary of the work carried out by the Dairy Research Laboratory of the Department of Agriculture and Stock for the Brisbane Milk Board covering a period of five years. The year 1942-1943 is included for comparison purposes.

TABLE 1.

SUMMARY OF WORK AND RESULTS OF TESTS CARRIED OUT FOR THE BRISBANE MILK BOARD BY THE DAIRY RESEARCH LABORATORY, DEPARTMENT OF AGRICULTURE AND STOCK.

Data.	1942–43.	1946–47.	1947–48.	1948–49.	1949–50.	1950–51.
Platings—bottled pasteurised milk	927	1,021	957	952	1,310	1,234
Presumptive coliform tests	918	818	855	978	1,037	1,205
Phosphatase tests—number	203	418	421	486	662	1,398
Percentage negative	80·3	..	98·0	97·0	99·7	99·1
Methylene blue tests at depots—number	..	72,217	79,579	82,242	79,057	78,122
Percentage below 4 hours	..	..	10·7	11·0	8·2	6·7
Methylene blue tests in laboratory	..	1,004	641	..	..	..
Microscopic examinations	..	4,328	4,975	4,183	5,124	4,293
Fat tests at depots—number	..	29,227	30,522	24,755	29,796	27,697
Percentage below 3·3%	..	..	1·2	14·0	12·0	11·1
Pasteurised milk fat tests	..	965	1,081	1,234	1,677	1,583
Average fat percentage (raw milk	..	3·69	3·74	3·70	3·71	..
Average fat percentage (pasteurised milk)	..	3·96	4·00	3·91	3·81	3·76
Methylene blue tests of bulk milk from country factories	..	1,595	2,593	3,120	3,204	2,781
Fat tests of bulk milk from country factories	..	1,568	2,600	3,086	3,054	2,666
Factory surveys	..	..	20	53	53	48
Suppliers suspended	..	54	15	6	6	3

These results reflect the increasing amount of work performed by the Dairy Research Laboratory of the Department of Agriculture and Stock in the field of milk quality control, and the response of milk plants to the control scheme indicates the increasing interest in the bacteriological grading of market milk.

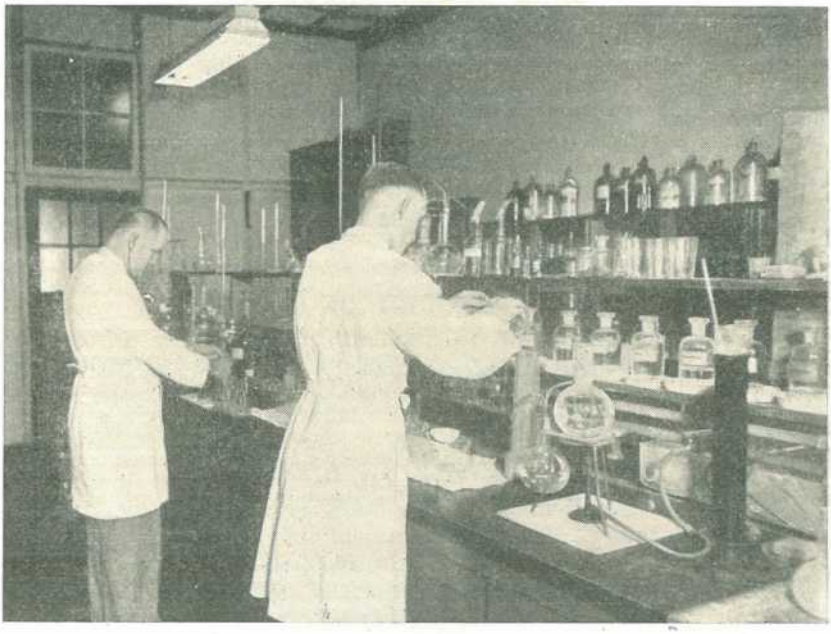

Plate 11.
Daily Milk Samples Being Tested in the Chemical Section of the Dairy Research Laboratory, Brisbane.

EXTENSION OF BACTERIOLOGICAL CONTROL OF MARKET MILK.

A laboratory at Toowoomba has for some years been offering a similar service to that already in existence in Brisbane. With the establishment of a dairy laboratory at Murgon in the South Burnett district and a projected laboratory at Malanda in North Queensland, the bacteriological control of market milk will soon be extended to the major dairying centres of the State.

FUTURE OF THE BACTERIOLOGICAL CONTROL OF MARKET MILK.

It is true that the bacteriological tests used in the control of market milk are among the most controversial aspects of dairy bacteriology. This has been largely conditioned by the fact that the term quality is rather a protean word and authorities find it difficult to adopt tests and standards which are all-embracing. The accumulation of knowledge through research often throws new light on firmly established tests, with the result that they are often modified. It is a hopeful sign that the market milk industry and the dairy bacteriologist have remained sufficiently plastic to be receptive to new ideas. However, irrespective of adjustments in certain tests, all have as their objective the overall improvement of milk quality.

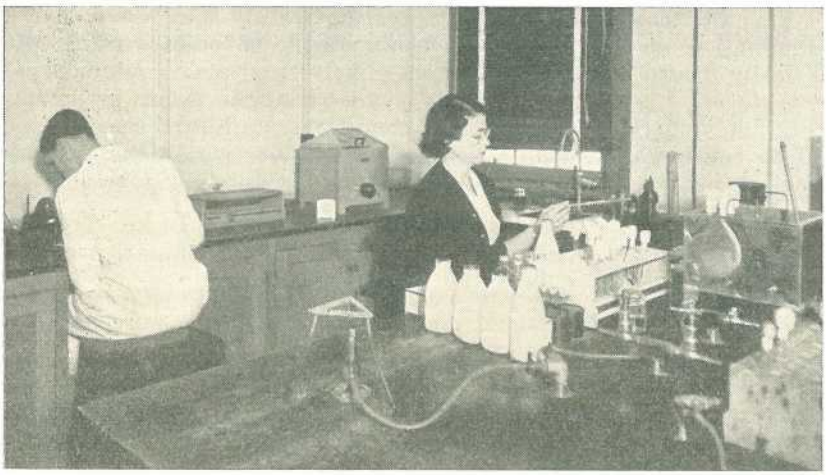

Plate 12.

Daily Milk Samples Being Tested in the Bacteriological Section of the Dairy Research Laboratory, Brisbane.

REPORTS OF RESEARCH WORK.

The following papers record the results of research work in relation to the bacteriological testing of market milk in Queensland.

(1) Studies on the effects of transport and storage on the bacteriological quality of raw milk. Part 1. The reduction of methylene blue by raw milk as influenced by time and temperature of storage. By V. R. Smythe.

Certain aspects of Brisbane's milk supply are discussed and trends of air temperature and raw milk quality are illustrated graphically, using data obtained by testing 95,000 milk samples over a period of three years.

(2) Studies on the effects of transport and storage on the bacteriological quality of raw milk. Part 2. The effect of the milk can on the methylene blue reduction time. By V. R. Smythe.

Factors inherent in the milk can have been found to cause a marked fall in the reduction time of raw milk. The effect is accentuated by increased milk temperature and by prolonged transport. Furthermore, such factors result in a greater degree of injury to high-quality milks than to low-quality milks. No attempt has been made to differentiate between individual can factors.

(3) A laboratory whirler for determining counts of thermoduric organisms in raw milk supplies. By V. R. Smythe.

A laboratory whirler which permits the rapid performance of thermoduric counts on milk samples is described. The method is faster and more convenient than the orthodox roll-tube count and yet retains all the advantages of roll-tube counting.

(4) A method for detecting sources of milk contamination on farms. By V. R. Smythe and Dawn Tabrett.

A method has been devised for locating readily the sources of milk contamination on dairy farms. The method embodies rinsing with aseptically drawn milk all the surfaces likely to provide contamination, and performing bacteriological tests on the rinsings. It has been found practicable under Queensland field conditions, and furthermore lends itself to considerable modification to suit various conditions. Results of methylene blue reduction tests and plate counts for several farms are tabulated.

(5) The value of the resazurin test for the determination of milk quality. By W. F. Schubert and Patricia M. Nagle.

Both the 10-minute and the one-hour resazurin tests were compared with the "modified" methylene blue test, the standard plate count at 37°C., the direct microscopic count and the leucocyte count.

(6) A comparison of a quaternary ammonium compound and a calcium hypochlorite compound as a germicidal agent. By W. F. Schubert.

A calcium hypochlorite compound and a quaternary ammonium were tested by the Weber-Black Method with a laboratory strain of *Escherichia coli* as the test organism. The hypochlorite showed the greater efficiency, probably because of the lower resistance of the gram-negative organism.

(7) The bacteriological content of dairy farm utensils cleansed with approved detergents. By W. F. Schubert.

An investigation designed to obtain information on the bacteriological condition of dairy farm utensils cleansed with approved detergents was carried out during 1951 on selected farms. This work emphasised the value of the technique of cleansing and sterilizing rather than the relative merits of the individual detergents and sterilants.

TECHNICAL APPENDIX.

The Plate Count.

For a large number of years this laboratory used the Yeastral media of the British Ministry of Agriculture and Fisheries (Memo. 139/Foods Jan. 1937) with incubation of the plates at 37°F. In recent years a change was made to the tryptone-glucose-meat extract-skim-milk media of the Standard Methods for the Examination of Dairy Products of the American Public Health Association, with incubation at 30°C. It was felt that this procedure was more suited to giving a maximum count in 48 ± 3 hours. Under these conditions, the lower temperature favours the development of thermobacteria.

The milks are plated according to the technique of the Standard Methods for the Examination of Dairy Products.

The Presumptive Coliform Test.

This test is used as an indicator of post-pasteurisation contamination. The presence of any coliforms is most undesirable, for the simple reason that they are lactose-fermenters and thus endanger quality. In routine laboratory work 1 ml. of milk is inoculated into the MacConkey broth as prescribed by the British Ministry of Agriculture and Fisheries (Memo. 139/Foods Jan. 1937). One departure from the British technique is that only 3 ml. of broth is used in each Durham fermentation tube instead of the 5 ml. laid down in the standardised procedure. Incubation is for 48 ± 3 hours. A positive result is interpreted as indication of post-pasteurisation contamination. Confirmatory and completed tests are occasionally carried out.

The Phosphatase Test.

This test, though not primarily a bacteriological one, is closely linked with the bacteriological examination of pasteurised milk. The Kay-Graham test is used in routine work. The long test is the only one used in the routine examination of pasteurised milk. A negative test is interpreted as showing that all of the milk has been properly heat-treated.

Keeping Quality Test.

Experiments have been conducted with this test with a view to its wholesale recommendation in milk plant work. However, difficulty has been experienced in obtaining a satisfactory low-temperature incubator to provide a uniform temperature of 18 $\pm$ 0.5°C. The effect of the holding temperature favouring certain types of bacteria is still under investigation.

Technique of Examining Washed Milk Bottles.

The method outlined by the British Ministry of Agriculture and Fisheries (Technque B743/T.P.B.) is used with one or two departures for the examination of the bottles. The departures from the British method are as follows:—

(1) The bottle is capped at the milk plant with an aluminium cap and not a rubber stopper as recommended. This procedure, it is felt, approximates more closely to the conditions under which milk is filled into the bottle.

(2) The colony count on the bottle is carried out on tryptone-glucose-meat extract media of the Standard Methods for the Examination of Dairy Products.

Sterility Tests on Equipment used for Milk Work.

Sterility tests are conducted on each batch of equipment used in routine milk work by the method set down by the British Ministry of Agriculture and Fisheries (Technique No. B/697/T.P.B). The technique has been found to be particularly useful in disclosing latent weaknesses in what are universally accepted as efficient bacteriological methods of preparing sterile glassware, blanks, &c.

References.

AMERICAN PUBLIC HEALTH ASSOCIATION. 1948. Standard Methods for the Examination of Dairy Products. 9th ed.

GREAT BRITAIN, MINISTRY OF AGRICULTURE AND FISHERIES. 1937. 139/Foods.

———————————————. Technique B697/T.P.B.

———————————————. Technique B743/T.P.B.

Weed Photographs for Display.

The Department of Agriculture and Stock has prepared a series of large coloured photographs of the more common weeds encountered in Queensland.

These photographs are available on request, wherever practicable, for display at country shows.

Show societies wishing to borrow the series should write to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Cans and Can Washing.

P. McCALLUM, Division of Dairying.

A VERY common saying on the part of most dairymen is that "everything must come out of the can". The term is usually used when alluding to the payment for some improvements on the farm or in the factory. Very often little thought is given to "what must go into the can", and in particular to care and cleaning to protect the quality of milk or cream put in the can. The cleaning and sterilizing of milk and cream cans is in many cases not given the attention its importance demands.

Regulation 189 of the Dairy Produce Acts prescribes certain requirements in the manufacture of milk and cream cans to ensure that cans of a satisfactory standard are produced. Care of the can during its period of use will not only prolong its life, but safeguard the quality of dairy produce.

Many dairymen overlook the can as a potential source of contamination. Milk or cream is in contact with the can for a longer period than with any other part of their equipment, and much deterioration can take place during the storage period between production and delivery to the receiving platform at the factory.

Cans must be structurally sound and free from rust holes and cracks or holes between the wall of the can and the bands. The can lid should not be overlooked. An amazing amount of contamination can take place from cans with such defects. Assuming that the can is in good order and well tinned, there are two types of contamination that can take place—(1) visible dirt, and (2) invisible dirt or bacterial contamination.

Visible dirt may consist of dust particles from the yard or feed stalls, adhering milk residues, or milkstone. These must be removed by cleaning and scrubbing in a detergent (cleanser) solution before the can is ready for sterilization by steam or boiling water. An apparently clean can may contain thousands, and in some cases millions, of organisms. A small amount of milky water in the can could contain many more millions of bacteria which would cause serious defects in milk or cream. Recently, when grading milk by smell and taste it was noticed that a can of milk had a foul odour which resembled the smell of a pigsty, and it was thought that the milk had absorbed the flavour from the atmosphere. However, closer examination revealed that the can lid was cracked around the inside seam and a foul exudate had contaminated the milk. The six gallons of milk which were rejected caused the farmer a loss of £1.

The return of unclean and improperly washed cans from the factory to the supplier has been the cause of much ill feeling between the farmer and the factory management. While it is the responsibility of the factory to return the cans in a clean, dry and near-sterile condition to the farmers, the individual attention that the cans should get on the farm will never entirely be done away with. Can-washing machines, like all other machines, on many occasions are not functioning at their top efficiency, but the operative on the can washer is often blamed for poorly washed cans while the trouble is not due to him but to a faulty machine.

OPERATION OF CAN WASHERS.

To enable farmers to understand a little more about can-washing machines, a brief outline of their operation is given. Can washers are of two types—(1) rotary, and (2) straight-through or tunnel type.

Rotary Machines.

Rotary machines have been in general use in factories for many years, but are giving way to the straight-through washer in many places. One of the main advantages of the rotary washer is that it requires minimum floor space. As cans have to be loaded and unloaded by hand, the output per minute is limited to about four to six. When the cans are loaded into the rotary machine, they are subjected to a cold or warm water rinse to remove the milk or cream from the cans and lids. Below the cans is a tray to catch rinsings, which are carried away from the washer to the floor, thus preventing the rinsings entering the soda solution in the washer. By depressing an automatic foot-pedal the cans move clockwise into the second chamber, which is only an idling chamber to prevent the operator and the cleansed cans and lids from being splashed.

In the third chamber the cans are subjected to the main cleansing process. Very hot (boiling) soda solution is pumped through jets under pressure and strikes the cans and lids externally and internally. It is very important that these jets be kept free from obstructions, or poorly washed cans result. In the next section the cans receive a liberal and forceful boiling water rinse, followed by intensive steaming. The proportion of water and steam is regulated by a tappet rocker arm. An excessive proportion of water to steam leaves the cans wet. Finally, they are given a hot air blast for thorough drying of cans and lids. They are then carried forward to the section where they entered and are unloaded from the machine.

Straight-through Machines.

Straight-through can washers are capable of washing up to 12 cans per minute. The cans may go direct from the tipping vat into the washer on endless chains and some can washers are also fitted with a can inverter and automatic lidding device at the outlet end of the washer. There are many different designs, but most types subject the cans to the following treatments:—(1) a pre-rinse or steaming in the draining section at the entrance to the washer; (2) outside and inside jet rinse with cold or warm water at a pressure of not less than 8 lb. sq. in.; (3) a detergent jetting with 3-9 galls. of 0.5% caustic soda solution at a pump pressure of 20-25 lb. sq. in. and at a temperature of not less than 160°F.; (4) a rinse with 2-7 gallons of water at a temperature of 180°-200°F. and at a pressure of 20-25 lb. sq. in.; (5) a near-sterile rinse at almost 212°F., followed by a steam blast; and, finally (6) a hot air blast at not less than 230°F.

Bacteriological Standards.

Bacteriological standards have been laid down to check the cleansing and sterilizing of cans immediately they come out of the can washer. The U.S.A. standard differs slightly from the British, which is as follows:—

Colonies per can.	Classification.
Under 50,000	Satisfactory.
50,000 to 250,000	Fairly satisfactory.
Over 250,000	Unsatisfactory.

Plate 1.

Cans Used to Forward Milk to a Factory. Note the can with the dented walls, rust spots and cracked seam in the lid, all of which serve as harbours or breeding grounds for bacteria.

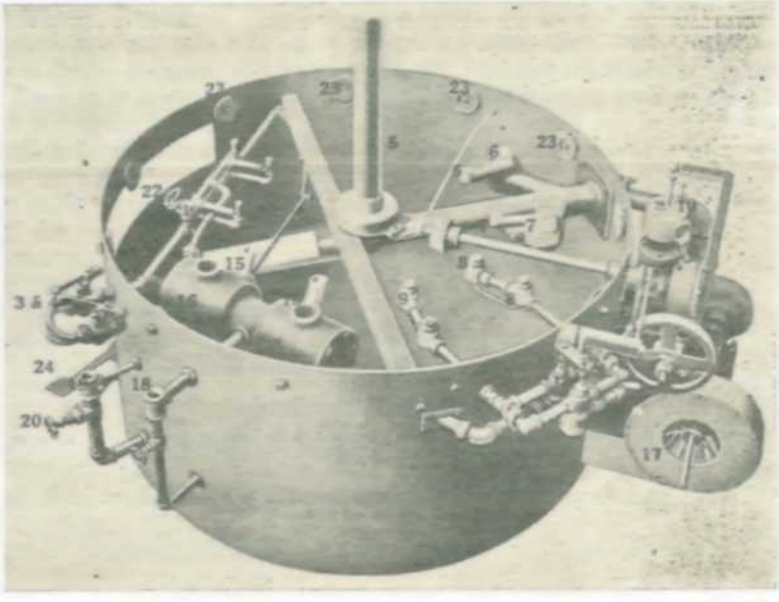

Plate 2.

A Rotary Can Washer, Illustrating the Main Parts.

—Photo. by James Bell Machinery Co.

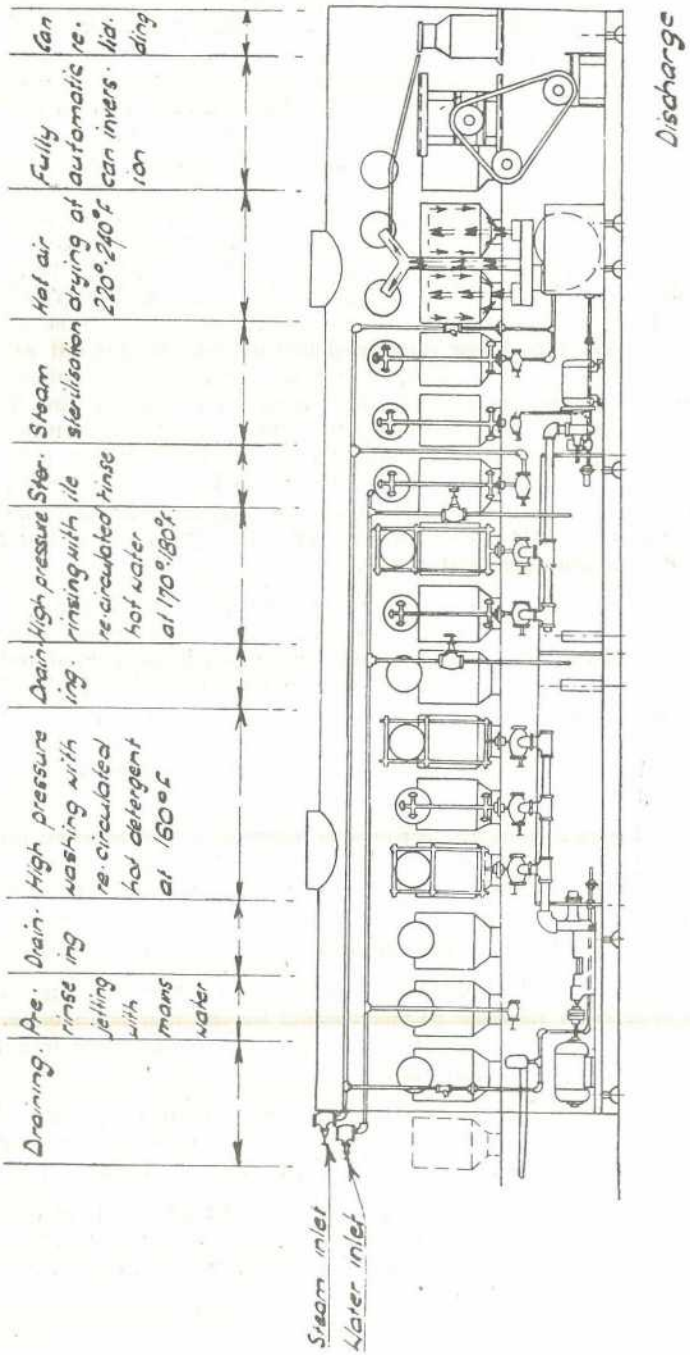

Plate 3.

A Straight-through Can Washer. Internal view of sections.

—Diagram from Bryant Bulletin.

CARE OF CANS.

To assist in improving milk and cream quality and prolonging the life of cans, the following points should be noted. New cans are covered with a film of grease, and this should be removed by thorough cleaning and scrubbing. Quite frequently milk or cream supplied in such cans without prior cleansing has an oily or metallic flavour and is degraded at the factory. In the cleaning of cans only a good detergent or cleanser, which must be thoroughly rinsed from the can with boiling water, should be used. If steam is available, steam for three minutes. Up-end to drain and dry on a metal draining rack. Immediately before use, rinse cans and lids with a chlorine solution prepared according to the instructions on the container. Do not use abrasive cleaners, as they cut the tinned surface of the can. It is very nice to see a clean, bright can, but a few dairymen are over-keen and cut away the tinned surface and retinning is then necessary. It is surprising how few dairymen clean the outside of the can and polish the label or name plate. Most cream graders are impressed by the condition and cleanliness of the can when grading cream. If they get a "border line" cream in a clean, bright can, they are inclined to bear a little with the farmer, but if the outside of the can is dirty and the name plate tarnished and almost indistinguishable, they do not take any risk with the cream and grade it down.

Using milk and cream cans for storing water on the farm is a bad practice, as it causes them to rust quickly. Many goods cans were spoilt during the 1951 drought where water had to be carted for dairy purposes. Milk or cream stored in a rusty can will quickly develop a "metallic" flavour and this type of flavour defect should cause the cream to be degraded to second grade. Metallic flavour is most objectionable, as it is intensified when the cream is subjected to the process of pasteurisation.

Plate 1 shows clearly the difference between a well cleaned and well cared for can, and an unwashed, neglected can as seen on a receiving platform. If you were a cream or milk grader, which can would most impress you? There would be no question concerning the standard of hygiene practised on the respective dairies from which these cans came.

It is essential that cream be stirred frequently during the day, but care is necessary if damage to the bottom of the can is to be avoided. Cream stirrers in poor condition are capable of doing harm to the tinned inner surface of the can.

Farmers frequently put wrong-fitting lids on cans before their despatch to the factory and much force is then necessary to remove them. This results in damage to the lid and neck of the can.

With regard to having cans retinned, it is recommended only with cans where rusting has not eaten into the base metal; any can which is soldered inside, in which rust has penetrated through to the base metal, or contains a hole, is unfit for retinning.

Brucellosis Testing of Swine.

The Department of Agriculture and Stock is operating a scheme whereby pig herds are tested at intervals for the occurrence of swine brucellosis (contagious abortion).

A herd listed by the Department as "brucellosis tested" is one in which all such animals as may be determined by the Director of the Department's Division of Animal Industry have been subjected to two successive tests for brucellosis, at intervals determined by him, without any positive reactors being found.

In order for a herd to be retained on the list of Tested Herds, a semi-annual or annual re-test of the herd, as determined by the Director, is required. If at a re-test any animal gives a positive reaction to the test the herd is removed from the list; it is not listed again until subsequent tests, as determined by the Director, have been carried out.

Full particulars of the Brucellosis Testing of Swine and application forms may be obtained from the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

TESTED HERDS.
(AS AT 27th MAY, 1953.)

Breed.	Owner's Name and Address.
Berkshire	J. J. Bailey, " Lucydale " Stud, East Greenmount
	S. Cochrane, " Stanroy " Stud, Felton
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	G. Handley, " Handleigh " Stud, Murphy's Creek
	J. L. Handley, " Meadow Vale " Stud, Lockyer
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	O'Brien and Hickey, " Kildurham " Stud, Jandowae East
	E. Pukallus, " Plainby " Stud, Crow's Nest
	G. C. Traves, " Wynwood " Stud, Oakey
	E. Tumbridge, " Bidwell " Stud, Oakey
	Westbrook Farm Home for Boys, Westbrook
	H.M. State Farm, " Palen Creek," Palen Creek
	A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
	H. H. Sellars, " Tabooba " Stud, Beaudesert
	F. Thomas, M.S. 373, Beaudesert
	D. T. Law, Trouts road, Aspley
	R. H. Crawley, " Rockthorpe " Stud, *via* Pittsworth
	F. R. J. Cook, " Alstonvilla," Wolvi, *via* Gympie
	D. E. and E. C. Apelt, " Thelmur," Oakey
	Mrs. I. M. James, " Kenmore " Stud, Cambooya
	H. L. Stark, " Florida," Kalbar
	J. H. N. Stoodley, " Stoodville," Ormiston
	H.M. State Farm, Numinbah
	V. G. M. and A. G. Brown, " Bardell," Goovigen
	R. E. Paulsen, " Crest " Stud, Binjour Plateau, M.S. 670, Gayndah
	M. G. and R. H. Atkins, " Diamond Valley " Stud, Mooloolah
	L. Puschmann, Taylor
Large White	H. J. Franke and Sons, " Delvue " Stud, Cawdor
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	F. L. Hayward, " Curyo," Jandowae
	J. A. Heading, " Highfields," Murgon
	K. B. Jones, " Cefn " Stud, Pilton
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	R. Postle, " Yarralla " Stud, Pittsworth
	E. J. Bell, " Dorne " Stud, Chinchilla
	L. C. Lobegeiger, " Bremer Valley " Stud, Moorang, *via* Rosewood
	J. H. G. Blakeney, " Talgai " Stud, Clifton
	H. R. Gibson, " Thistleton " Stud, Maleny
	H.M. State Farm, Numinbah
	K. A. Hancock, " Laurestonvale " Stud, Murgon

TESTED HERDS—continued.

Breed.	Owner's Name and Address.
Large White	V. P. McGoldrick, " Fairymeadow " Stud, Cooroy N. Woltmann and Sons, Wooroolin R. S. Powell, Kybong, *via* Gympie E. B. Horne, " Kalringal," Wooroolin S. T. Fowler, " Kenstan " Stud, Pittsworth J. A. and J. McNicol, " Camden," Canning Vale, Warwick H. L. Larsen, " Oakway," Kingaroy C. Allison, "Colrene" Stud, Lake and Reserve roads, Slacks Creek E. G. Evans, Box 22, Maleny Mrs. I. G. Utting, "White Lodge," Mountain Road, Cooroy N. E. Meyers, Halpine Plantation, Kallangur Dr. B. J. Butcher & A. J. Parnwell, 684 Logan road, Greenslopes.
Tamworth	S. Kanowski, " Miecho " Stud, Pinelands N. R. Potter, " Actonvale " Stud, Wellcamp D. F. L. Sherman, " Waverley " Stud, Kaimkillenbun A. C. Fletcher, " Myola " Stud, Jimbour Salvation Army Home for Boys, Riverview F. Thomas, M.S. 373, Beaudesert A. J. Surman, Noble road, Goodna P. V. McKewin, " Wattleglen " Stud, Goombungee Department of Agriculture and Stock, Regional Experiment Station, Kairi E. C. Phillips, " Sunny View," M.S. 90, Kingaroy T. A. Stephen, " Withcott," Helidon W. F. Kajewski, " Glenroy " Stud, Glencoe A. A. Herbst, Bahr Scrub, *via* Beenleigh R. G. Koplick, " Melan Terez " Stud, Rochedale H.M. State Farm, Numinbah D. B- Alexander, Kinleymore, *via* Murgon
Wessex Saddleback ..	W. S. Douglas, " Greylight " Stud, Goombungee D. Kay and P. Hunting, " Kazan " Stud, Goodna E. Sirrett, " Iona Vale " Stud, Kuraby C. R. Smith, " Belton Park " Stud, Nara H. H. Sellars, " Tabooba " Stud, Beaudesert H. Thomas, " Eurara " Stud, Beaudesert D. T. Law, Trouts road, Aspley G. J. Wilson, " Glenbella " Stud, Silverleigh J. B. Dunlop, Acacia road, Kuraby A. Curd, Box 35, Jandowae C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek

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The Honey Flora of South-Eastern Queensland.

S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture), Science Branch.

[*Continued from page* 302 *of the May issue.*]

Grey Ironbark.

Botanical Name.—*Eucalyptus drepanophylla* F. Muell. ex Benth., sometimes known as *Eucalyptus decepta* Blakely; it has also been mistaken for *Eucalyptus paniculata* Sm., which is not known from Queensland.

Other Common Names.—Thattinebark, white ironbark.

Plate 12.

Grey Ironbark (Eucalyptus drepanophylla). Leaves, buds and seed-capsules.

Distinguishing Features.—An ironbark (Plates 12 and 13) with relatively narrow leaves not always easy to distinguish from narrow-leaved ironbark (*Eucalyptus crebra*), to be described in a later section, but the leaves are rather broader, the timber not nearly so red, and the bark often not so black.

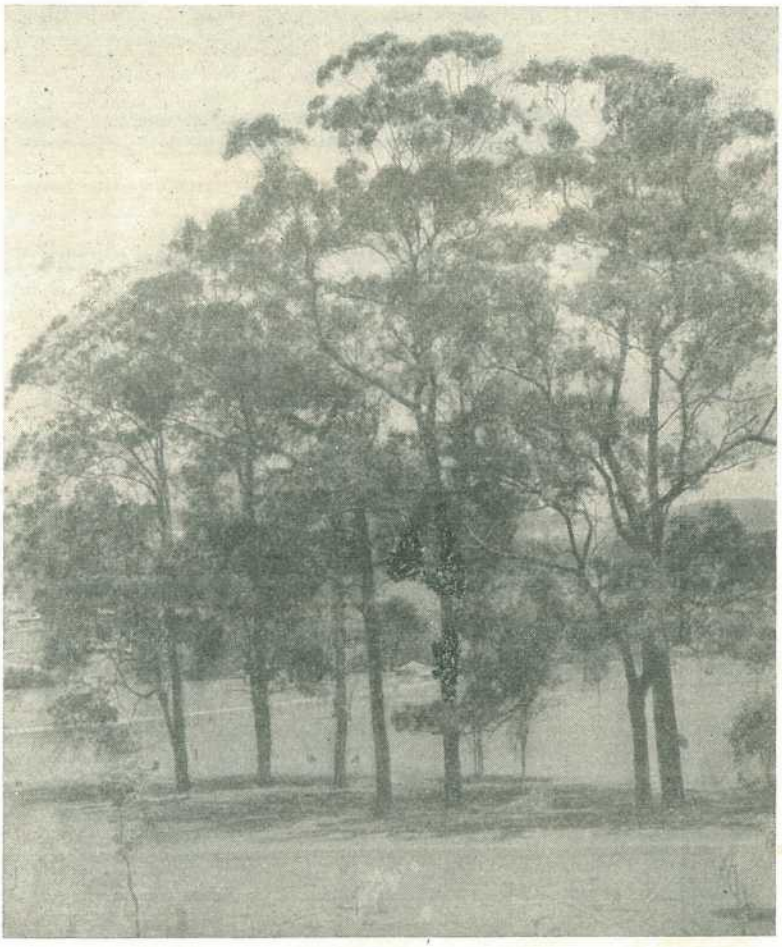

Plate 13.

Grey Ironbark (Eucalyptus drepanophylla). Clump at Brookfield.

Description.—A tree up to 80 ft. high or more, with dark grey, rough, deeply furrowed bark up to the small twigs. The leaves are mostly 5½-8 times as long as wide and about 3½-6 in. long, on stalks about ½ in. long. The flowers are borne in bunches at the ends of the twigs and are about ½ in. wide when fully open; the buds have a conical or nearly conical lid about as long as the lower part. The seed-capsules are cup-shaped or somewhat rounded, about ¼ in. long and nearly as wide; the valves are sometimes prominent.

Distribution.—Widely spread in the forest country in south-eastern Queensland; it is found nearly throughout eastern Queensland and northern coastal New South Wales.

Usual Flowering Time.—July to December.

Colour of Honey.—Light amber.

Importance as Source of Honey.—Major.

Importance as Source of Pollen.—Minor.

General Remarks.—Grey ironbark is one of the best known and most valuable of the coastal nectar-producing trees. Although some flowering occurs each year, about every third year large numbers flower together and good yields are harvested, particularly if suitable weather conditions prevail.

The honey is dense, has excellent colour and flavour, and granulates with a medium grain. As grey ironbark usually flowers with coastal gums, a pure sample of the honey is not readily obtained, although its flavour is normally predominant. The "ironbark-gum" blend is possibly the most popular of coastal honeys. The species is an unsatisfactory pollen plant, bees usually obtaining their requirements from other plants flowering at the same time.

Silver-leaf Ironbark.

Botanical Name.—Eucalyptus melanophloia F. Muell.

Other Common Names.—Silver leaf; broad-leaved ironbark.

Distinguishing Features.—An "ironbark" (Plates 14 and 15) with oblong or broadly rounded silvery or pale grey leaves with hardly any stalk and arranged in pairs along the twigs.

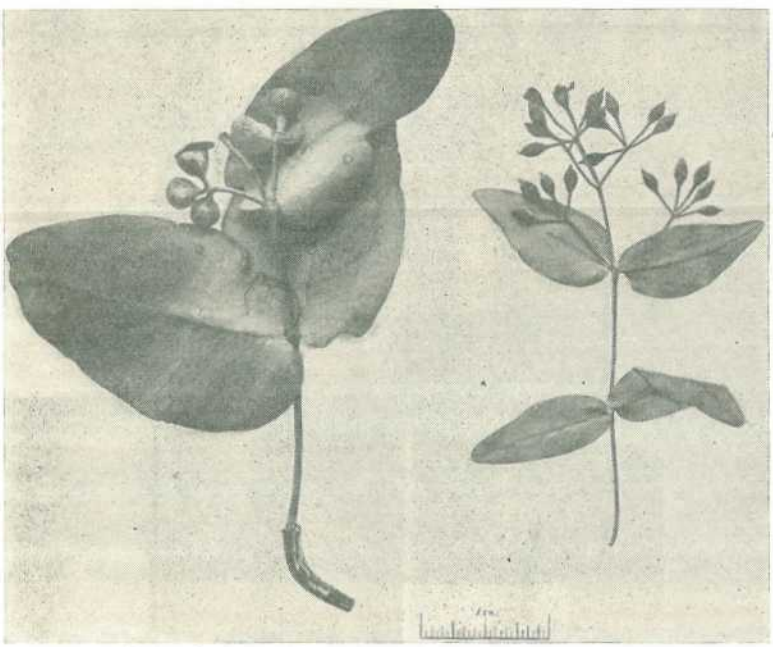

Plate 14.

Silver-leaf Ironbark (Eucalyptus melanophloia). Leaves, buds and seed-capsules.

Description.—A tree up to 40 ft. high, with blackish, hard, deeply furrowed bark up to the small twigs. The leaves are in pairs, silvery or pale grey, heart-shaped at the base with hardly any stalk, usually less than twice as long as wide, mostly 1½-2½ in. long. The flowers are borne in small bunches at the ends of the twigs; the lid of the bud is conical, about as long as the lower part; the open flower is nearly ½ in. wide. The seed-capsule is cup-shaped or somewhat rounded, about ⅓ in. long and wide, with the tips of the valves somewhat projecting.

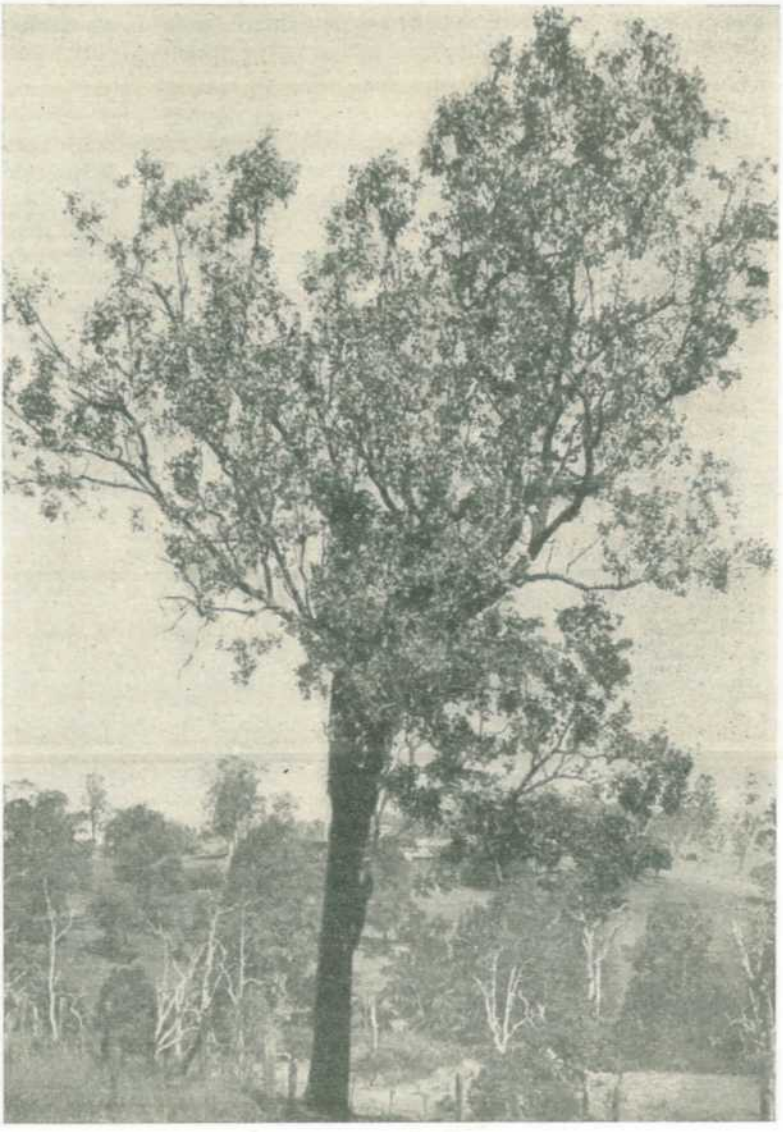

Plate 15.

Silver-leaf Ironbark (Eucalyptus melanophloia). Brookfield.

Distribution.—Nearly throughout the open forest country of south-eastern Queensland, often in pure stands. It is widely spread in Queensland and New South Wales.

Usual Flowering Time.—December to February.

Colour of Honey.—Light amber.

Importance as Source of Honey.—Medium.

Importance as Source of Pollen.—Medium to major.

General Remarks.—This tree has a conflicting reputation as a nectar producer. In coastal ranges, many years may elapse without nectar being obtained in surplus amounts. Inland, useful quantities are harvested every second year. The flow is affected quickly and seriously by small variations in climatic conditions. The honey is dense and has a slightly aromatic flavour; it granulates slowly with a coarse grain and such honey has a "glassy" appearance.

Mugga.

Botanical Name.—Eucalyptus sideroxylon A. Cunn. ex Maiden.

Other Common Name.—Red ironbark.

Distinguishing Features.—An "ironbark" (Plates 16 and 17) with the small branches smooth and grey, and flowers produced in small clusters among the leaves.

Description.—A tree up to 100 ft. high, with hard, rough, deeply furrowed, grey or blackish bark on the trunk and main branches, and grey, smooth bark on the smaller branches; the furrows on the trunk

Plate 16.

Mugga (Eucalyptus sideroxylon). Leaves, buds and seed-capsules.

are often brownish on small trees. The leaves are greyish in colour, usually 3-8 times as long as wide, usually 3-5 in. long, on stalks about ½ in. long. The flowers vary in colour from red through pink to white on different trees and are borne in clusters among the leaves; the buds have a conical lid shorter and narrower than the lower part; the open flower is about ½ in. wide. The seed-capsules are oval or rounded, about ⅜-¾ in. long, and are carried on rather long stalks; the cells and valves are so deeply placed as to be not easily seen.

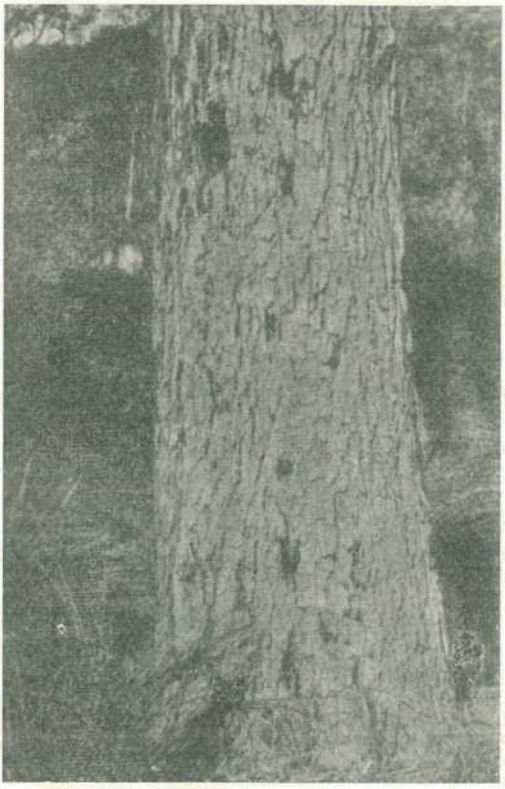

Plate 17.
Mugga (Eucalyptus sideroxylon). Botanic Gardens, Brisbane.

Distribution.—Open forest hillsides with sandy soil in the Darling Downs District and the southern part of the Burnett District; it is very rare in the Moreton District, chiefly on the slopes of the Great Dividing Range. It is widely spread in eastern New South Wales and in Victoria.

Usual Flowering Time.—July to November.

Colour of Honey.—Light amber.

Importance as Source of Honey.—Major.

Importance as Source of Pollen.—Nil to minor.

General Remarks.—The honey is of high quality, good body and granulates quickly with a fine grain. During early summer considerable quantities are obtained in apiaries situated near stands of mugga. Occasionally flowering is heavy in midwinter and when this happens only a limited amount of honey is gathered. With this early flowering some dwindling in colony strength may occur and this is due largely to the normally slow winter rate of brood replacement being restricted further by the shortage of pollen.

Pink Bloodwood.

Botanical Name.—Eucalyptus intermedia R. T. Baker.

Other Common Names.—Bloodwood, red bloodwood.

Distinguishing Features.—This tree (Plates 18-20) has a grey, flaky, brittle bark up to the small twigs, leaves much paler on the lower surface than the upper surface, large bunches of flowers at the ends of the twigs, and rather large and thick seed-capsules.

Description.—A tree up to 80 feet high with grey, flaky, brittle bark throughout, brownish when broken. The leaves are about 3-6 times as long as wide, about 3-6 in. long and ¾-2 in. wide, mostly pointed, rather dark and shining green on the upper surface, much

Plate 18.

Pink Bloodwood (Eucalyptus intermedia). Leaves, buds, flowers and seed-capsules.

paler and duller on the lower surface, with a large number of fine, parallel side-veins running from the midrib to the edges. The flowers are produced in large bunches at the ends of the twigs and are larger than those of most Queensland eucalypts, being about $\frac{3}{4}$ in. wide when fully out. The pointed lid is much shorter than the rest of the bud. The capsules are somewhat woody, about $\frac{1}{2}$-$\frac{3}{4}$ in. long, and their shape is somewhat like an egg with the top cut off.

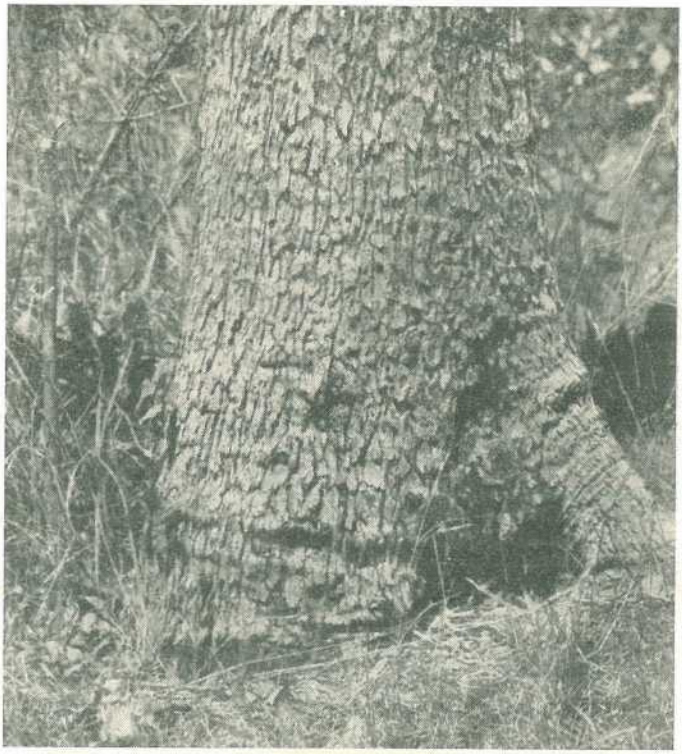

Plate 19.

Pink Bloodwood (Eucalyptus intermedia). Portion of trunk.

Distribution.—Widely spread in forest country in the Moreton, Wide Bay, and Burnett Districts, never in pure stands and often as scattered trees. It is fairly common throughout the coastal belt of Queensland and northern New South Wales.

Usual Flowering Time.—January to March.

Colour of Honey.—Medium amber, occasionally with a reddish tint.

Importance as Source of Honey.—Minor to medium.

Importance as Source of Pollen.—Medium.

Plate 20.

Pink Bloodwood (Eucalyptus intermedia) at Rosewood.

General Remarks.—This tree, the most important of the bloodwood group, comes into flower during a period of nectar and pollen shortage, and colonies working the flow usually obtain some winter stores from this source. At the time of flowering, breeding may be stimulated to such an extent that heavy late swarming occurs.

The honey is of poor density and only fair flavour; it granulates with a large, soft-textured grain. Bloodwood honeys should not be removed from the hive until the bees have capped the entire comb surface, otherwise the extracted honey may ferment. Moderate flows are

obtained from this species at irregular intervals, and the crop harvested on such occasions is either utilised as the sweetening and colouring agent in some processed foodstuffs or blended with higher grade honey.

Like all bloodwood honeys, it is characterised by its stringiness—that is, the capacity to be drawn out into long fibres. This unique elastic property of bloodwood honeys is due to the presence of an unusual amount of dextran.

Note: On sandy soils in the Darling Downs District and in parts of the Burnett District, another bloodwood, sometimes called "long-fruited bloodwood" (*Eucalyptus polycarpa* F. Muell.), is found. This bloodwood differs from the ordinary pink bloodwood in having longer, narrower leaves, giving a somewhat weeping appearance to the crown, and nearly oblong capsules; the buds also are whitish instead of reddish. Another bloodwood (*Eucalyptus gummifera* (Gaertn.) Hochr., also known as *Eucalyptus corymbosa* Sm.), likewise popularly called red bloodwood or pink bloodwood, is found on deep sandy soil near the coast in south-eastern Queensland and occasionally further inland, but it is much commoner in New South Wales, south of Newcastle. There has been a lot of confusion between *Eucalyptus intermedia* and *Eucalyptus gummifera*, but the latter may be distinguished by the smaller branches being smooth and greyish white, the bark on the trunk being reddish, not brownish when broken, the denser foliage, the very small lid of the bud, and the top edge of the seed-capsule spreading outward.

White Bloodwood.

Botanical Name.—Eucalyptus trachyphloia F. Muell.

Other Common Names.—Yellow bloodwood, brown bloodwood.

Distinguishing Features.—This tree (Plates 21-23) has a flaky, brittle bark on trunk and main branches, and smooth, greyish or whitish bark on the small branches; rather small leaves, much paler on the lower surface than the upper; and large bunches of flowers at the ends of the twigs.

Description.—A tree up to 70 feet high with grey, flaky, brittle bark on the trunk and main branches, but smooth and greyish or whitish on the smaller branches, where it is shed in long strips. The leaves are about 5-8 times as long as wide, about 3-4½ in. long and ½-¾ in. wide, green on the upper surface, very much paler on the lower surface, with a large number of fine parallel veins running out from the midrib to the edges. The flowers are produced in large bunches at the ends of the branches and are about ⅜ in. wide; the lid is very short. The seed-capsules are shaped somewhat like an egg with the top cut off or like a small cup, between ¼ in. and ½ in. long and about ¼ in. wide.

Plaet 21.
White Bloodwood (Eucalypus trachyphloia). Leaves, flowers, buds and seed-capsules.

Plate 22.
White Bloodwood (Eucalyptus trachyphloia). Portion of trunk.

Plate 23.
White Bloodwood (Eucalyptus trachyphloia) at Caboolture.

Distribution.—In forest country in sandy or stony ground in south-eastern Queensland, sometimes rather common but mostly as scattered trees. It is also known from further north and south.

Usual Flowering Time.—February to April.

Colour of Honey.—Light amber.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—The somewhat inferior honey from this species, with the characteristic stringiness of bloodwood honeys, has poor density and only fair flavour. Often, it ferments shortly after extraction and, in fact, has been known to "blow" in the honeycomb. The first indication of fermentation is the gradual development of an unpalatable flat flavour, and when this is noticed, heat treatment of the extracted honey should be undertaken immediately. Normally, it granulates quickly with a grain that is coarse in appearance but soft in texture. The species provides some winter stores, and the pollen stimulates breeding.

[TO BE CONTINUED.]

RECENT BOOKS.

"Jute Substitute Fibres: Bimli-Jute, The Roselle and Aramina Fibre."
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In view of the interest in fibre growing now being shown in Queensland and other sub-tropical and tropical regions, this well-illustrated publication on kenaf, rosella and Urena fibres is very timely.

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The book is published by Wheatland Journals Ltd., 356 Kilburn High Road, London, N.W.6, and the English price is 30s.

"Rural Australia. A Graphical Summary, 1952."

The Commonwealth Bureau of Agricultural Economics has prepared this book to show in graphical form first the general relationship of the Australian rural economy to the total economy of the country, and secondly the principal features of each of the major rural industries. It should prove a valuable reference in the libraries of secondary schools, universities and all who aim to be well-informed on our rural economy.

The book is distributed on behalf of the Bureau by Angus and Robertson Ltd., 89 Castlereagh street, Sydney. Its price is 21s. (postage 1s.).

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ASTRONOMICAL DATA FOR QUEENSLAND.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

JULY

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.39	5.03	Cairns	9	49	Longreach ..	27	43
6	6.39	5.05	Charleville	25	29	Quilpie	37	33
11	6.39	5.07	Cloncurry	37	63	Rockhampton ..	1	19
16	6.38	5.10	Cunnamulla ..	31	27	Roma	15	19
21	6.36	5.12	Dirranbandi ..	22	16	Townsville ..	8	41
26	6.34	5.15	Emerald	12	28	Winton	29	51
31	6.31	5.17	Hughenden ..	21	49	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	9.28	9.36
2	10.32	10.12
3	11.35	10.46
4	..	11.21
	a.m.	
5	12.39	11.59
		p.m.
6	1.43	12.40
7	2.48	1.26
8	3.52	2.18
9	4.52	3.13
10	5.47	4.12
11	6.36	5.12
12	7.18	6.10
13	7.55	7.07
14	8.28	8.02
15	8.58	8.54
16	9.26	9.45
17	9.54	10.37
18	10.23	11.29
19	10.54	..
		a.m.
20	11.28	12.24
	p.m.	
21	12.07	1.21
22	12.52	2.19
23	1.45	3.19
24	2.44	4.18
25	3.50	5.14
26	4.58	6.05
27	6.06	6.51
28	7.14	7.32
29	8.20	8.10
30	9.26	8.46
31	10.31	9.22

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	21	15	38	31	12	7	43	35
6	26	12	43	27	18	2	50	30
11	29	11	44	26	19	1	52	29
16	19	19	35	35	10	10	41	41
21	12	27	27	43	1	18	29	51
26	12	28	27	43	2	19	30	51
31	15	22	30	38	6	13	35	44

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	34	21	54	44	38	29	29	18
3	23	32	46	53	30	38	20	28
5	18	43	42	59	27	45	16	36
7	8	51	36	64	21	50	8	43
9	3	55	34	67	18	52	4	45
11	7	50	36	63	20	49	7	42
13	14	42	39	59	24	44	13	36
15	23	32	46	53	30	38	20	28
17	33	23	52	45	37	30	27	20
19	42	18	58	43	43	27	35	17
21	50	9	64	36	48	22	41	9
23	55	4	68	33	51	19	45	5
25	52	5	66	34	50	20	43	6
27	43	12	59	38	44	24	36	12
29	31	24	51	46	35	31	25	21
31	20	36	43	55	28	40	17	31

Phases of the Moon.—Last Quarter, 4th July, 8.03 a.m.; New Moon 11th July, 12.28 p.m.; First Quarter, 19th July, 2.47 p.m.; Full Moon, 26th July, 10.20 p.m.

On July 15th the Sun will rise and set about 25 degrees north of true east and true west respectively and on the 16th and 29th the moon will rise and set very close to true east and true west respectively. On July 5th the earth will be at its greatest distance from the sun.

Eclipses.—On July 11th there will be a partial eclipse of the sun but it will not be visible from Australia. However on July 26th there will be a total eclipse of the moon which will be seen from this portion of the earth. The time of commencement will be 8.32 p.m. and the time of ending, just after midnight. The duration of totality will be about 1¾ hours.

Mercury.—An evening object at the beginning of the month, in the constellation of Cancer, setting about 2 hours after the sun. It will be in conjunction with the sun on the 25th and at the end of the month, in the constellation of Gemini will rise ¾ hour before sunrise.

Venus.—Still a very brilliant object in the morning sky. At the beginning of the month in the constellation of Taurus will rise 3½ hours before the sun and on the 16th will pass Aldebaran and on the 23rd will pass Jupiter. By the end of the month, still in the constellation of Taurus, it will rise 2 hours 52 minutes before the sun.

Mars.—Still too close in line with the sun for observation.

Jupiter.—In the constellation of Taurus, at the beginning of the month will rise about 2 hours before the sun and at the end of the month will rise 3 hours 20 minutes before sunrise.

Saturn.—At the beginning of the month will set just after midnight and will pass Spica on the 26th. At the end of the month Saturn will set between 10.45 p.m. and midnight.

56-20