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DEPARTMENT OF AGRICULTURE

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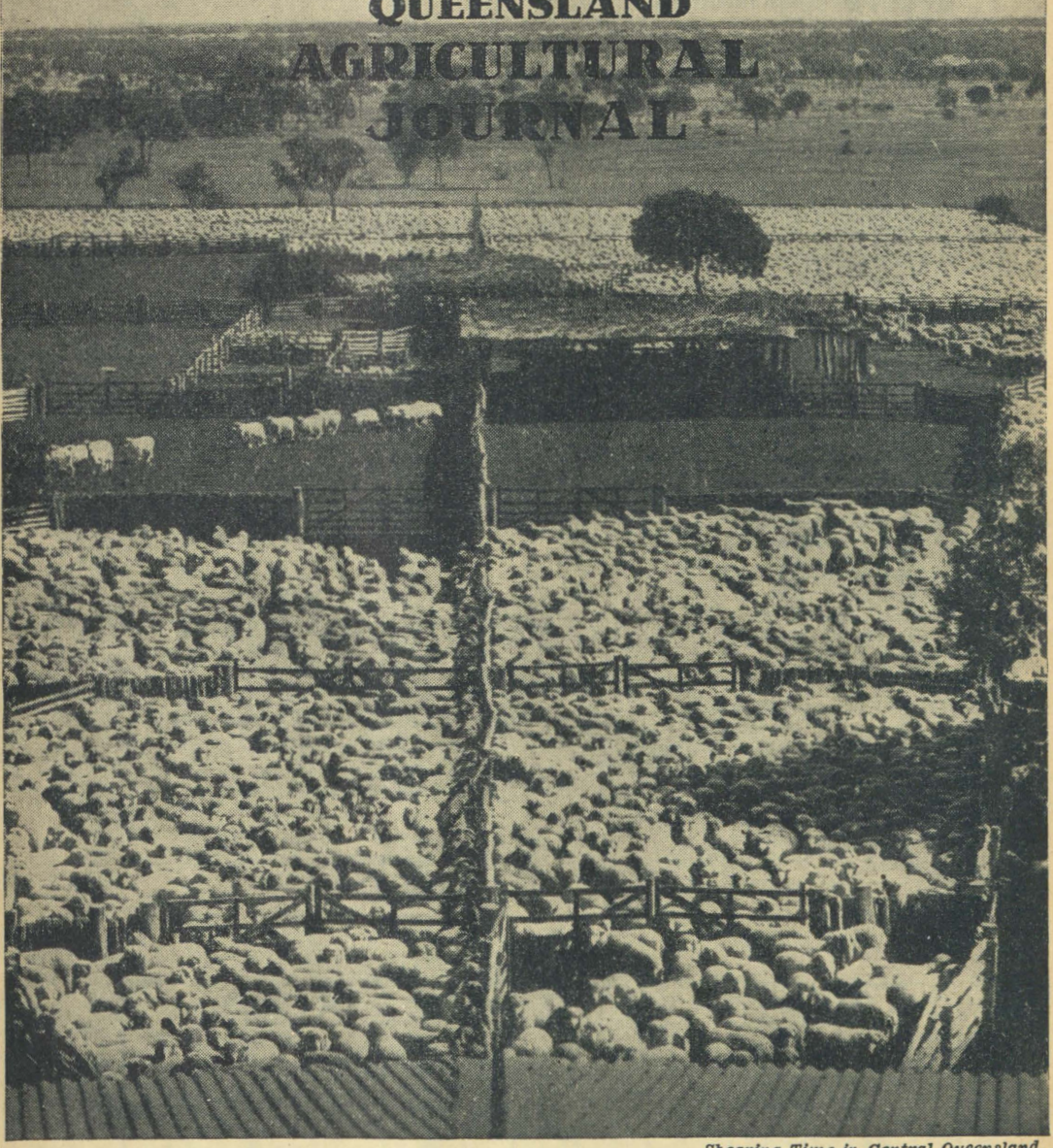

Shearing Time in Central Queensland.

LEADING FEATURES

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Agriculture in the Mary Valley and Adjoining Districts.

A. HEGARTY, Adviser in Agriculture, Agriculture Branch.

THE development of a district by agriculture is ordinarily slower than by mining; hence the startling gold discovery by Nash in 1867 played the dominant role in rapidly populating the Gympie district in the early days of its history. Agriculture, however, was destined to be the major factor in stabilising the district and in building up a prosperous community. Not only did the Gympie district possess great mineral wealth, but fortunately the climate and country proved very suitable for the development of agricultural industries.

At the time of Nash's discovery, the Gympie district was looked upon as second-class pastoral land and was extensively stocked with Merino sheep. Later it was found that the country was better adapted for raising and fattening cattle.

The agricultural development of the early days was confined to the felling of the rich river scrubs and forest flats, and planting crops to provide food for the mining population and farm produce for the mine horses. Dairying became established in a small way about 1882 with the introduction of the farm separator to the district. During 1906, a small butter factory was opened up to handle the increased dairy production, and from 1915 to 1924 larger premises were established at Gympie, Pomona, Cooroy, Eumundi and Maleny.

With the decline in mining after 1906, the district witnessed a great change-over to agricultural and pastoral pursuits, with large holdings being thrown open for selection. The district is now well established as an important dairying, pastoral, agricultural and fruit-growing district, and all available land is occupied. Very little land of agricultural value is left for selection and unoccupied Crown land has now become the centre of an important reafforestation programme.

The district can claim to be one of the most important dairying areas in Queensland. Sown pastures and agricultural crops are largely responsible for the district's high contribution of 15% of the State's butter production.

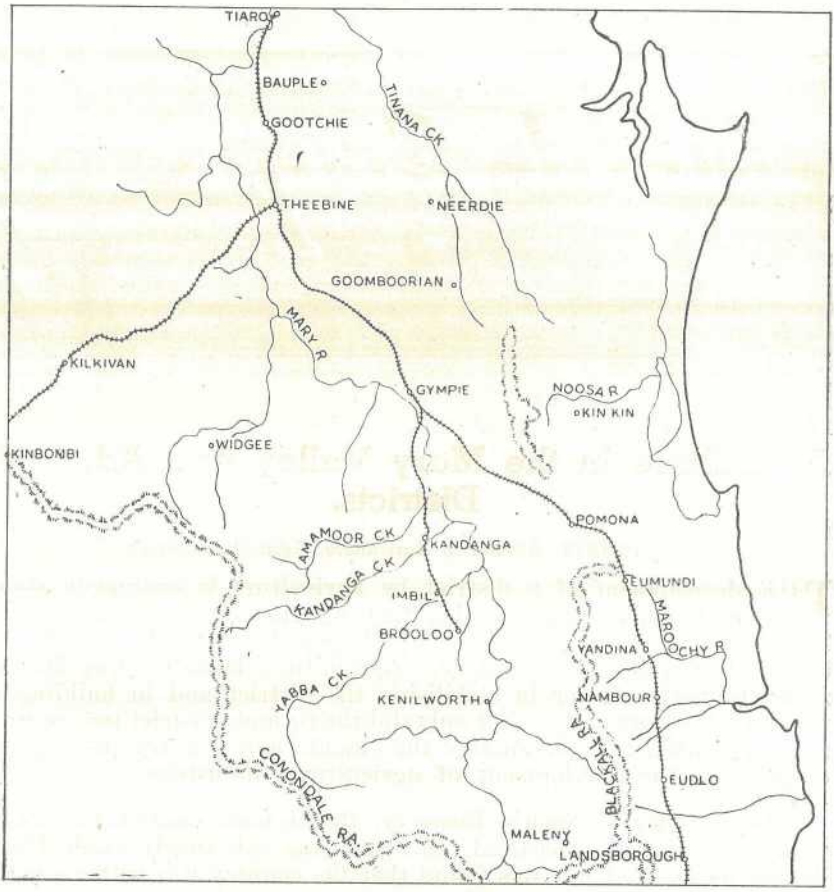

Plate 157.

Sketch Map of the Mary Valley and Adjoining Districts.

The boundaries of the Mary Valley district (Plate 157) may be broadly defined as follows:— On the east, the coastline from Inskip Point to Caloundra; on the south and west, Landsborough, and the Conondale, Jimna and Coast Ranges; on the north, a line through Tiaro from the Coast Range to Inskip Point. The area included is approximately 4,000 square miles, which, with the exception of river flats and a coastal "wallum" strip, is mainly undulating in nature. The Maleny Plateau and Blackall Range constitute a subsidiary watershed ranging in height from 1,210 feet to 1,345 feet.

Gympie (population 8,880) is the main town and is fairly centrally situated to serve the district. Well-established rail and road systems connect all the smaller towns and provide a good network for transport and communication.

WATER FACILITIES.

The district is exceptionally well watered by rivers and creeks. The principal stream is the Mary River, which drains an appreciable basin to the west of the Blackall Range, and travels in a northerly direction, entering the sea near Maryborough. The Mary River drainage system also

embraces a number of useful permanent creeks, the principal of these being Obi Obi, Yabba, Little Yabba, Kandanga, Amamoor, Six Mile, Eel, Glastonbury, Widgee, Wide Bay, and Munna Creeks. All these creeks provide useful stock and irrigation facilities in all seasons.

On the eastern fall of the Blackall Range watershed, the short Mooloolah and Maroochy River systems flow easterly into the Pacific Ocean. Further north the Noosa River system drains a vast area of wallum country and this river flows in a southerly direction, entering the sea at Laguna Bay. Complementary to the Noosa River system the extensive Tinana Creek, embracing Tagigan and Coondoo Creeks, flows northwards to provide the Maryborough water supply at Teddington Weir.

Practically every dairy farm in the district is undulating in nature and each property has a frontage to a permanent creek or gully, which provides excellent stock-watering facilities. Earth dams are not widely used for stock-watering in this district. Of recent years, more use has been made of windmills to supply permanent water from underground but the district cannot claim to have a true sub-artesian system.

Most wells are sunk into local soakage beds and the depth of water-bearing strata may vary from 20 to 80 feet, depending on the type of country.

Irrigation of agricultural crops plays an important role in this district, but practically all water is drawn from permanent rivers and creeks. The fruit and vegetable industries, however, often use dams and wells for a limited water supply, particularly for winter irrigation on frost-free slopes.

CLIMATE.

The Mary Valley district is subject to a wide range of temperature and rainfall. This is due to the variation from the large coastal fringe to the plateau country and thence to the drier western portion. Consequently, agriculture has developed in fairly distinctive zones in relation to rainfall. All sections of the district receive predominantly summer rainfall, with a moderately dry winter and early spring; hence cultivation is designed mainly for summer cropping. However, in years of suitable winter rainfall, winter crops and pastures flourish.

In some years frosts may be early and destructive, but on the average, frosts are moderate and do not cause great damage. Temperature and humidity are usually high in the summer. Drought periods of varying length occur not infrequently in the spring and summer months.

The average monthly rainfall for five recording centres in the district is shown in Table 1. Also included in the table are the mean maximum and mean minimum temperatures for Gympie.

SOILS.

The most important agricultural soils are the alluvials adjacent to the main rivers and creeks. These soils are very fertile and with suitable seasonal conditions produce heavy-yielding crops. They are mostly light-grey loams to dark-grey clay loams of good depth and with good drainage. Most of the agricultural crop production comes from these soils.

TABLE 1.

CLIMATOLOGICAL DATA FOR MARY VALLEY CENTRES.

Recording Centre.	Recording Period in Years.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average.
Rainfall in Points.														
Maleny	27	1,109	1,076	1,028	899	562	421	281	202	269	353	505	809	7,514
Cooroy	50	934	1,027	918	566	446	388	244	180	226	315	397	635	6,276
Gympie	73	657	658	613	343	291	260	207	165	202	273	333	540	4,542
Kilkivan	62	563	491	390	220	185	214	150	135	161	268	266	461	3,504
Tiaro	49	661	541	484	310	230	234	167	122	164	234	275	506	3,928
Mean Maximum Temperature (°F.).														
Gympie	26	88·5	86·9	85·1	82·1	76·9	72·0	71·6	74·1	78·9	83·7	86·7	88·5	..
Mean Minimum Temperature (°F.).														
Gympie	26	66·6	66·5	63·8	57·9	49·9	46·3	42·9	44·2	50·2	56·5	61·3	64·9	..

Plate 158.
Mixed Farming and Dairying Country at Kandanga.

In the drier areas of Woolooga and Kilkivan, agricultural crops are grown on undulating ridge country, where soils of a variety of textures are represented, ranging from light-brown sandy loams to the unusual dark-grey clay loams of the serpentine belt.

Along the coastal fringe there is much hilly country where the soils are usually shallow, mainly overlying schist or shale, and little agriculture is practised on them. Limited cultivation is carried out on the yellow clay loams of the poorly-drained flats.

Plate 159.
Mary River Country.

On the Blackall Range, particularly at Maleny, Montville and Mapleton, a characteristic group of red volcanic loam soils occur. These soils are well drained and are acid in reaction. In the virgin state they carried heavy rain-forest. The Maleny section of this belt of country was sown to pasture and now supports a thriving dairying industry. The Montville-Mapleton section in the past has been devoted to fruit-growing, but a trend to dairying is now occurring.

On the coastal fringe around Nambour-Woombye and at Goomboorian, areas of dark-brown to dark-red-brown loams are used for fruit and vegetable culture. At Bauple the red and brown loams are used for sugar-cane and fruit-growing.

Along the entire coastal strip of the area shown in the map is a stretch of country 10 to 20 miles wide which in the past has been collectively referred to as "the wallum." This area consists of lowlying coastal-plain country. It is made up of a series of low, rolling ridges only a few feet in height separated by extensive areas of lower swampy land. The soils are sandy for depths varying between two and four feet, the texture reaching a sandy loam on some of the better ridges. They are low in plant foods and are usually very acid in reaction. The ridges carry eucalypt vegetation which grades off into a stunted, shrubby vegetation of Banksia and grasstree. On the true swamps, the vegetation is mainly tea-tree and the soils silt loams and clay loams.

At present the low land with a high water-table and poor drainage is practically useless. On the other hand, the ridges which carry a pasture consisting mainly of kangaroo grasses provide useful grazing and are used as drought-relief country (Plate 160).

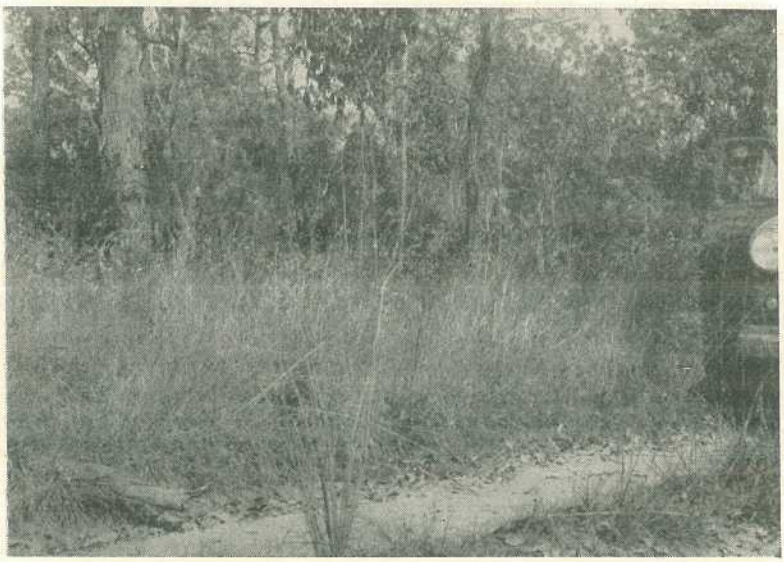

Plate 160.
Native Kangaroo Grass Pasture in Open Forest.

In view of present knowledge in relation to stock deficiencies and the new field of trace elements, some development of the wallum country may be practicable, as the rainfall over the area is good. Substantial

quantities of fertilizer as well as trace elements will no doubt be required in the first instance. Cattle in this country suffer traditionally from "softbone" and both therapeutic mineral treatment of stock and top-dressing of pastures and crops to correct deficiencies in the soil will be necessary.

A great variability in soils from farm to farm is found throughout the Mary Valley and it is impossible to generalise on soil characteristics. However, some important facts can be enumerated. The soils subject to heavy summer rainfall are all acid in reaction and have pH values ranging from 4·8 to 6·0. This acid condition reflects a deficiency of lime and is usually associated also with a deficiency of available phosphoric acid. Only a small amount of available nitrogen is normally present in the soils. The pastures generally lack a worthwhile legume population, so there is little scope for building up soil nitrogen by the use of pasture legumes. Where lucerne and annual summer or winter legumes can be grown on cultivated land, the problem is not so difficult.

Soil Erosion.

Most cultivation for agricultural field crops is carried out on alluvial flats or light slopes, and soil erosion is not a great hazard. The greatest hazard is present on the fruit and vegetable areas where steep, frost-free slopes are cultivated. Serious soil loss often occurs in these locations.

While most of the hills and ridges are under pasture cover little soil loss occurs, but a serious problem in the coastal hillside pastures is the occurrence of slips. These slips usually appear where clay loams overlie schist or shale; in wet seasons a large volume of saturated soil may slip or skid.

Cultivation is increasing in the Kilkivan area and signs of soil erosion have been observed in several instances there. Early attention to this problem will be beneficial.

In all areas, contour furrowing in pastures is a useful method whereby the volume of run-off water from slopes can be reduced.

VEGETATION AND PASTURES.

Before clearing commenced, a wide range of natural timber vegetation occurred throughout the district, varying from rain-forest on the Blackall Range country to river scrubs, with open-forest country in the drier western portions, and along the coastal strip a bastard type of scrub embracing softwoods and eucalypts.

Grass growth was negligible in the rain-forest and river scrubs, but in the open forest both forest blue grass (*Bothriochloa intermedia*) and Queensland blue grass (*Dichanthium sericeum*) were common. Throughout the higher rainfall belt amongst the bastard scrubs, kangaroo grasses (mainly *Themeda australis*) predominated. As in many other areas in Queensland, the blue grasses, kangaroo grasses and other valuable grasses were quickly eaten out and rapidly replaced by inferior species such as blady grass (*Imperata cylindrica* var. *major*), bracken fern (*Pteridium aquilinum*), bunch spear grass (*Heteropogon contortus*), pitted blue grass (*Bothriochloa decipiens*), and wire grasses (species of *Aristida*). Improvement of these native pastures presents a problem. Valuable areas of Rhodes grass have been established, and in recent years small areas of green panic (*Panicum maximum* var. *trichoglume*) have shown promise.

Plate 161.
Paspalum Pasture and Windbreak, Maleny.

Plate 162.
A Dairy Farm at Maleny.

However, useful grass species were available for sowing on cleared land, and in the Mary Valley district there now are extensive areas of introduced grasses. With the large-scale clearing of land which occurred between 1906 and 1924, thousands of acres were sown to paspalum (Plate 161) and Rhodes grass. In recent years, particularly on the Blackall Range country, extensive areas have been planted with kikuyu grass (Plate 162). These introduced grasses are responsible for maintaining the large dairying industry. A notable feature of the pastures is the lack of a good pasture legume. In recent years the invasion of mat grass (*Axonopus affinis*) into paspalum pastures has created a serious problem, particularly on the wet coastal strip.

Plate 163.
Coastal Pastures on Hillsides, Cooroy.

Much of the country is so hilly and steep that it does not lend itself to safe cultivation. Pasture-farming therefore plays a most important part in the prosperity of the primary industries of this district.

Pasture Renovation.

A number of problems have arisen on the extensive acreage sown to exotic grass species. Much of this area was sown to paspalum, and declining productivity of the grass is now a major problem. Paspalum pastures become sodbound after a number of years' grazing, and mechanical means of renovation are required to correct this condition. On shallow soils the use of cutaway disc harrows and the stiff-tine renovator (Plate 164) has given very good results, and provided the treatment is thoroughly carried out, excellent regrowth will occur following rain. On deeper soils the rotary hoe and the mouldboard plough have been used successfully. Although paddocks treated in this way require a considerable spell before grazing, it is considered that the improvement in pastures which is obtained makes drastic treatment of this type well worth while.

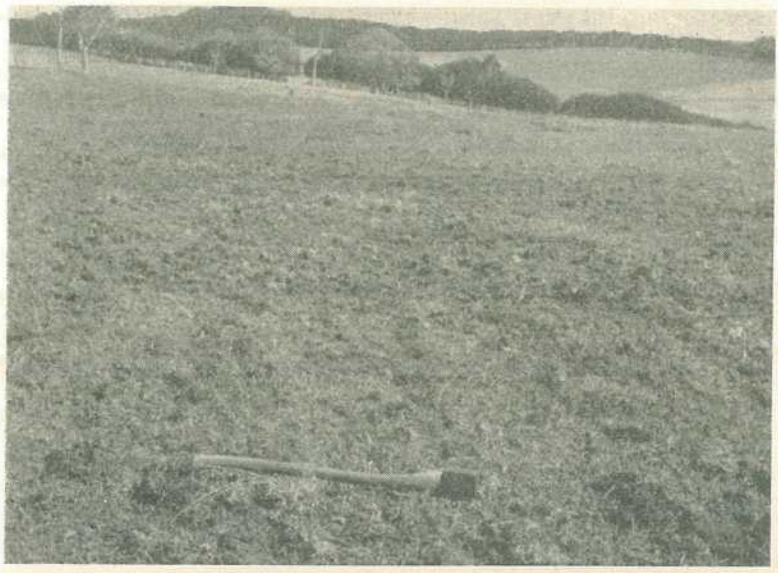

Plate 164.
Tine Renovation of Paspalum Pasture, Maleny.

Kikuyu pastures tend to become rootbound after a number of years' grazing, but this grass also rapidly responds to pasture renovation (Plates 165–166). Rotary hoe and disc plough renovation have both provided promising results and are used, particularly on the Maleny plateau.

Considerable work has been undertaken in renovation and reseeding of pastures infested by mat grass, but to date results are variable and further detailed investigation is required.

Plate 165.
Drastic Disc Plough Cultivation of Kikuyu Sod, Maleny.

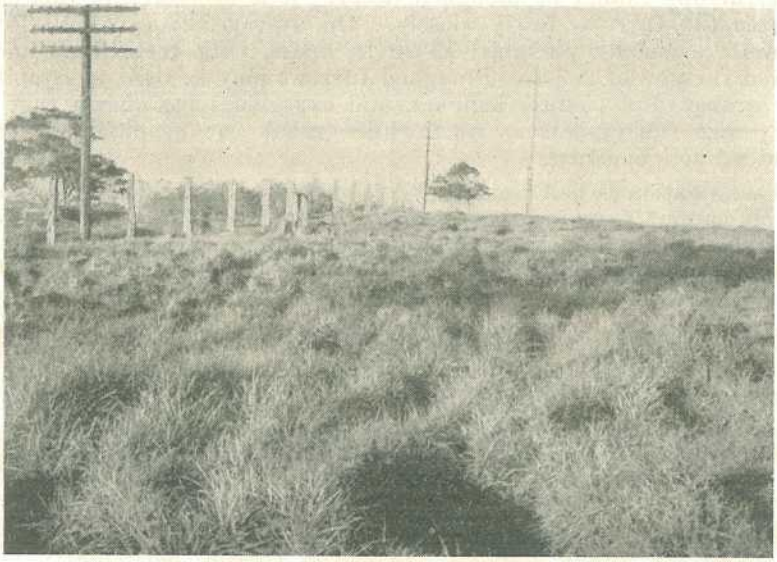

Plate 166.

Regrowth of Kikuyu Pasture Following Disc Plough Renovation.

Pasture Contour Furrows.

On pasture slopes ranging from 10% to 25%, the system known as pasture furrowing has proved of value. On such slopes during sudden storms, water run-off may be considerable. The obstruction to water movement provided by contour furrows helps to trap and hold such water and penetration of storm rains into the pasture sod is improved. Most of the hillside country has shallow soil and as a

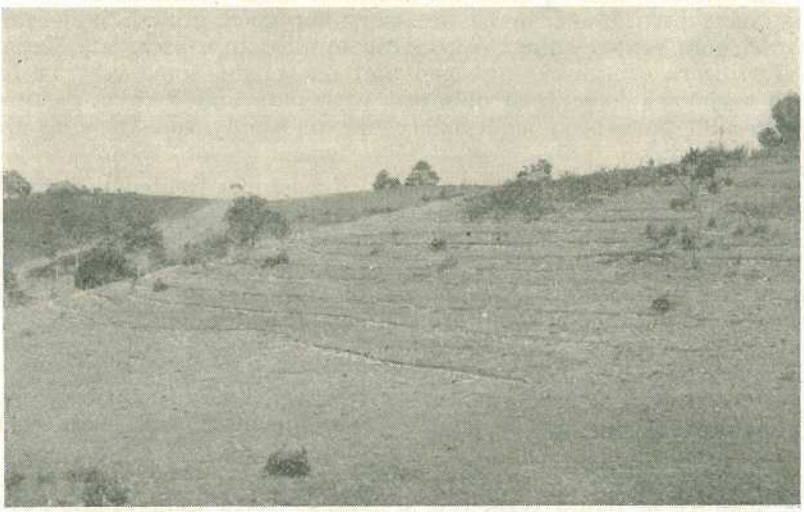

Plate 167.

Contour Furrowing a Coastal Hillside Pasture of 22% Slope.

result furrows cannot be ploughed deeply; it is necessary in this case to space the furrows fairly closely. On average slopes of 10–15%, furrows are usually ploughed 12–20 ft. apart, with vertical distances between furrows of 2–3 ft. Ploughed furrows may be used to establish other grasses and pasture legumes, and experience has shown that in the average run of seasons worthwhile growth can be obtained from the added soil moisture.

Investigation is being continued to determine the economic usefulness of contour furrowing in pastures. Indications are that contour furrowing will be a very useful supplement to other methods adopted for pasture improvement.

Topdressing.

All pasture lands throughout the district are acid in reaction and are low in available phosphates. Such soil conditions have helped to aggravate the poor growth of grass, while pasture legume growth is particularly poor over a wide area. From analyses of soil samples it is known that the rate of lime or dolomite application required may vary from 10 cwt. to 2 tons per acre and that of superphosphate from 1½ cwt. to 2 cwt. per acre. Topdressing of pastures in the Mary Valley, usually with lime and superphosphate, is a comparatively recent practice and is not yet widely adopted. Beneficial results, particularly with legume establishment, have been achieved in experiments on the use of soil amendments, and in average seasons, reasonable returns can be anticipated, especially where heavy lime dressings are not required.

Where soils are known to be deficient in lime and phosphoric acid, it is recommended that farmers treat small strips with lime or dolomite or with superphosphate as required and observe the response of the treated pastures compared with untreated areas before applications on a wide scale are attempted.

Trace Elements.

On the wet coastal fringe, symptoms of copper deficiency have been observed in stock, and in some horticultural areas additions of molybdenum have been found to be necessary for good growth in certain crops. Where copper sulphate has been applied to soils in association with fertilizers containing nitrogen and phosphate, some very useful growth responses have been obtained with oats and kikuyu pasture. These results have been achieved so far on sandy soil fringing the wallum country.

In the main dairying area, growth of pastures treated with trace elements has not been superior to that of pasture to which lime and superphosphate have been applied. Trace-element investigations, however, are being continued. It is possible that the heavy lime applications often necessary to produce an appreciable response in legume growth may be reduced by using small applications of molybdenum.

Manure-spreading.

Manure-spreading is not widely carried out, but a few progressive dairy-farmers on the Maleny Plateau collect manure and urine from the bails and pigyards and store this material until it is convenient to apply it to pasture. The system usually employed entails gravitation of the manure in liquid form into a suitably lined tank (Plate 168). When the tank is full, the contents are syphoned onto the pasture or spread from a portable tank. The rate of application of this semi-liquid

manure is very heavy. From 10 to 20 tons may be used per acre, and the application is rather slow, but good results have been observed, particularly on unproductive pasture land. The system employed could well be adopted by many farmers, even though levelling and cementing of yards and pens may be fairly expensive. On too many farms cowyard manure is regarded as a nuisance rather than as an asset. Until the problem of the proper collection and distribution of farmyard manure on pasture or cultivation has been solved, no dairy farm can claim to be fully efficient.

Plate 168.

Concrete-lined Farmyard Manure Pit with Sump and Pipe Syphon, Maleny.

The harrowing of paddocks carrying large stock numbers will help to spread manure and promote more even pasture growth. The practice is of particular value for night paddocks.

Subdivision.

Subdivision of large grazing paddocks into smaller areas has been found to be very useful in the dairying districts of the Mary Valley. Dairy cows will not graze large paddocks evenly, and the quick, close cropping in smaller paddocks makes better use of the pasture. Experience has shown that as many night paddocks as day paddocks are required in order to prevent dung contamination of a few paddocks. Paddocks large enough to carry the herd for 3–4 days or nights provide a quick turn-around and maintain a short crisp bite of pasture.

Plate 169.
White Clover in Pasture along the Mary River.

Pasture Legumes.

A number of pasture legumes, both annuals and perennials, have been tried in the Mary Valley; to date, the most promising are white clover, red clover, and lucerne. These legumes will make good growth, particularly where lime and phosphate treatments have been applied, and will provide late-winter and spring grazing prior to the summer flush of normal summer-growing pastures.

Pilate 170.
A White Clover-Rhodes Grass Pasture.

In good seasons, such as 1950, when satisfactory winter and early-spring rain occurs, white clover grows prolifically along the alluvial flats of the Mary River system (Plate 169) and on the Maleny Plateau. The Maleny Plateau, by virtue of its height and close proximity to the sea, enjoys in most years a well-distributed annual rainfall and it is not uncommon to find white clover growing as a perennial. However, in very favourable seasons the growth of white clover at Maleny may be too prolific and cause bloating of ruminants if not carefully grazed.

In many pastures the summer-growing native tick trefoil (*Desmodium triflorum*) and the exotic lespedeza (*Lespedeza striata*) contribute valuable legume balance to summer-growing pasture mixtures. In good seasons these legumes make a valuable showing and they are spreading fairly rapidly in some districts.

In the drier western portion of the Mary Valley area, trial sowings of Townsville lucerne are showing promise and this plant has been able to regenerate successfully over three seasons.

Native pasture legumes are common and include species of *Glycine, Rhynchosia* and *Vigna*. All are summer-growing in habit and make prolific growth in early spring, particularly in association with native pasture grasses.

Despite the presence of native summer-growing legumes and introduced winter species in some localities, the overall position of pasture legumes in the Mary Valley is far from satisfactory. Intensive investigations are necessary in an endeavour to rectify this position.

Weed Problems.

As in most mixed-farming areas, weeds are a problem both in pastures and in cultivated crops.

Blady grass and bracken fern are the most important pasture weeds, but the invasion of pastures by inferior grass species such as the mat grasses (*Axonopus affinis* and *A. compressus*) and sour grass (*Paspalum conjugatum*) is causing much concern at present, particularly on steeply sloping land where cultivation is not practicable. Other troublesome pasture weeds include lantana, wild tobacco (*Solanum auriculatum*), poison peach (*Trema aspera*) and Scotch thistle (*Cnicus lanceolatus*).

Many weeds occur in cultivations, but Noogoora burr (*Xanthium pungens*) and nut grass (*Cyperus rotundus*) are the most serious problems, particularly on the alluvial flats. Johnson grass (*Sorghum halepense*) and turnip weed (*Rapistrum rugosum*) are also very common on some farms.

The availability of hormone-type weedicides has eased the problem of control of those weed species which are susceptible to these compounds, but little progress has been made so far with chemical treatment of blady grass and bracken fern on an economic basis. Where cultivation can be carried out, neither of these weeds is beyond control, but on broken, steep and poorly-cleared country, practical control measures are not available at present.

AGRICULTURAL CROPS.

The wide range of climatic factors and soil types in the Mary Valley favours the cultivation of many crops. The main agricultural crops are grown for use by the dairying and pig industries. The district is not a large exporter of produce from agricultural crops, the trend being to use more and more of these products on the farm each

year. Apart from the large sugar and fruit-growing industries, it is estimated that about 24,000 acres are cultivated annually for agricultural crops.

Maize.

Maize is by far the most important individual grain crop and is also widely grown for green feed. The alluvial flats lend themselves admirably to the successful cultivation of maize (Plate 171). Maize acreages on individual farms are not large, but all farmers with suitable soil grow the crop.

Plate 171.

Well-cultivated, Five-weeks-old Maize in the Mary Valley.

For many years the varietal position was static, being based upon a number of the best available open-pollinated varieties. Improved Yellow Dent, Early Leaming, Star Leaming, Red Nib and Ninety-Day types were most popular and gave reasonable yields. The recent introduction of hybrid-maize varieties has created widespread interest and very encouraging grain yields from these hybrids have been reported from many centres.

The crops are usually grown without fertilizer and are normally hand-harvested as required on the farm. Three or four mechanical maize-pickers are in operation but do not handle a large acreage.

Normal district maize plantings are in the vicinity of 4,500 acres per year, and the yield is approximately 135,000 bushels of grain. At least 95% of this grain is used on farms for stock-feeding purposes.

It is not expected that any large increase in maize acreage will occur, as marginal soil areas are now being planted to the hardier grain sorghums.

Sorghum Group.

Of recent years, greater interest is being taken in growing crops of the sorghum group. This trend is particularly noticeable in respect of grain sorghum. Several header-harvesters are now operating in the district, and some fine crops of grain sorghum have been grown, particularly in the drier areas of Woolooga, Kilkivan and Cinnabar.

The Wheatland variety is popular because of the good yields obtained with it. Grain losses due to birds and insect pests are liable to be heavy, particularly in the coastal districts.

Sweet sorghum and Sudan grass are grown on many farms but do not enjoy widespread popularity. Much greater use should be made of these fodders. Sudan grass is favoured as a grazing crop in the drier areas of Woolooga and Kilkivan.

It is estimated that 3,500–4,000 acres are now sown annually to grain sorghum, sweet sorghum and Sudan grass. Yields of grain sorghum vary from 20 to 40 bush. per acre, with sweet sorghums and Sudan grass yielding from 10 to 20 tons of green material per acre, depending on seasonal conditions.

Plate 172.

A Crop of Victoria x Richland Oats on Alluvial Flat Beside the Mary River.

Millets.

Wide interest is taken in the growing of millets, particularly for green feed. These crops are grown singly or in a mixture with Poona peas. Valuable results have been obtained by using millets for grazing and hay production.

Perhaps the greatest advantage of growing millet crops is the fact that they are early-maturing and can be sown in late spring or early summer for a quick supply of green feed.

The area sown to millets remains fairly constant at 1,200 acres per annum and it is not expected that much increase will occur.

Winter Grazing Crops.

The large area sown to winter grazing crops is an outstanding feature. As all the main pasture species are summer-growing types, the need for winter supplementary grazing crops is clearly apparent.

Oats.—Oats is the most popular and the most widely grown of the winter-cereal grazing crops. It is estimated that 7,200 acres are sown annually, mostly for grazing. Small areas are made into hay or harvested for grain.

There has been a big change in the demand for oat varieties. The old standard varieties, such as Algerian, Belar, Buddah, Fulghum and Sunrise, are all susceptible to heavy crown-rust damage. With the introduction of the new crown-rust-resistant types, such as Vicland (Victoria x Richland) and Fultex (Fulghum x Victoria), farmers

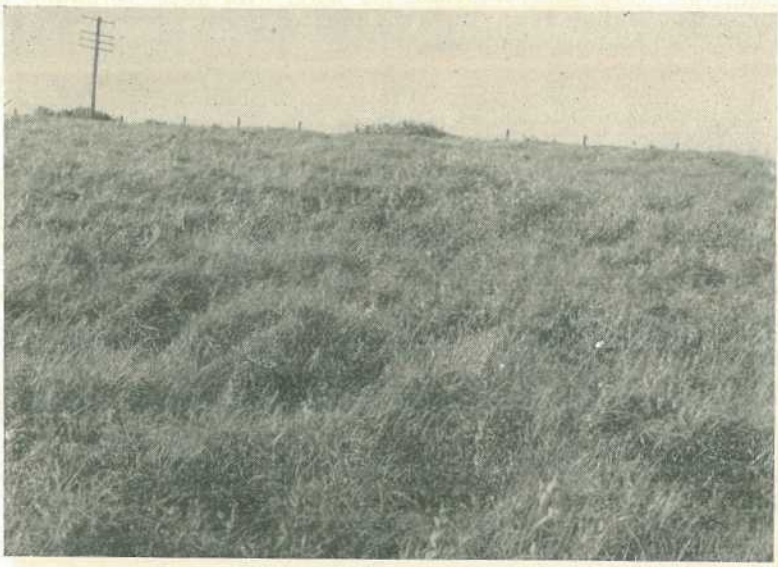

Plate 173.
Oats and Field Peas Oversown on Disc Plough Renovated Kikuyu Pasture.

are changing to these varieties as rapidly as the availability of seed permits. Oats for grazing and hay will always be a very popular crop with dairy farmers in the Mary Valley and these new oat varieties have enhanced the value of this crop.

Barley.—Barley is used by many farmers as a subsidiary grazing crop, with small areas being harvested for grain. Approximately 900 acres are grown annually, the most popular varieties being Skinless and Cape; small sowings of malting barley are occasionally grown for grain. The overall acreage under barley shows no sign of increase.

Wheat.—Wheat is grown both for grazing and for grain production, but the area is small, being approximately 600 acres. Standard dual-purpose varieties such as Warput have been grown with success for a number of years, but recently the rust-resistant variety Lawrence has been used more widely. Most wheat crops are grown for grain, but if seasonal conditions do not favour grain production the crops are used for grazing.

Small areas of a wheat-field pea mixture are also sown for green feed.

Lucerne.

Lucerne is very widely grown along river and creek alluvial flats, both for grazing and for hay production, and some 4,200 acres are under this crop each year. The deep, fertile soils on these flats are very suitable for lucerne-growing and irrigation facilities are readily available.

The district is not a large producer of lucerne hay. Though little of the crop is marketed outside the district, insufficient is stored on farms as insurance against droughts and seasonal shortages. Most farmers could make far greater use of farm-conserved hay, the value of which in drought times is universally recognised.

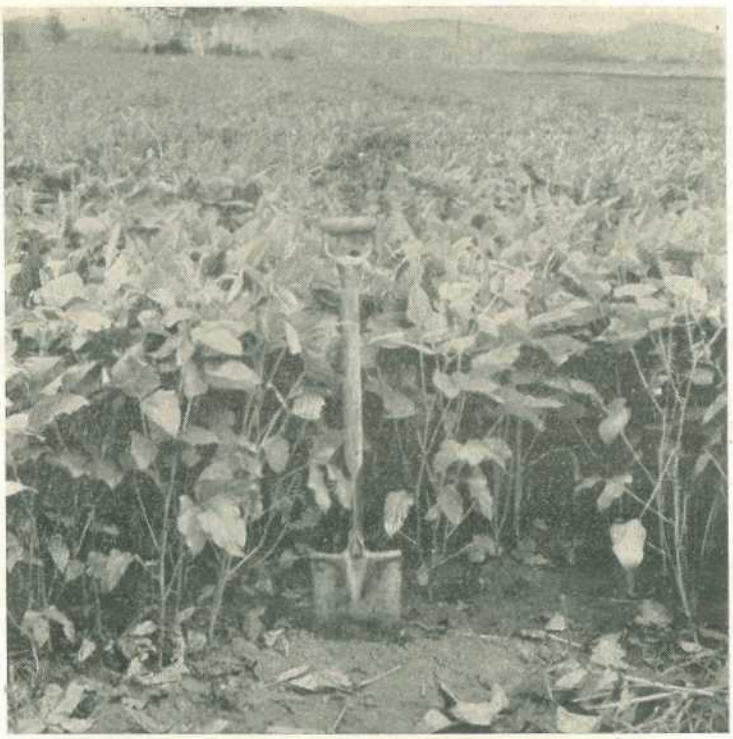

Plate 174.

A Well-grown Poona Pea Crop, used for Grazing and Green-manure purposes.

Additional interest is being taken in the crop, particularly on the heavier soils where the use of lime and fertilizer has shown responses. Lucerne should also be used more throughout the district as a constituent of pasture mixtures.

The main variety grown is Hunter River Broadleaf, and farmers have found inoculation of the seed to be advantageous in establishing fields.

Miscellaneous Green Crops.

Under this heading are included two useful fodder legumes, Poona peas (Plate 174) for summer culture and field peas for winter. Each year farmers plant from 800 to 1,000 acres of these crops. Both crops

are grown primarily for grazing and green-manure purposes, but when weather conditions are satisfactory, good hay can be made.

As stated previously, Poona peas are often grown in association with millets for summer feed, and in winter, field peas may be mixed with winter cereals. Wider use should be made of these fodder legumes both for stock-feed and for soil-renovation purposes.

Cowcane and Fodder Sugar-cane.

Cowcanes and sugar-canes used for stock fodder are worthy of special mention. Each year farmers have some 600 acres of this fodder crop under cultivation. During the 1951-52 drought, standing crops of cowcane provided excellent reserves of succulent stock fodder for many farmers. Experience in the Gympie district has shown that, as a source of nutritious bulk for dairy cattle, no other crop will yield so heavily and stand in the field so long without serious deterioration.

Much greater use can be made of this crop, particularly along the coastal fringe where frosting is not severe. Farms with 2–3 acres of cowcane are able to withstand long dry spells without stock losses. The varietal position is somewhat confused, but at present the cowcanes 90-Stalk and Improved Fodder Cane, and the sugar-cane variety P.O.J. 2878, are mainly used for this purpose.

Pumpkins.

Pumpkins are grown on many farms but are usually grown for stock-food, chiefly for pigs, rather than for sale. Pumpkins are grown as a rotation crop on alluvial soils but yields are not high. The district acreage is estimated at approximately 2,000.

The variety most commonly grown is Beaudesert or Queensland Blue, with individual preferences in certain areas for cattle pumpkins and grammas.

Potatoes.

Potatoes are not a major crop in the district, but good crops are grown on alluvial flats, particularly where irrigation facilities exist. Individual farm areas are usually small, varying from one to 10 acres. Both autumn and spring crops are grown. It is estimated that the area planted annually does not exceed 400 acres.

Yields per acre are extremely variable and range from 1–3 tons per acre without irrigation to 4–10 tons with irrigation. Factor has been the most popular variety for many years, but of recent years the new varieties Sebago, Sequoia and Saranac have gained increasing favour.

Certified Seed.

The new interest engendered by hybrid maize has encouraged the production of certified hybrid maize seed within the district. So far it has been possible to meet the district demand for hybrid seed and in addition supply a quantity for adjacent districts.

A limited quantity of certified Wheatland grain sorghum has also been grown and produced. The wetter sections of the district, however, are unsuited for the production of sorghum seed of good quailty.

Varieties of certified seed produced in the 1950-51 season were—

Hybrid Maize: Q 499, Q 431, Q 716, Q 717.
Grain Sorghum: Wheatland.

HORTICULTURAL CROPS.

The area is very important for the production of fruit and vegetable crops, and each year the district derives a big income from this source. Pineapples, bananas, papaws and citrus fruits constitute the main fruit crops, and each winter, planting of French beans provides a steady farm income.

Each year some 14,000 acres are cultivated to orchard and plantation fruit crops and vegetables for sale.

FORESTRY.

Valuable forestry reserves and reafforestation plantations are situated throughout the district. In association with forestry projects, extensive sawmilling plants operate for local and export sales of hardwood and pine.

Plate 175.
Dairy Cows in Kikuyu Pasture, Maleny.

DAIRYING AND GRAZING.

As stated earlier, a close link exists between agricultural pursuits and the dairying and pig-raising industries. Farm sizes vary from 100–150 acres in the closely settled areas to 300–700 acres in the drier, open-forest areas. The stock-carrying capacity varies with the type of country concerned. On the good pasture lands of the smaller farms, one beast is carried per three acres on the average, while on the poorer pastures in the drier areas one beast to 10 acres is usual.

Statistical returns show that 235,000 cattle and 35,000 pigs are carried on farms in this area. Of the cattle listed, a small percentage are beef cattle. These beef cattle are maintained mainly in the dry, open-forest area on the western fringes of the district. Both breeding and fattening are carried out, depending on the type of country and feed available.

Dairy production is extensive and provides about 15% of Queensland's total annual butter production. Butter production at the main centres of manufacture in 1949-50 is shown below.

Factory.	Butter Production. lb.
Gympie	7,286,913
Pomona	1,667,745
Cooroy	1,427,514
Eumundi	2,073,461
Maleny	2,701,209
Total	15,156,842

Both the Jersey (Plate 175) and A.I.S. breeds are well represented throughout the district. The former appear to be more adaptable to the smaller farms, while A.I.S. cattle appear to be very well suited to the larger properties in the Woolooga and Kilkivan areas.

In the past the dairying industry has depended mainly on pastures and green-fodder crops for maintaining production. However, the weaknesses of this system have been very evident in drought years such as 1951. At present there is a definite trend towards conservation of hay and storage of grain, and hand-feeding of stock is receiving attention. It is very desirable that farmers with suitable areas of cultivation should adopt some form of fodder conservation.

Labour shortages and high farm wages have hindered expansion of fodder conservation considerably. Due to the high cost of labour and handling facilities, very little interest is shown in silage-making in Mary Valley dairying districts.

From experience gained in the last drought, the most suitable fodder reserves appear to be hay and grain and most reliance must be placed on these. It is anticipated that good prices for dairy products will stimulate a wider and more effective interest in fodder conservation than has been the case hitherto.

Beef cattle are not fed on crops in the district nor are they normally fed with hay or grain. Fattening on native pasture grasses is carried out successfully in most years, particularly on hilly country unsuited to agricultural activities.

Queensland Year Book, 1951.

The twelfth issue of the Queensland Year Book has just been published by the Government Statistician.

The volume contains 429 pages, in which is provided a comprehensive survey of a number of aspects of Queensland life—economic, financial, social and administrative. There are chapters on government, population and health, public justice, social services, land and settlement, production, transport and communication, trade, marketing, prices, employment, public finance and private finance. There are numerous supporting tables, and a convenient summary of statistics appears as an appendix.

The Year Book is available from leading booksellers and from the Government Statistician, Brisbane, for two shillings a copy.

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 25th NOVEMBER, 1952.)

Breed.	Owner's Name and Address of Stud.
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. W. Wyatte, Rocky Creek, Yarraman
	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
	C. F. W. and B. A. Schellback, " Redvilla " Stud, Kingaroy
	R. H. Crawley, " Rockthorpe " Stud, via Pittsworth
	F. R. J. Cook, "Alstonvilla," Woolvi, 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.
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
	O. H. Horton, Mannuem, Kingaroy

TESTED HERDS—continued.

Breed.	Owners Name and Address of Stud.
Large White—*continued*	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
Tamworth	S. Kanowski, " Miecho " Stud, Pinelands N. R. Potter, " Actonvale " Stud, Wellcamp D. F. L. Skerman, " 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 P. V. Campbell, Lawn Hill, Lamington 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
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 G. J. Cooper, "Cedar Glen", Yarraman J. B. Dunlop, Acacia Road, Kuraby A. Curd, Box 35, Jandowae

The 1952 Pig Meats Carcass Competitions.

F. BOSTOCK, Officer-in-Charge, Pig Branch, and Competition Judge.

THE Australian Meat Board, in association with the Department of Agriculture and Stock and with the co-operation of all sections of the industry, this year conducted its fifth Baconer Pig Carcass Competition on a district basis. Judging and field days in the respective districts were conducted in May at Mareeba, Rockhampton, Toowoomba, and Brisbane.

Prize-winners.

The championship was awarded to Mrs. M. Forde, of the Rockhampton area, for a purebred Large White carcass with a score of 85%. The carcass was well proportioned and of good type, and scored well in all points.

Prize-winners in their respective districts were as follows:—

Prize.	Owner.	Breed.	Weight (lb.)	Points.
		Northern.		
1st ..	T. H. Cailes ..	Berkshire	164	84½
2nd ..	J. B. Smith ..	Berkshire x Large White	169	84
3rd ..	R. Clacherty ..	Berkshire x Large White	153	83
		Central.		
1st ..	Mrs. M. Forde ..	Large White ..	134	85
2nd ..	N. Holmes	Berkshire	128	81½
3rd ..	F. N. Baxter ..	Berkshire	150	81
		Darling Downs.		
1st ..	G. H. Handley ..	Berkshire	147	84
2nd ..	O'Brien and Hickey	Berkshire	148	83½
3rd ..	L. Puschman ..	Berkshire	172	83
		South Queensland.		
1st ..	Q.A.H.S. and College	Berkshire	136	84
2nd ..	C. A. Wharton ..	Large White ..	158	83
3rd ..	W. G. Eisenmenger	Wessex x (Gloucester Old Spot x Tamworth)	133	82½

Field Days.

Field days were again arranged to coincide with the judging at each district centre and it was very pleasing to note the popularity of these days with the farmers, who gave good support by attending in numbers.

Officers of the Department of Agriculture and Stock, together with the Works Management in each district, went to considerable trouble to make these field days as instructive and interesting as possible. Farmers were afforded the opportunity of inspecting the carcasses entered in the competition, inspecting the bacon factory or meatworks and listening to addresses on subjects dealing directly and indirectly with pig production.

Comments on Entries.

The Hammond System of carcass appraisal was again used in judging. To qualify for entry into the competition, the pig in the first place must have been sired by a purebred boar and the dressed carcass had to weigh not less than 120 lb. and not more than 180 lb.

That the competitions were again a success was borne out by the fact that in all 172 entries were received; of these 149 carcasses were judged and 140 were eligible for competition. This represents an increase over last year of 12 carcasses competing in the competitions and an increase of 13 entries received. No doubt had seasonal conditions been more favourable, the number of carcasses presented for judging would have been greater. Of the nine carcasses disqualified, five were overweight and four underweight.

While the top score (85%) and the average score (70·629%) were not quite so good as last year, competitors are to be congratulated on the general quality of their entries, especially when the unfavourable seasonal and feed conditions experienced are given due consideration.

The hams were not quite so well fleshed as last year; this is unfortunate when it is realised that the ham is one of the highest priced cuts. Farmers should continue to select breeding stock showing good development of hams.

The shoulders again scored well, but continued careful selection is necessary if the present high standard is to be maintained.

Streak or belly did not score so well as last year, and careful feeding and selection will have to be given further consideration, because a streak that is thick and contains a large percentage of flesh adds to the value of the bacon rasher. There were several streaks of very good quality judged.

Eye muscle scored reasonably well, indicating that producers have continued the careful selection of breeding stock and given attention to the rations fed during the early life of the pig.

Backfat development was very fair, but with adverse seasonal conditions, many carcasses were unfinished. This bears out the result obtained in a recent experiment conducted by the Department of Agriculture and Stock, which indicated that an improvement in backfat thickness is possible by increasing the fibre contained in the rations fed to baconer pigs during the finishing period.

Body length scored particularly well and as with the backfat development would appear to indicate that considerable improvement is possible by the feeding of rations containing a larger proportion of fibre than is generally practised.

Leg length, which gives an indication of the quantity of bone contained in the carcass, was only fair, there being a distinct tendency on the part of all breeders to overlook this point, with the result that leg length was too great in a large percentage of carcasses.

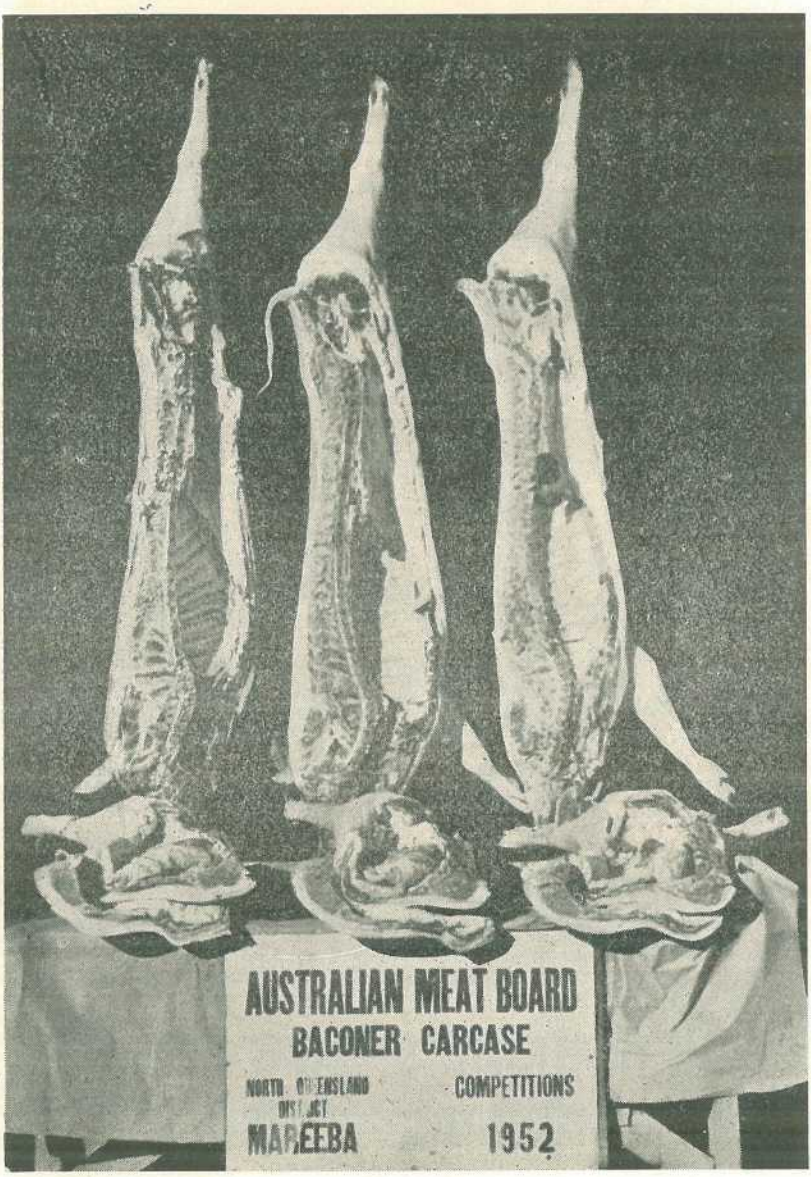

Plate 175.

Prize-winners in the Northern District Competition.

The overall score represents a praiseworthy effort on the part of all competitors and as was the case last year the score secured for 1st, 2nd and 3rd places in each district was not below 80%.

From Table 1, which sets out the points scored for each of the five years since the commencement of these competitions, it will be noted that an overall improvement of approximately 10% has been secured in the quality of the carcasses entered for competition.

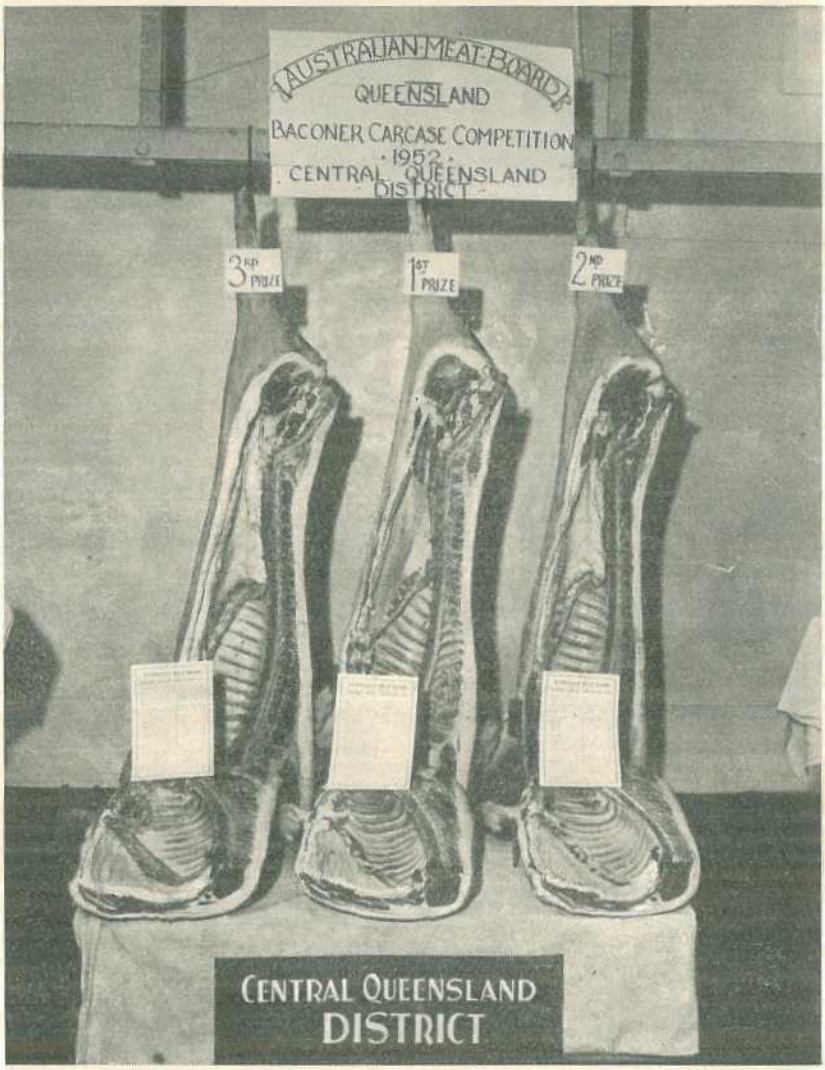

Plate 176.

Prize-winners in the Central District Competition.

Plate 177.

Prize-winners in the Darling Downs District Competition.

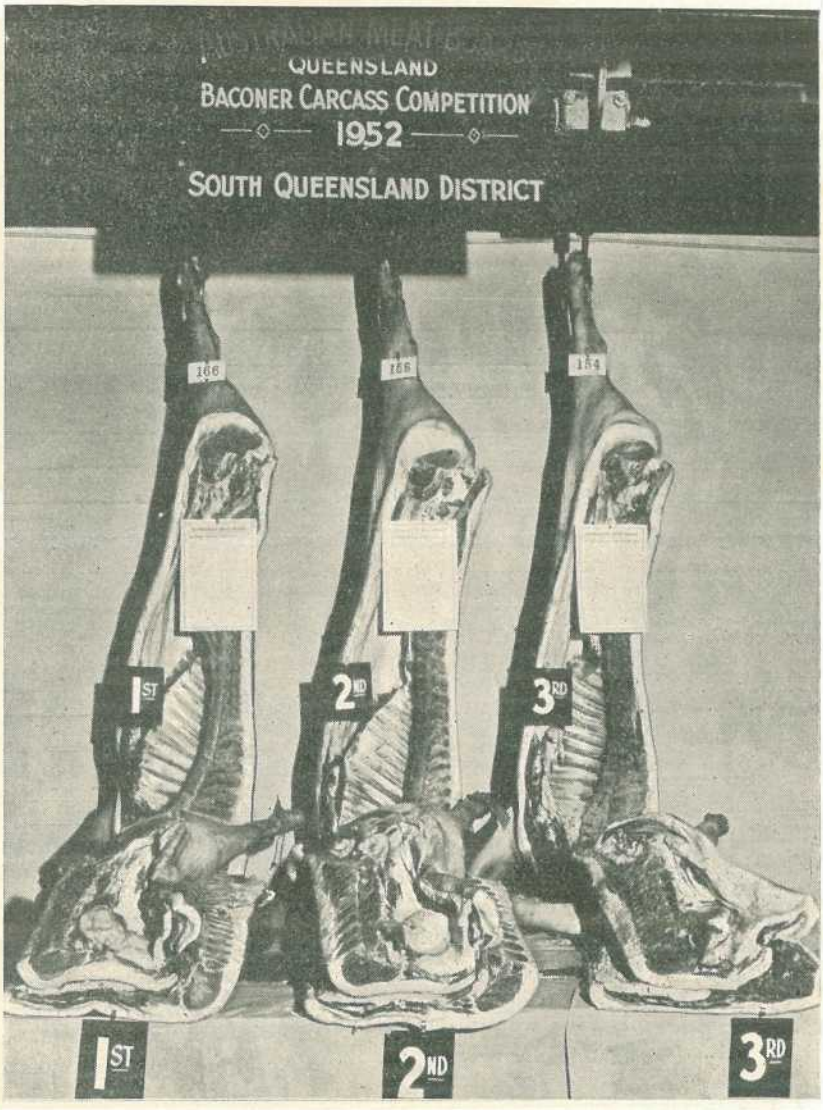

Plate 178.

Prize-winners in the South Queensland District Competition.

TABLE 1.

AVERAGE POINTS FOR EACH SECTION OF JUDGING.

—	Possible Points.	1948.		1949.		1950.		1951.		1952.	
		Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.	Average Points Obtained.	Percentage of Possible Points.
By Inspection—											
Hams ..	8	5·604	70·050	6·27	78·40	6·097	76·213	6·44	80·52	6·286	78·571
Shoulders ..	7	5·562	78·029	5·92	84·57	5·849	83·564	5·92	84·60	5·947	84·959
Streak ..	12	6·764	56·367	5·57	46·40	7·766	64·724	7·41	61·79	6·982	58·185
By Measurement–											
Eye Muscle ..	28	11·775	58·875	18·04	64·42	14·262	50·936	20·15	71·96	19·114	68·265
Backfat Thickness	20	15·489	77·445	15·26	76·30	14·572	72·864	15·45	77·23	14·729	73·643
Body Length..	20	12·500	44·643	13·06	65·30	13·388	66·941	12·98	64·92	14·814	74·072
Leg Length ..	5	3·111	62·220	3·02	60·40	3·281	65·631	3·21	64·22	2·757	55·142
Totals ..	100	60·805		67·97		65·218		71·57		70·629	

Nosema Disease of the Honeybee.

C. ROFF, Adviser in Apiculture.

NOSEMA disease was recorded for the first time in Queensland in one hive of an apiary near Brisbane, during August of this year. It is an infectious disease of adult honeybees and is found in all the principal beekeeping regions of the world. Individual bees and sometimes colonies die from its effects, but rarely is an entire apiary destroyed.

The causal organism of Nosema disease is a microscopic, single-celled animal parasite *(Plate 179), which during one stage of its life history forms resting bodies or spores. The spores after being ingested by the bee germinate within the stomach, and the resultant new parasites invade the cells lining the inner surface of the mid-intestine, where in 3-5 days they mature and produce a further crop of spores. These pass into the rectum and are ejected with the faeces, which some infected bees abnormally void within the hive. Other bees in the same manner contaminate watering places.

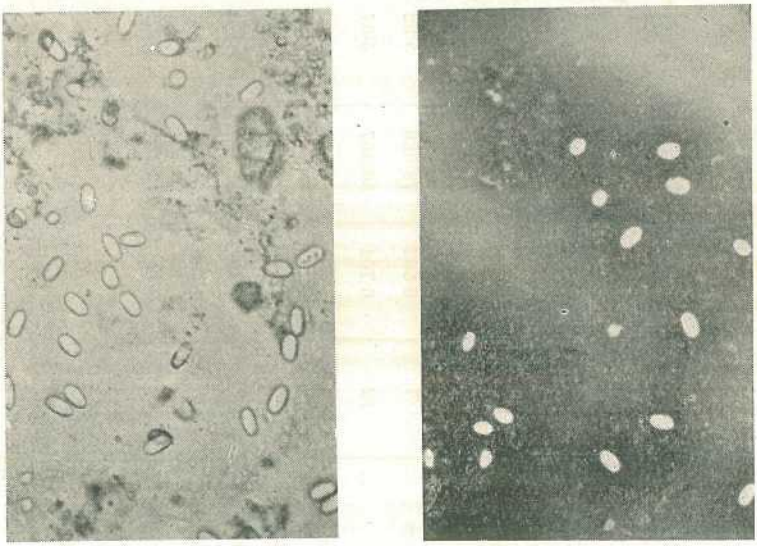

Plate 179.

Spores of Nosema apis in Water (left) and in Stain (right). Magnified 600 times (After Dade).

* *Nosema apis* Zander.

Transmission of Nosema disease to other bees and to other hives is brought about by the ingestion of water and food contaminated with the faecal droppings of infected bees. Robber bees are also responsible for hive-to-hive infections. Overseas experience indicates that the disease is unlikely to be transmitted by tools, or by the clothes or hands of the beekeeper.

Features of the Disease.

(1) All races of honeybees appear to be susceptible to Nosema disease.

(2) Workers are most often infected, although occasionally the parasite has been found in drones and queenbees. Brood is not infected.

(3) Nosema is widespread in cold regions, where the bees are confined to the hives during most of the winter. In warmer regions, where bees may fly almost every day in the year, it is found less frequently.

(4) The occurrence of the disease is seasonal, being most noticeable during late winter and spring. The infection subsides during summer, but increases in late autumn and again reaches a peak during the following late winter and spring. At other times, however, the disease may be aggravated by periods of cold, damp weather.

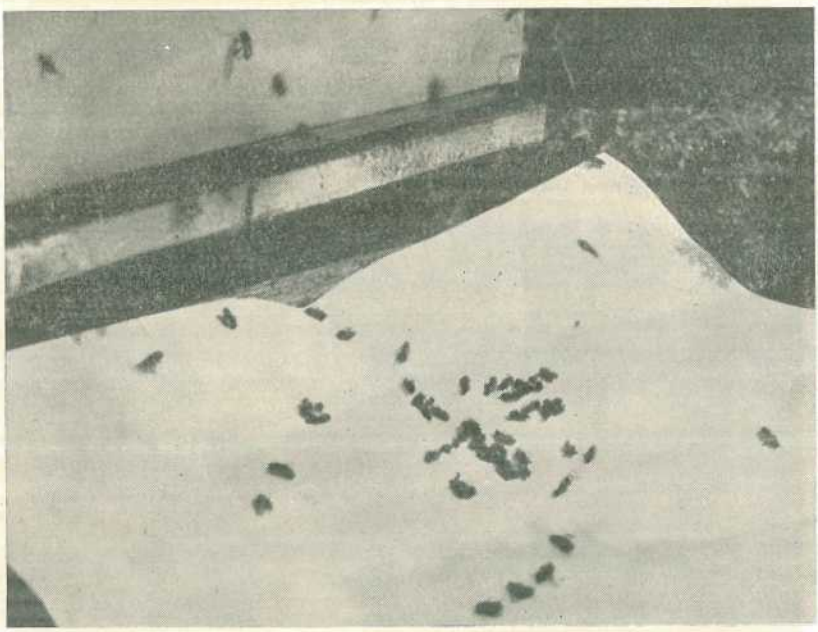

Plate 180.

Dead Bees, Infected with Nosema Disease, in Front of a Hive.

Symptoms.

Positive diagnosis is dependent upon the presence of spores of *Nosema apis* in the mid-intestine, and this can be ascertained only by microscopic examination. Gross symptoms are of limited value, as apparently healthy bees may, upon microscopic examination of the stomach, show the presence of spores in large numbers. Nevertheless,

the disease may be suspected if the symptoms described below are present, and specimens should then be submitted for examination. It should be kept in mind, however, that other disorders exhibit similar symptoms, and therefore it does not follow that the trouble is Nosema disease if any or all of the following symptoms are present.

(1) The colony is noticeably restless and weak. Dead and dying adult bees may be noticed in front of the hive (Plate 180), or the colony may dwindle slowly in strength due to steady loss of bees which die inconspicuously away from the hive.

(2) Dysentery may occur and this is evidenced by yellow, crusty faecal spots on the hive floor and alighting board.

(3) Heavily infected bees crawl feebly on the ground and are unable to fly or sting. The abdomen is often distended, shiny and hairless; the wings unhooked and askew; and the legs dragged as if paralysed.

Preventive Measures.

The following measures will minimise the incidence and spread of Nosema disease If these are adopted as standard beekeeping practice it is unlikely that the Queensland beekeeper will encounter the disease.

(1) The apiary and flight approach of all hives should be kept clean and dry, and colony strength maintained by providing the food, hive space, and protection required for each particular period of the year.

(2) Stagnant watering places (Plate 181) should be eliminated, as these are easily contaminated with spores from infected bees. If running water is not available and containers for water are used, these should be cleaned and recharged regularly, and *always* placed in sunny positions. The spores of *Nosema apis* in water exposed to sunlight are killed in about three days.

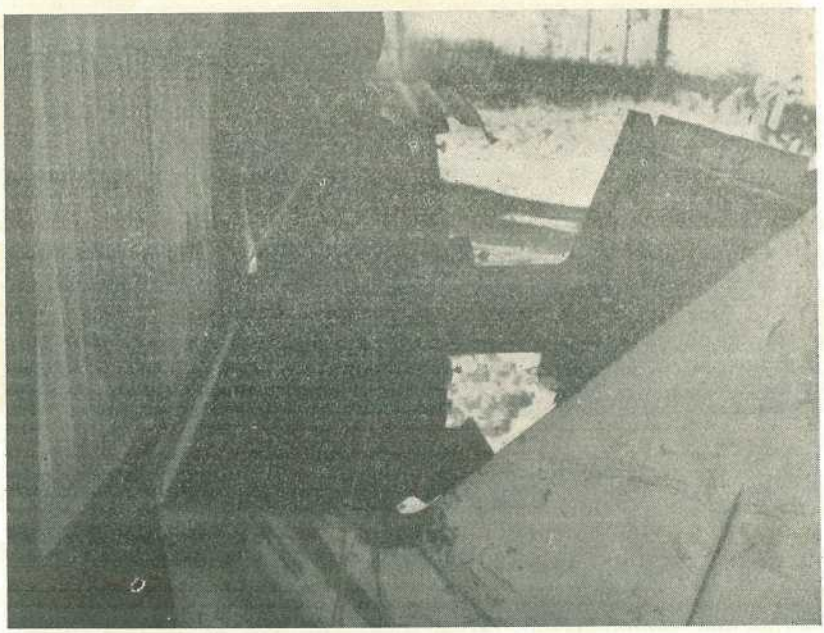

Plate 181.

Watering Places Such as This on the Shaded Southern Side of a Shed are readily Contaminated with Nosema Spores.

Plate 182.

This Apiary is in a Sunny Position and is less Likely to Become Infected with Nosema Disease.

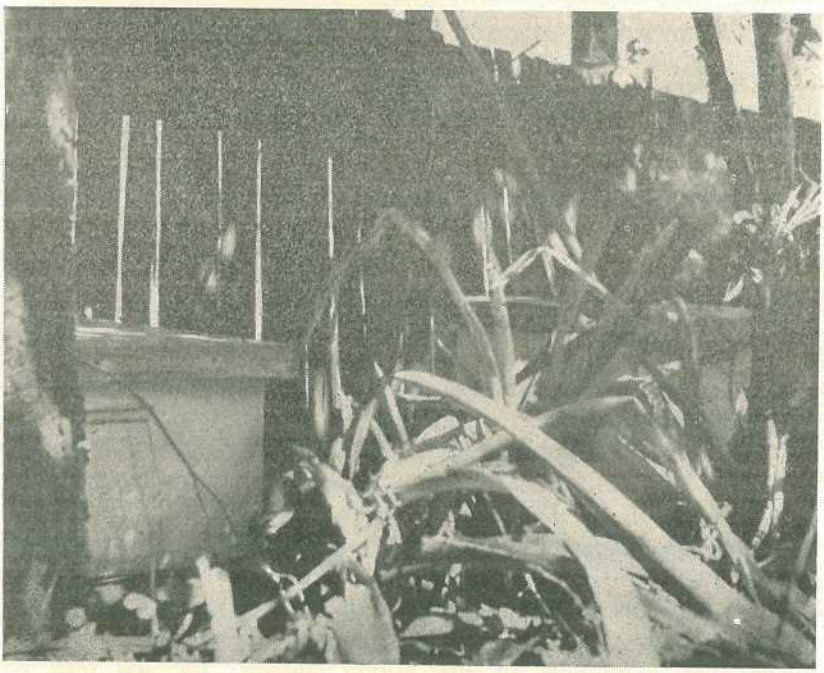

Plate 183.

The Hive in this Shady Location Developed Nosema Disease.

(3) Colonies should be kept separated at least six feet apart to prevent drift, and apiaries should be situated where they will obtain full sunlight (Plate 182). Nosema disease is more likely to occur in apiaries situated in shade or partial shade with attendant dampness (Plate 183).

(4) Beekeepers should ensure that they do not obtain queenbees, colonies, nuclei, or swarms from an infected apiary. As a precautionary measure, queenbees received from elsewhere in Australia should be transferred on arrival to a clean cage and the escort bees should be replaced by young bees from within the apiary, before introduction to a colony. The old cage, together with any candy it may contain, and the escort bees should be burnt. This procedure is standard quarantine practice for all consignments of queenbees received from overseas.

Treatment of Infected Colonies.

Strong colonies with a mild infection often recover. However, colonies which are weakened seriously by the disease or which die out from its effects should be handled in a manner which insures eradication as is described below.

(1) The destruction of diseased colonies should take place in the evening when all bees are in the hives.

(2) Dig a small pit suitable to burn the bees to be destroyed.

(3) Kill all the surviving bees in the diseased hives with calcium cyanide; about two teaspoonfuls of the poisonous powder should be put through the entrance of each hive before closing it. *Extreme care should be taken to avoid inhaling the poisonous gas given off by the cyanide.*

(4) Build a fire in the pit, and as soon as it is burning well, add the bees that have been killed by the calcium cyanide and also any that have died previously from the disease.

(5) Scrape the inside surfaces of the various parts of the hives and burn the debris.

(6) After all diseased material has been burnt, spade the ground down, refill the pit, and pack well.

(7) Render all the beecombs down for wax. The Nosema organism is killed at the temperature of melting beeswax.

(8) Sterilize the contaminated hives, frames and other hive parts by either boiling for half an hour in 1% caustic soda solution or scorching all the inner surfaces, edges and alighting boards to a dark-brown colour with a blow torch.

(9) Turn over the soil beneath and around the infected hives and cover with quicklime.

Legislative Requirements.

Under *The Apiaries Act of* 1947 it is provided that any beekeeper in whose apiary any disease appears shall immediately notify, in writing, the Under Secretary, Department of Agriculture and Stock, Brisbane.

Irrespective of the legal requirements, any beekeeeper who notices unusual bee symptoms in his apiary should, for his own sake, communicate with the Department in order that assistance may be given.

Disease Samples.

When sending samples for examination the following requirements should be observed.

(1) At least 20 bees are necessary for diagnosis and these should preferably be alive or recently dead. Dried-up bees are useless

(2) Mail the sample in a wooden or strong cardboard box. Do not use a tin or glass container

(3) The package should bear the name and address of the sender and be accompanied by an explanatory letter.

TUBERCULOSIS-FREE CATTLE HERDS.
(AS AT 25th NOVEMBER, 1952.)

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas F. H. Hutton, " Bingegang," Dingo
A.I.S...	F. B. Sullivan, " Fermanagh," Pittsworth D. Sullivan, " Bantry " Stud, Rossvale, *via* Pittsworth W. Henschell, " Yarranvale," Yarranlea Con. O'Sullivan, " Navillus Stud," Greenmount H. V. Littleton, " Wongalea Stud," Hillview, Crow's Nest J. Phillips and Sons, " Sunny View," Benair, via Kingaroy Sullivan Bros. " Valera " Stud, Pittsworth Reushle Bros., " Reubydale " Stud, Ravensbourne H. F. Marquardt, " Chelmer " Stud, Wondai W. G. Marquardt, " Springlands," Wondai A. C. and C. R. Marquardt, " Cedar Valley," Wondai A. H. Sokoll, " Sunny Crest " Stud, Wondai W. and A. G. Scott, " Welena," A.I.S. Stud, Blackbutt G. Sperling, "Kooravale" Stud, Kooralgin, via Cooyar
Ayrshire	L. Holmes, " Benbecula," Yarranlea J. N. Scott, " Auchen Eden," Camp Mountain "St. Christopher's and Iona " Studs, Brookfield Road, Brisbane E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
Friesian	C. H. Naumann, " Yarrabine Stud," Yarraman
Guernsey	C. D. Holmes, " Springview," Yarraman A. B. Fletcher, Cossart Vale, Boonah
Jersey	J. S. McCarthy, " Glen Erin Jersey Stud," Greenmount J. F. Lau, " Rosallen Jersey Stud," Goombungee G. Harley, Hopewell, Kingaroy Toowoomba Mental Hospital, Willowburn Farm Home for Boys, Westbrook F. J. Cox and Sons, " Rosel " Stud, Crawford, Kingaroy Line R. J. Browne, Hill 60, Yangan P. J. L. Bygrave, " The Craigan Farm," Aspley R. J. Crawford, " Inverlaw Jersey Stud," Inverlaw, Kingaroy P. H. F. Gregory, " Carlton," Rosevale, *via* Rosewood E. A. Matthews, " Yarradale," Yarraman A. L. Semgreen, " Tecoma," Coolabunia G. & V. Beattie, " Beauvern," Antigua, Maryborough L. E. Meier, " Ardath " Stud, Boonah A. M. and L. J. Noone, "Winbirra," Stud, Mt. Esk Pocket, Esk W. S. Conochie and Sons, "Brookland" Stud, Sherwood Road, Sherwood
Polled Hereford ..	W. Maller, " Boreview", Pickanjinnie

PLANT PROTECTION

White Wax Scale on Citrus.

T. MANEFIELD, Assistant Entomologist, Science Branch.

IN recent years white wax scale * has become the major scale insect pest of citrus in coastal districts of southern Queensland, and has caused some concern in inland areas during years of excessive rainfall. It also occurs on a wide variety of other introduced and native shrubs and trees. An unsightly black deposit on the foliage, twigs and fruit is constantly associated with the insect. This deposit, known as "sooty mould", is composed of the massed threads of a number of fungi which are not parasitic on the plant but grow in the sugary secretion or honey-dew produced by the scale insect. The presence of the mould on fruit is one of the main reasons why control of this pest is necessary.

Habits and Life History.

Each stage of the insect secretes a protective white waxy material, which in the adult stage forms a globular covering up to a quarter of an inch thick and three-eighths of an inch in length, the colour becoming slightly grey with age. The newly hatched scale larvae are free-moving but soon settle, usually on young twigs, and secrete a wax covering fringed with rectangular projections. Further wax produced over the body becomes conical, then globular, later extending outwards over the fringe when the adult shape is assumed. With heavy infestations and fusion of the wax, the outlines of individual scales are lost, the twigs becoming covered with an irregular coat of wax (Plate 184).

At maturity the insect body is full of eggs. These are laid into the space beneath the insect, the body wall and wax providing a protective covering until hatching. Life history studies have shown that there is a prolonged major hatch commencing in September and carrying through until early January, with a peak between late November and early December. Minor hatchings, however, have been recorded at other times of the year except late summer.

Control.

The best method for preventing the development of sooty mould is to eradicate the white wax scale. Timing of spray application and complete coverage are two essentials for the successful control of this insect In *coastal districts* trees should be sprayed in *early December* with the following mixture—

20 lb. washing soda (or 7½ lb. soda ash);
1½ pints detergent† (34-40% active ingredients);
100 gallons water.

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* *Ceroplastes destructor* Newst.

† The detergent used in successful Departmental experiments against white wax scale contained 34 per cent. sodium secondary alkyl sulphate.

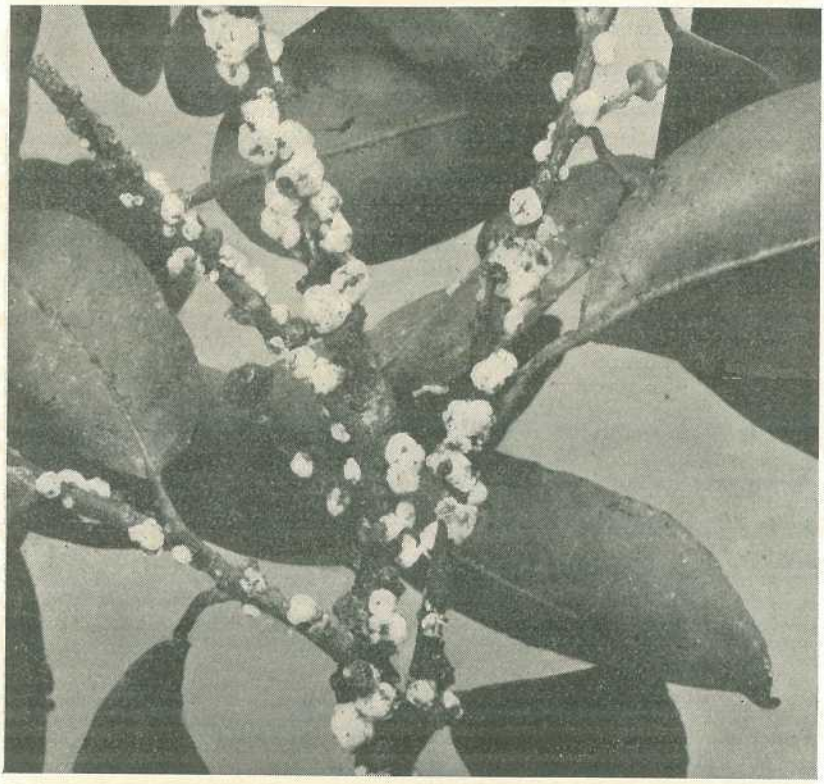

Plate 184.

White Wax Scale and Sooty Mould on Citrus.

In *inland areas,* control is rarely necessary as the normal high summer temperature and low humidity cause the wax to melt, thus effecting a natural control. However, if control measures are necessary, the trees should be sprayed in *early December* with the above mixture, adding 2½ *gallons of white oil* for the control of red scale.*

For the home gardener, mechanical treatment such as brushing gives a quick and efficient control of this pest on small trees.

Cleaning the Fruit.

Should it be necessary to remove sooty mould from fruit, this may be done efficiently in the packing shed by the use of one of the modern detergents. The fruit should be dipped in a 1 in 2,000 solution, brushed, and then allowed to dry well before being packed.

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* *Aonidiella aurantii* (Mask.).

Common Bean Mosaic Yield Trial, 1952.

J. C. JOHNSON, Assistant Pathologist, Science Branch.

SINCE the first published account of the occurrence of common bean mosaic in Australia in 1933*, green bean growers have often been warned of the serious effect this disease may have upon the vigour and yield of their crops. There has, however, been no statement of the actual extent to which the widely grown variety Brown Beauty may be affected and it was for this reason that the trial described here was undertaken. The effect of the disease upon two susceptible strains of Brown Beauty (Nos. 15 and 28) was compared with that on strain 17, a recent selection made by the Horticulture Branch which has been shown in glasshouse trials to be immune to common bean mosaic.

Plate 185.

Common Bean Mosaic. View of an inoculated plot (E4, centre) with healthy rows on each side. At this time the infected plants were showing signs of recovery.

Since it was known that plants of field-run Brown Beauty give variable reactions to mosaic infection, single plant progenies were used to obtain more uniform responses. By this means it was considered that differences due to infection alone could be observed, and that other differences due to variation in plant type would be largely eliminated. These single plant progenies have been shown to be pure lines. The insect vector of the virus is generally more active in the spring months and it was hoped that cross-inoculation between plots would be kept to a minimum by sowing in March. However, the aphid vector did appear towards the harvesting period, and some contamination of the uninoculated plots occurred.

Experimental Results.

The experiment was carried out at the Redlands Experiment Station and with the assistance of the Station staff. Plots were arranged in randomised blocks, and replicated eight times. These plots were single

* C. J. Magee, Plant Disease Leaflet No. 57, New South Wales Department of Agriculture, 1933.

rows 10 feet long and containing approximately 30 plants; single-row buffers were left to separate the experimental rows. Half of the total number of plots of each strain were artificially infected in the field by rubbing a mixture of freshly prepared infected bean sap and carborundum powder onto each of the two primary leaves immediately after they had unfolded. This treatment gave 100% infection of susceptible plants which was apparent six days after the treatment had been carried out.

The symptoms of the disease became very noticeable in the inoculated plots of strains 15 and 28 and continued to increase in severity for 10-15 days after they had been infected. In comparison the uninoculated rows at this time showed marked vigour. However, in the period that followed until harvesting, the difference between infected and healty plots gradually lessened (Plate 185) and by the end of this time it was impossible to distinguish between them.

The plots were harvested three times, with most of the crop coming from the first pick. Yield data based on both first and total picks are presented in Table 1. There was a reduction in yield so far as the two susceptible strains were concerned, while strain 17 showed no reduction. This effect was most noticeable when yield figures for the first pick only are compared.

TABLE 1.

Mean Yields (ounces per plot).

Strain.	Treatment.	First Pick.	Total Pick.	Per Cent. Reduction.	
				First Pick.	Total.
17	Uninoculated ..	90·8	105·9	..	..
17	Inoculated ..	90·0	106·5	0·9	—0·6
15	Uninoculated ..	69·0	85·5	..	..
15	Inoculated ..	58·8	78·8	14·8*	7·9
28	Uninoculated ..	57·0	76·0	..	..
28	Inoculated ..	48·4	68·8	15·1*	9·5

* = Significant at 5% level.

Discussion.

The fact that first pick figures showed significant differences while total pick figures did not was due to several contributing factors which were readily observed during the course of the experiment. The first was the gradual recovery of infected plots. This appears to be due to a development of greater tolerance towards the presence of the virus subsequent to the first marked reaction. The recovery of infected plants which has been observed to occur many times in glasshouse tests carried out under diverse growing conditions supports this explanation. The second factor was the failure to restrict infection to the inoculated plots. The aphid vector of mosaic was first noticed just prior to harvesting and was probably present for some time before then. When harvesting was complete, all plots and guard rows were tested for infection, and only plots of strain 17 and one section of the guard rows out of 12 such sections were found to be free. This testing was done in the glasshouse, using a comprehensive leaf-sampling technique and suitable indicator plants.

So far as the Brown Beauty variety is concerned, infection in the field is very difficult to detect, and diagnosis can only be made with certainty by transmission to indicator plants in the glasshouse. It was observed that another influence was of importance in obscuring mosaic infection—this was injury caused by cold, dry winds. These were of rather frequent occurrence during the course of the experiment. They caused leaf cupping and twisting in all of the plots, and leaf differences between infected and non-infected rows were obscured in a few days (Plate 186.)

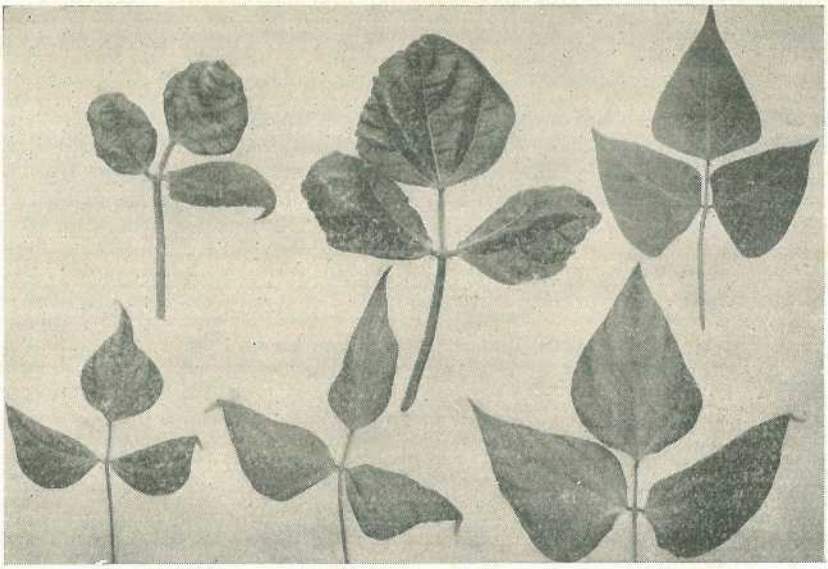


Plate 186.

Common Bean Mosaic and Wind Damage of Bean. Upper row, two wind-damaged and one healthy leaf; lower row, common bean mosaic.

Conclusions.

Under the conditions of this experiment, two susceptible strains of Brown Beauty beans showed a yield reduction of approximately 15% on the main pick when infected with common bean mosaic, while another strain which is fully resistant showed no yield reduction. Field-run Brown Beauty so far tested shows a mixture of susceptible, tolerant and immune types in fairly equal numbers, and it is therefore unlikely that any large losses have occurred with mosaic in this variety.

Since the choice of the susceptible strains used in this experiment was made from a limited number of such strains that were available at the time, the losses recorded do not necessarily represent the maximum possible. The yield reduction is, however, sufficient to warrant careful attention to resistance when breeding or selecting new lines of beans.

Herd Production Improvement Scheme.

Report on Group Herd Recording for the Year Ending September 30, 1951.

S. E. PEGG, Chief Adviser (Herd Recording).

AS a result of the severe drought conditions experienced throughout most of the dairying districts of the State during 1951 from March onwards the average production of cows for the herd recording year ended 30 September, 1951, was lower than in the previous year, as shown in Table 1.

During the year there were 45 groups in operation, but results of completed lactations were obtained from 814 herds in 40 groups only. Again this year all cows with completed lactations up to a maximum of 270 days were included even though a number had very short lactation periods.

Table 1 gives, according to age groups, the number of cows, their average production of milk and butterfat, and for comparison the average yield of butterfat for 1949-50 and 1948-49.

TABLE 1.

Average Production of Cows Which Completed Lactation Periods of 270 Days or Less.

Age Group.	Number of Cows.	Average Milk Yield.	Average Test.	Average Butterfat, 1950–51.	Average Butterfat, 1949–50.	Average Butterfat, 1948–49.
		Lb.	%	Lb.	Lb.	Lb
2 years ..	2,956	2,748	4·5	123	131	136
3 years ..	2,113	3,069	4·5	137	151	140
4 years ..	1,651	3,471	4·4	154	162	148
Mature ..	7,330	3,588	4·4	156	169	160
Unknown ..	12,748	3,303	4·4	145	146	139
All Ages ..	26,798	3,312	4·4	146	152	144

It will be seen that the average production of butterfat was 6 lb. below the 1949-50 average, the decrease being attributed to, firstly, the effect of drought and secondly, the lower production of cows in new

herd recording groups which were not included in the previous year's averages; most of these groups were situated in areas which were seriously affected by drought conditions.

The report on dairy cattle and milk production in Queensland issued by the Government Statistician shows the average production of milk per cow in Queensland in 1950-51 as 284 gallons. The period which the Statistician's report covers ended on 31 March, 1951, and the effects of adverse seasonal conditions which prevailed later in the year are not reflected to the extent that they are in this report. Using the same average butterfat content (4.3%) as that for the recorded cows, the comparison is:—

	Milk. lb.	Butterfat. lb.
Statistician's average for all cows in Queensland	2,840	122
Average of all recorded cows	3,312	146

Effect of Length of Lactation.

It is illuminating to compare the average production of cows which had a full lactation period of 270 days with those which had a lactation period of less than 270 days. Details are given in Tables 2 and 3.

TABLE 2.

AVERAGE PRODUCTION, ACCORDING TO AGE, OF COWS WHICH MILKED FOR THE FULL LACTATION PERIOD OF 270 DAYS.

Age Group.	Number of Cows.	Average Milk Yield.	Average Test.	Average Butterfat.
		Lb.	%	Lb.
2 years	678	3,957	4·5	178
3 years	555	4,202	4·6	191
4 years	443	4,475	4·5	203
Mature	1,869	4,728	4·5	210
Unknown	3,104	4,493	4·4	200
All Ages ..	6,649	4,479	4·5	200

TABLE 3.

AVERAGE PRODUCTION OF COWS WITH LACTATION PERIODS OF LESS THAN 270 DAYS.

Age Group.	Number of Cows.	Average Milk Yield.	Average Test.	Average Butterfat.
		Lb.	%	Lb.
2 years	2,278	2,388	4·5	107
3 years	1,558	2,665	4·4	118
4 years	1,208	3,103	4·4	136
Mature	5,461	3,198	4·3	138
Unknown	9,644	2,920	4·4	128
All Ages ..	20,149	2,927	4·4	128

These tables show that the average production of cows which completed a lactation of nine months was 200 lb. butterfat, compared with 128 lb. for cows with a lactation period of less than nine months—a difference of 72 lb.

The difference in production stresses the necessity of concentrating on breeding animals which will milk for at least nine months and also the necessity of providing sufficient feed to enable them to continue producing over that period. An amount of 72 lb. butterfat is equivalent to 88 lb. commercial butterfat, which at the ruling price of 3s. 6d. per lb. is valued at £15 8s.

Only 6,649 cows (24·8%) completed a full 270-days lactation period, the low percentage undoubtedly being attributable to a large extent to the adverse seasonal conditions which prevailed.

Value of Continuous Recording.

Table 4 shows the average production of cows in each herd recording group.

TABLE 4.

DETAILS OF HERDS RECORDED AND PRODUCTION, 1950-51.

Group.	Number of Herds.	Number of Cows.	Average Milk Yield.	Average Test.	Average Butterfat, 1950–51.	Average Butterfat, 1949–50.	Average Butterfat, 1948–49.
			Lb.	%	Lb.	Lb.	Lb.
Beaudesert ..	20	1,067	3,883	4·4	170	160	129
Biggenden	19	432	2,435	4·3	105	..	..
Boyne Valley ..	11	653	2,299	4·4	101	..	..
Burncluith ..	14	393	2,642	3·8	100	..	..
Cedar Pocket ..	20	674	3,275	4·9	162	151	132
Cooroy No. 1 ..	20	978	3,114	4·7	145	153	121
Cooroy No. 2 ..	25	819	3,014	4·4	133	130	102
Eungella	18	222	2,335	4·5	106	131	..
Goomeri	26	895	2,775	4·2	117	129	121
Gympie No. 1 ..	23	654	2,657	4·6	122	125	..
Kenilworth ..	22	871	3,442	4·6	157	164	131
Kilcoy	21	1,018	2,702	4·6	124	120	113
Killarney	23	402	3,906	4·4	171	154	161
Kingaroy No. 1 ..	24	830	3,213	4·2	136	150	150
Kingaroy No. 2 ..	26	882	3,463	4·0	138	147	120
Malanda No. 1 ..	22	783	4,493	4·3	195	180	163
Malanda No. 2 ..	7	145	5,262	3·9	207	166	..
Maleny No. 1 ..	21	806	3,459	4·9	170	176	155
Maleny No. 2 ..	15	540	3,771	4·7	176	197	145
Mapleton-Kureelpa	19	517	2,954	4·6	137	..	..
Miles	19	900	3,291	4·1	136	121	..
Millaa Millaa ..	24	634	4,112	4·5	186	178	153
Miva-Theebine ..	18	734	2,656	4·8	127	126	102
Monto	20	1,074	3,702	4·3	159	156	160
Mount Tamborine	24	735	3,122	4·7	147	..	..
Mundubbera ..	16	325	1,603	4·0	64	..	..
Oakey No. 1 ..	19	481	3,257	4·1	135	149	184
Oakey No. 2 ..	15	586	4,442	4·3	191	179	186
Oakey No. 3 ..	17	808	4,090	4·0	163	156	149
Pittsworth ..	18	498	4,621	4·0	186	..	..
Pomona	20	686	2,772	4·8	133	153	118
Ravenshoe ..	18	378	3,505	4·6	160	144	..
Roadvale	23	692	3,278	4·5	149	..	..
Tansey	21	1,019	3,032	4·4	132	..	..
Toogoolawah ..	25	540	2,911	4·4	129	128	119
Toowoomba No. 1	21	557	3,793	4·6	174	156	154
Toowoomba No. 2	32	666	3,546	4·2	150	154	148
Wallaville ..	20	389	1,441	4·4	64	..	..
Warra	24	948	3,629	4·1	149	133	..
Warwick	24	568	3,815	4·3	166	179	190

Several groups which have retained a considerable number of the the original members since the commencement of operations have continued to show improvement in the average production of butterfat. Production in the Beaudesert group over the last three years has been:—

1948-49 .. .. 129 lb.
1949-50 .. .. 160 „
1950-51 .. .. 170 „

Cedar Pocket is another group which has shown significant increases—from 132 lb. butterfat in 1948-49, to 151 lb. in 1949-50, to 162 lb. in 1950-51.

There are also numerous instances where the average production of individual herds has shown a progressive improvement. Some examples of the improvement which has been achieved, despite the adverse season of 1950-51, are shown in Table 5.

TABLE 5.

IMPROVEMENT MADE IN AVERAGE PRODUCTION OF FOUR HERDS.

Herd.	1948–49.		1949–50.		1950–51.	
	Number of Cows.	Butterfat.	Number of Cows.	Butterfat.	Number of Cows.	Butterfat.
		Lb.		Lb.		Lb.
A.	49	137	53	169	44	221
B.	144	126	100	169	122	176
C.	21	98	36	108	32	139
D.	105	104	96	125	111	132

The improvement in the average production per cow and total production for the farm as shown in Table 5 indicates the value of continuous recording. Some dairymen are inclined to record for a year or two, then cease and recommence when they again have a number of young animals in the herd. Other farmers, after recording for a period, express the desire to record heifers only.

It should be realised that the worth of a cow to its owner should be measured by her lifetime production. All too frequently it has been found that animals which showed great promise of being good producers when recorded as heifers have failed to reach expectations; these animals can only be revealed by continuous recording.

By recording continuously, farmers have a regular check on the production performances of individual cows and are able to determine which animals combine the five qualities sought—sound milk and butterfat production, fertility, resistance to disease, long working life, and good milking temperament.

Members of a herd recording group also have a continuous check on their system of feeding, breeding and management, and are able to assess quickly the value of any changes in husbandry.

Production According to District.

Table 6 gives the average production of cows according to districts, and Table 7 gives a further analysis.

TABLE 6.

AVERAGE PRODUCTION, ACCORDING TO DISTRICT, OF COWS WHICH COMPLETED LACTATION.

District.	Number of Herds.	Number of Cows.	Average Production, 1950–51.			Average Butterfat Production.	
			Milk.	Test.	Butterfat.	1949–50.	1948–49.
			Lb.	%	Lb.	Lb.	Lb.
Eastern Downs ..	169	4,566	3,939	4·2	167	162	173
Western Downs ..	57	2,241	3,320	4·1	135	134	..
South-eastern Queensland ..	316	11,330	3,150	4·6	146	149	128
South Burnett ..	97	3,626	3,115	4·2	131	140	131
Central Burnett ..	35	757	2,078	4·2	87	..	..
Upper Burnett ..	20	1,074	3,702	4·3	159	156	160
Port Curtis ..	31	1,042	1,979	4·4	87	..	..
Mackay	18	222	2,335	4·5	106	131	..
Atherton Tableland	71	1,940	4,234	4·4	186	172	160

TABLE 7.

AVERAGE BUTTERFAT PRODUCTION OF THE LOWEST AND HIGHEST HERDS IN EACH OF THE MAIN DISTRICTS ACCORDING TO HERD SIZE.

District.	Size of Herd.									
	1–10 Cows.		11–20 Cows.		21–50 Cows.		51–100 Cows.		Over 100 Cows.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Eastern Downs	13	263	75	293	93	264	99	246	141*	141*
Western Downs ..	56	189	41	177	54	216	62	174	169*	169*
South-eastern Queensland	12	182	30	269	58	268	71	230	98	176
South Burnett	10	184	17	222	46	229	92	162	132	147
Central Burnett ..	19	88	55	106	43	92	47	51	..	..
Upper Burnett ..	53*	53*	91	150	95	223	117	213	159*	159*
Port Curtis	12	85	25	94	48	144	45	118	82	92
Mackay	20	196	77	157	101	108	..	..	..	..
Atherton Tableland ..	12	259	41	241	94	268	136	287	..	..

* Indicates only herd in that herd size in district.

It will be noted that the average butterfat production of the herds covers an extremely wide range. The lowest is 10 lb. and the highest 293 lb., a difference of 283 lb., indicating that with an improvement in the standard of farm management on lower-producing farms a considerable increase in production is possible.

Some of the average production figures of herds in the 1-10 cow group are extremely low. This is due to only a few cows having a complete lactation during the period and as the lactation periods were short owing to the drought, average production is hardly a true reflection of the productive capacity of the herd.

Production by Age and District.

The cows which completed lactations are grouped according to age and butterfat yield in Table 8. It will be noted that of the 26,798 cows which completed lactations, 6,874 (25.6%) produced less than 100 lb. butterfat; over 400 lb. was produced by 27 cows, of which five, all located on the Atherton Tableland, produced over 450 lb. Some particulars concerning these cows follow:—

Mr. A. R. Cornish's A.I.S. cow "Judy" was born on 16/12/43 and for her 1950-51 lactation calved on 20/8/50. She produced 15,030 lb. milk and 546 lb. butterfat, with an average butterfat content of 3.6%.

Mr. R. S. Griffiths' A.I.S. cow "Envy" produced 8,685 lb. milk and 500 lb. of butterfat in 270 days, the average butterfat content being 5.7%. She was born on 26/9/44 and calved on 2/6/50 for the 1950-51 lactation.

TABLE 8.

AVERAGE BUTTERFAT PRODUCTION ACCORDING TO AGE.

Age Group.		Under 100 lb	100–149 lb.	150–199 lb.	200–249 lb.	250–299 lb.	300–349 lb.	350–399 lb.	400–449 lb.	450–499 lb.	Over 500 lb.
2 years	No.	1,064	914	693	224	53	7	1	..	..	..
	%	35·00	30·92	23·44	7·58	1·79	0·24	0·03	..	..	..
3 years	No.	596	645	550	239	54	22	7	..	..	..
	%	28·21	30·53	26·03	11·31	2·56	1·04	0·33	..	..	..
4 years	No.	381	417	451	259	101	32	6	4	..	..
	%	23·07	25·26	27·32	15·69	6·12	1·94	0·36	0·24	..	..
Mature	No.	1,496	1,993	2,039	1,162	461	141	26	10	1	1
	%	20·41	27·19	27·82	15·85	6·29	1·92	0·35	0·14	0·01	0·01
Unknown	No.	3,326	3,441	3,249	1,820	691	173	37	8	2	1
	%	26·09	26·99	25·49	14·28	5·42	1·36	0·29	0·06	0·015	0·008
All Ages	No.	6,874	7,418	6,981	3,695	1,354	372	77	22	3	2
	%	25·65	27·68	26·05	13·79	5·05	1·39	0·29	0·08	0·01	0·007

Mr. J. K. English's A.I.S. cow "Beauty" produced 12,480 lb. milk and 489 lb. butterfat in a lactation period of 240 days, the average butterfat content being 3.9%. The lactation period was not completed, as Mr. English withdrew his herd from test. "Beauty" was six years of age when she calved on 20/9/50.

Mr. A. R. Cornish's A.I.S. cow "Fairy 3rd" produced 12,930 lb. milk and 466 lb. butterfat with an average butterfat content of 3.6%, in a lactation period of 240 days. "Fairy" was six years of age when she calved on 27/9/50.

Mr. R. S. Griffiths' A.I.S. cow "Idaho" produced 8,280 lb. milk of an average butterfat content of 5.6%, to yield 464 lb. butterfat. She was born on 21/11/43 and calved on 18/10/50 for the 1950-51 lactation.

Table 9 shows the herds grouped according to butterfat production. It will be seen from this table that 11.2% of the herds averaged over 200 lb. of butterfat compared with 9.5% in 1949-50. This is a very pleasing improvement, particularly in view of the serious drought conditions.

TABLE 9.

HERDS GROUPED ACCORDING TO AVERAGE BUTTERFAT PRODUCTION.

District.		Total No. of Herds.	Under 100 lb.	100–149 lb.	150–199 lb.	200–249 lb.	250–299 lb.	Over 300 lb.
Eastern Downs	No.	169	18	48	68	30	5	..
	%	..	10·65	28·40	40·24	17·75	2·96	..
Western Downs	No.	57	16	21	17	3	..	..
	%	..	28·07	36·84	29·82	5·26	..	..
South-eastern Queensland	No.	316	71	123	98	22	2	..
	%	..	22·47	38·92	31·01	6·96	0·63	..
South Burnett	No.	97	20	51	21	5	..	..
	%	..	20·62	52·58	21·65	5·15	..	..
Central Burnett	No.	35	23	11	1	..	..	..
	%	..	65·71	31·43	2·86	..	..	..
Upper Burnett	No.	20	3	6	8	3	..	..
	%	..	15·00	30·00	40·00	15·00	..	..
Port Curtis	No.	31	24	7	..	..	..	..
	%	..	77·42	22·58	..	..	..	..
Mackay	No.	18	8	6	4	..	..	..
	%	..	44·44	33·33	22·22	..	..	..
Atherton Tableland ..	No.	71	11	16	23	15	6	..
	%	..	15·49	22·54	32·39	21·13	8·45	..
All Queensland, 1950–51 ..	No.	814	194	289	240	78	13	..
	%	..	23·83	35·50	29·48	9·58	1·60	..
All Queensland, 1949–50 ..	No.	715	75	305	267	60	8	..
	%	..	10·49	42·66	37·34	8·39	1·12	..
All Queensland, 1948–49 ..	No.	507	71	228	152	38	17	1
	%	..	14·00	45·00	30·00	7·50	3·30	0·20

Lactation Periods.

It has already been mentioned that only 24.8% of the cows milked for a full period of 270 days. The average production of these cows was 56% above the average production of other cows which completed lactations. The average length of completed lactations for the year 1950-51 was 203 days, in comparison with 223 and 220 days respectively for each of the previous two years. The average length of lactation for each age group in each district is given in Table 10.

TABLE 10.

AVERAGE LENGTH OF LACTATION FOR EACH AGE GROUP ACCORDING TO DISTRICTS.

District.	2 years.	3 years.	4 years.	Mature.	Unknown Ages.	All Ages.
	days.	days.	days.	days.	days.	days.
Eastern Downs ..	201	207	215	215	203	206
Western Downs ..	187	184	192	194	201	193
South-eastern Queensland	203	211	213	214	211	211
South Burnett ..	185	195	202	205	196	197
Central Burnett ..	167	153	154	165	119	147
Upper Burnett ..	190	193	213	210	185	194
Port Curtis	139	168	187	169	151	156
Mackay	196	215	219	215	140	184
Atherton Tableland..	209	230	233	228	214	221
All Queensland ..	196	203	208	209	200	203

The three herds which had the highest average herd production in the State during the 12 months are as follows:—

Mr. A. M. Lee, Goomburra (Eastern Downs) had 20 cows which completed lactations during the year for an average production of 5,728 lb. milk, 5.1% butterfat content, and 293 lb. butterfat, with an average lactation period of 270 days. Mr. Lee came to Queensland from Victoria about five years ago and has concentrated on building a good

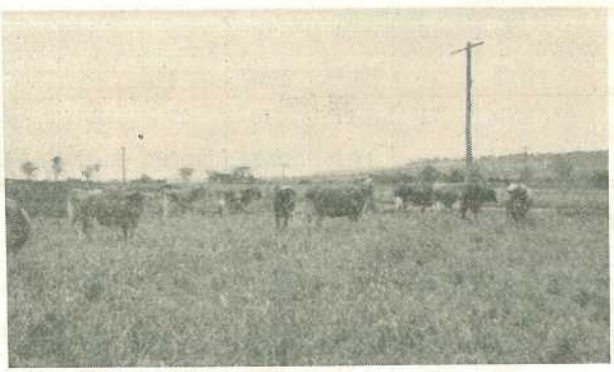


Plate 185.

Portion of herd of Mr. A. M. Lee, Goomburra. Mr. Lee's herd was the highest producing herd for the 1950-51 herd recording year, with an average production of 5,728 lb. milk, 5.1% butterfat content, and 293 lb. butterfat.

Plate 186.

Portion of farm and herd of Mr. R. A. Griffiths, Moregatta, Atherton Tableland. This was the second-highest producing herd of the herd recording season of 1950-51, the average production being 6,554 lb. milk, 4.4% butterfat content, and 287 lb. butterfat.

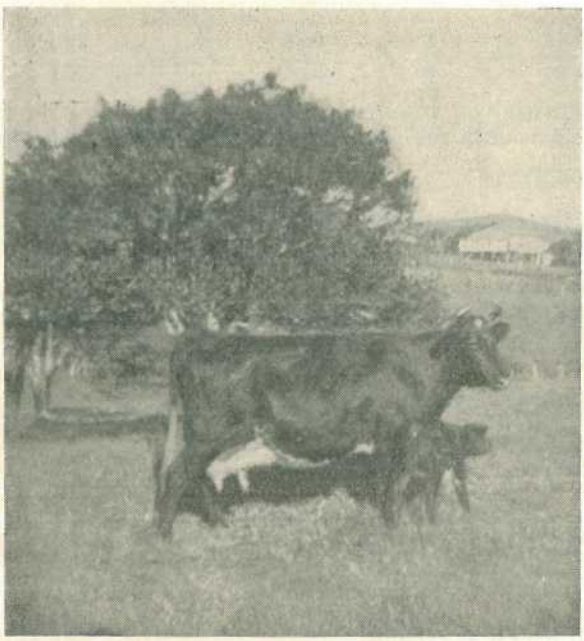


Plate 187.

Mr. R. S. Griffiths' A.I.S. cow "Envy." This cow was the second-highest producing animal for the year 1950-51, with a production of 8,658 lb. milk, 5.7% butterfat content, and 500 lb. butterfat.

Jersey herd. He has been a keen supporter of herd recording and joined the Allora herd recording group when it was formed in May, 1948. The production for the previous two years was:—

	Cows.	Milk. lb.	Test. %	Butterfat. lb.	Days.
1948-49 ..	18	5,892	4.3	256	253
1949-50 ..	19	4,490	4.6	208	245

The second highest herd, owned by Mr. R. S. Griffiths, Moregatta (Atherton Tableland), is an old-established A.I.S. herd. The 52 cows averaged 6,554 lb. milk, 4.4% butterfat content, and 287 lb. butterfat. The average length of lactation was 254 days. This herd relies on pastures, a small amount of concentrates being fed to a few cows only. For the previous two years the average production was:—

	Cows.	Milk. lb.	Test. %	Butterfat. lb.	Days.
1948-49 ..	29	5,833	4.3	252	261
1949-50 ..	32	6,107	4.4	269	258

The third highest herd is owned by Mr. G. Stephens, Darlington, Beaudesert (South-eastern Queensland). This Jersey herd had 20 cows with completed lactations for an average production of 5,069 lb. milk, 5.3% butterfat content, 269 lb. butterfat, and an average length of lactation of 255 days. Mr. Stephens was a foundation member of the Beaudesert herd recording group, the first to be formed in Queensland. The previous years' average production figures were:—

	Cows.	Milk. lb.	Test. %	Butterfat. lb.	Days.
1948-49 ..	111	3,647	5.1	186	211
1949-50 ..	76	4,323	5.1	221	217

Mr. Stephens withdrew his herd from the scheme during the 1950-51 year and this accounts for the small number of cows which completed lactations in that year.

Report on Pure-bred Production Recording.

In previous years, the annual report on pure-bred production recording has been distributed in pamphlet form as a supplement to this journal. For reasons of economy, the report for the year ended 30th June last will appear as a series of articles in the journal. The first will be published in the January issue.

Readers whose subscriptions are about to expire, and who desire to have the complete series of production records, are advised to renew their subscriptions without delay.

Acidity and Moisture Control During the Manufacture of Cheddar Cheese.

T. A. MORRIS, Division of Dairying.

THE development of acidity is the principal single factor responsible for the transformation of milk into cheese after the rennet is added. The lactic acid which the starter organisms produce from the milk sugar is responsible for the expulsion of whey and the conversion of the calcium paracaseinate of the curd into mono-calcium-paracaseinate; this and butterfat form the basic substances of cheese. The preservation of the cheese and the action of the enzyme in the rennet extract in converting the indigestible curd to readily digestible and nourishing cheese are dependent on this acidity. However, it is possible to develop too high an acidity, which, as well as spoiling the body of the cheese, will cause a sour or bitter flavour. Therefore, a correct rate of acid development must be obtained. Satisfactory control of acidity development is essential if cheese of consistently good quality is to be made.

The acidity of the milk when received has a strong influence on the rate at which acidity develops during cheesemaking and may often be responsible for the necessity to vary the manufacturing procedure.

However, the experienced cheesemaker has many means at his disposal for controlling the amount of acid developed in the cheese manufactured. Those measures which are applied during the manufacturing procedure are mainly aimed at reducing the moisture content of the curd, because there is a direct relationship between this and the extent of acid development. The lactose which is utilised by the lactic acid producing bacteria (the starter organisms) occurs in solution in the water content of milk. Thus the greater the amount of moisture retained by the curd, the greater is the potential acidity development. A curd with a low moisture content will develop acid at a slower rate and to a lower final degree than will curd with a high moisture content. However, the rate of expulsion of moisture is influenced considerably by the rate of the development of acidity. When acid development is slow, the rate of moisture expulsion is delayed, and the final moisture content of the cheese tends to be higher. Similarly, when acid production is too fast, there is slower expulsion of moisture after an initial period of about one hour after cutting. The final cheese will have a high moisture content unless corrective measures are applied.

Moisture, however, plays other important roles in influencing cheese quality. It considerably affects the body of the cheese, as well as being instrumental in making or marring cheese flavour. A cheese with a high percentage of moisture in the fat-free-substance will tend to have a weak, pasty body and will develop off-flavours much more rapidly than one with a normal percentage of moisture in the fat-free-substance. A low percentage of moisture in the fat-free-substance of cheese tends to cause a harsh, mealy body and retards the development of flavour. It is mainly on the mixture of moisture and fat-free-substance that flavour-producing bacteria act, and the relative wetness or dryness of this mixture influences their activity whether they are desirable or undesirable flavour-producing organisms. If milk quality is low, and the proportion of undesirable organisms gaining entry to the cheese is high, a cheese with a low moisture content should be

manufactured to retard the development of off-flavours. Such a cheese will mature more slowly but will ultimately develop a cleaner flavour than a similar cheese with a high moisture content.

The cheesemaker must therefore be able to control these two important factors—moisture and acidity—in such a manner that a satisfactory balance is attained.

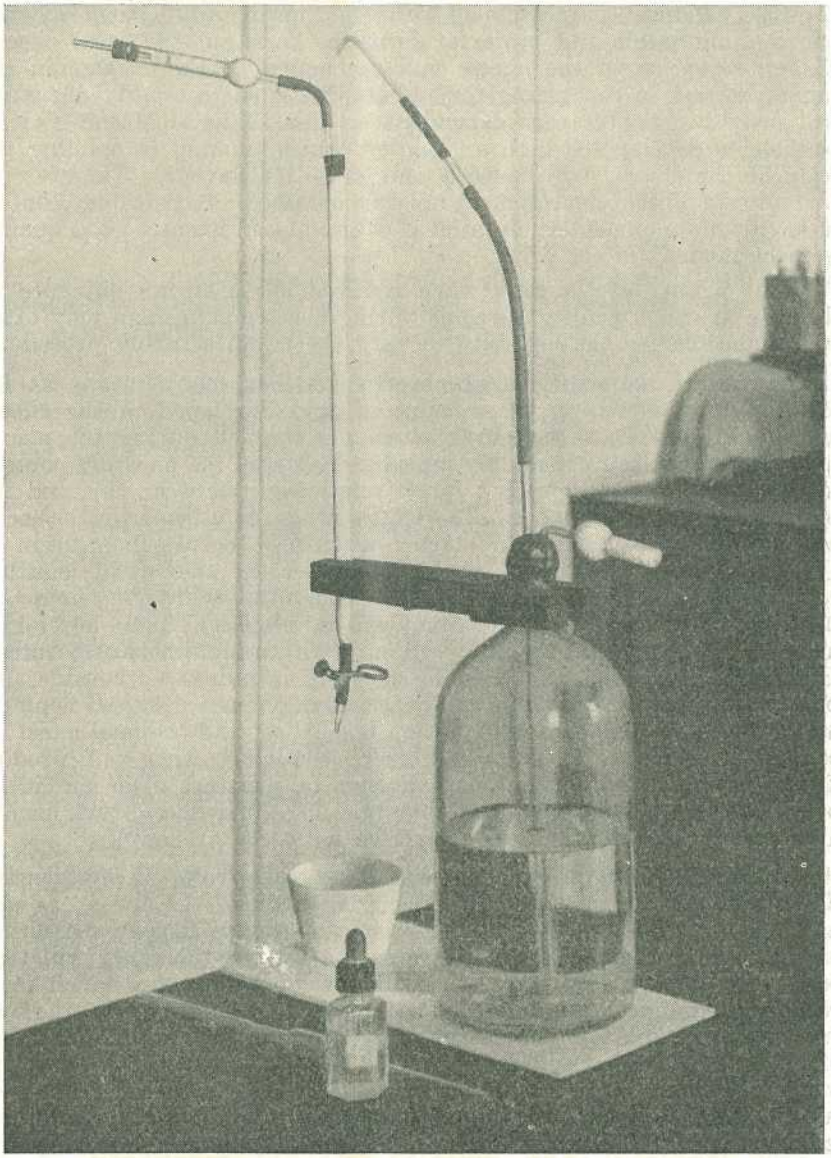


Plate 188.

Apparatus for Conducting the Acidity Test on Whey. Accurate acidity-testing is essential in controlling the development of acidity during cheesemaking.

In dealing with the control of acid development two instances must be considered:—

(1) Where corrective measures could be applied before the commencement of making, as a result of experience gained from the previous day's manufacture.

(2) Where manufacture has begun—for example, when the vat has been cut.

METHODS OF CONTROLLING ACIDITY AND MOISTURE CONTENT APPLICABLE BEFORE CUTTING THE CURD.

Variation of the Amount of Starter and the Length of the Priming Period.

The greatest change in the rate of acidity development may be effected by varying the quantity of starter used or the length of the priming period. The production of lactic acid is governed by the number of starter organisms present, their activity and the length of time they have had to multiply. Therefore, acid development is carried on at a faster rate during manufacture when a large quantity of starter is added than when a small quantity is used. A small quantity of starter allowed a long priming period has a similar effect to that of a large quantity of starter given a short priming period. The question therefore arises as to which of the factors under consideration—quantity of starter and length of prime—should be varied. If rapid acidity development is required and only the normal amount of starter is available, the priming period must be made longer. However, it is usually desirable to fix the length of the priming period at 10-15 minutes, which time is necessary for the starter organisms to recover from their dormant state. A short priming period not only saves time prior to setting but also reduces the danger of attack by bacteriophage. The starter is very open to attack by phage prior to the setting of the vat; thus the shorter the priming period, the less the possibility of a starter failure.

Variation of the Setting Temperature.

The ordinary starter streptococci have an optimum temperature of 70-75°F. Temperatures outside this range are less favourable for their growth, although a temperature of 90-95°F. may be reached before any significant falling off in activity occurs. Temperature is an important consideration in controlling the moisture content of the curd during manufacture, as the expulsion of moisture normally proceeds more rapidly at higher temperatures. Cheddar cheese vats are usually set at a temperature of 86-88°F. Vats set at a higher temperature tend to lose moisture at a faster rate in the early stages, but this rate slackens off later and the final moisture content of the cheese is normal. The higher temperature and the early loss of moisture may have a slight effect on the rate of acid development; however, the main feature is that by this means with an overripe vat of milk the rate of moisture expulsion may be brought more into line with the rate of acidity development. Thus an advantage can be gained in controlling a vat of milk which has a high initial acidity by setting it at a temperature of 6-8°F. higher than usual.

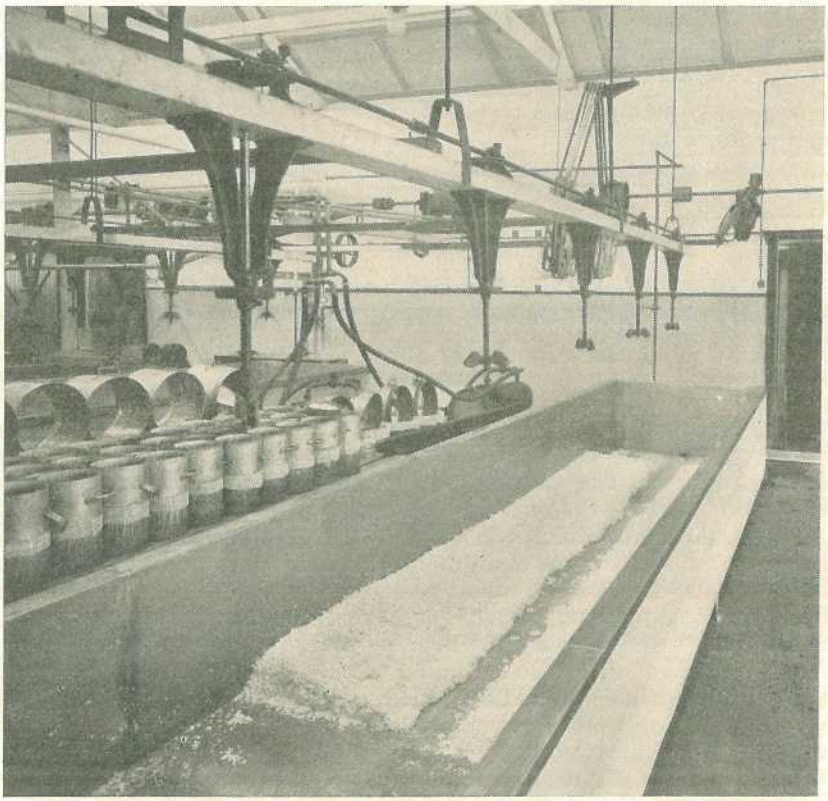


Plate 189.

The Draining of the Whey During Cheese Manufacture. The acidity at which the whey is run off is the main factor affecting the rate of acidity development after drying, and the final acidity of the cheese.

Variation of the Size of Cut.

When the curd is cut moisture escapes from the exposed surface. The finer the cut the greater is the surface of curd exposed and thus the escape of moisture is more rapid. This applies particularly during cooking, but less variation occurs in the moisture content in the later stages of manufacture. Many factories have two sets of curd knives: for example, one with spacings of three-eighths of an inch and one with quarter-inch spacings. The rate at which moisture is expelled after cutting may therefore be changed by varying the size of the curd knives. This is another method of keeping the rate of moisture expulsion in harmony with the rate of acid development, and, to some extent, a means of varying the final moisture content of the cheese.

METHODS OF CONTROLLING ACIDITY AND MOISTURE CONTENT AFTER CUTTING THE CURD.

Variation of the Cooking Temperature.

The usual range of temperature employed in cooking is 98-102°F. Below 98°F. insufficient firming of the curd takes place, while above 102°F. starter development is likely to be unduly retarded. If a vat is developing acidity at too fast a rate, a high cooking temperature will

aid in lessening the rate. Some starters are more sensitive than others to cooking temperatures in excess of 100°F. Within the temperature range of 98-102°F. the effect of variations in the cooking temperature on the moisture content of the curd is small. However, when a high cooking temperature is employed, acid production is slowed down with the result that the curd is cooked for a longer time, resulting in a lower moisture content. (On the other hand, a very high cooking temperature may reduce the rate of acid production in the later stages to such an extent that the expulsion of moisture becomes so slow that the final moisture content of the cheese is higher than normal).

Variation of the Running Acidity.

The running acidity is the main single factor influencing the rate of acidity development after drying, and the final acidity of the cheese. The lower the running acidity the slower is the subsequent rate of acid development and the lower is the final acidity attained. High running acidities cause a fast rate of acid development after drying and a high final acidity. Thus if a vat is making acid very fast, it should be run at a low acidity—any lack of firmness in the body of the curd as a result of the shortened cooking time should be corrected by dry-stirring. A vat which is producing acid slowly should be allowed to develop a higher acidity than usual before it is wheyed-off.

The effect of the running acidity on the moisture content of the cheese is indirect. Variations in the running acidity affect the subsequent rate of acid development, thus influencing the rate of moisture expulsion. A rate of acid development which is too slow or too fast retards the expulsion of moisture.

The running acidity is the key to the control of acid production from the wheying-off of the vat onwards. It is as important in ensuring the correct rate of acid production in the afternoon as the amount of starter is in the morning.

Variation of the Dry-Stirring of the Curd.

When a vat is wheyed-off an opportunity occurs for correcting the moisture content of the curd if it is too high. By dry-stirring the curd at this stage, the moisture content can be considerably reduced. This aids in controlling the acidity finally developed in the cheese, though it does not greatly alter the rate of acid production for the remainder of the manufacturing procedure. Where a "fast" vat occurs it should be thoroughly dry-stirred after wheying-off, particularly if the curd is moist. On the other hand, a "slow" vat should not be stirred at all. Moisture expulsion is slow unless acidity is developed in the curd. Thus in the case of a slowly working vat it is better to leave the curd moist, thereby encouraging acid production.

Variation of the Method of Cutting and Cheddaring the Curd.

Cutting the curd into large blocks, stacking the blocks, and allowing long intervals between turns aids in retaining moisture in the curd and encourages acid production. A fast-working vat of curd should be cut into small blocks, turned frequently, and not stacked.

Variation in the Time of Milling and in the Subsequent Treatment Prior to Salting.

When the curd is milled there is a temporary increase in the rate of expulsion of moisture. Early milling at a low acidity curtails acid production to some extent, while late milling at a high acidity is conducive to the attainment of a high acidity in the cheese. Early milling

may have a detrimental effect on the body and texture of the cheese, and in some cases a slightly fast vat may be more affected by early milling than it would be by a slight excess of acidity.

Curd which is developing acid normally but which is over-moist, and curd which is developing acid too rapidly, should be well stirred and drained after milling to allow the escape of whey. It is, however, more satisfactory if sufficient stirring has been given immediately after wheying-off to eliminate the need for more stirring, other than is necessary to keep the curd free.

Variation in the Time and Rate of Salting.

The addition of salt to the curd reduces the moisture content more or less in proportion to the amount of salt added. Thus a moist curd may be improved by the use of a little extra salt. The extent of acid production in the cheese subsequent to salting is doubly influenced by the amount of salt added. It is affected by the drying of the curd and also by the inhibitory effect which the salt (in the quantities used in cheesemaking) itself has on the acid-producing organisms. A "slow" vat should be salted later and with less salt than a normal or "fast" vat. It is more common for a vat to be salted too early than too late. Early salting of a normal or "slow" vat checks the breakdown of the curd before it has progressed to a satisfactory stage and may thus cause a harsh body in the cheese and delayed ripening. Because of the detrimental effect of excessive salt on the rate of ripening of the cheese and the development of flavour, it is not desirable to allow a fast, or moist, vat of curd to be brought to the salting stage before corrective measures are applied.

SUMMARY.

The acidity and the moisture content of cheese are so linked that when efforts to control one are made the possible effects on the other must be kept in mind.

The amount of starter used and the length of the priming period largely determine the rate of acidity development up to the time of wheying-off. Variation of the running acidity is the most effective means of controlling the later rate of acid development and the final acidity of the cheese.

The most effective means of reducing the moisture content of the cheese is by dry-stirring after wheying-off.

Slight daily variations in the rate of acid production may be dealt with as follows:—

(1) When acid production is too fast:—

- (*a*) Raise the cooking temperature.
- (*b*) Whey-off at a lower acidity.
- (*c*) Dry-stir the curd thoroughly after wheying-off.
- (*d*) Cheddar the curd in small blocks and turn frequently.
- (*e*) Do not stack the blocks.
- (*f*) Mill early.
- (*g*) Use a little extra salt.

(2) When acid production is too slow:—

(*a*) Lower the cooking temperature.

(*b*) Whey-off at a higher acidity.

(*c*) Do not dry-stir the curd.

(*d*) Cheddar the curd in large blocks which are stacked and allow long intervals between turns.

(*e*) Mill late.

(*f*) Allow a higher acidity to be reached before salting and use less salt—according to the moisture content of the curd.

Departmental Publications.

The following publications are among those available free of charge to Queensland primary producers on application to the Department of Agriculture and Stock, Brisbane.

Dairy Pamphlets.

No. 10.—Dairy Building and Equipment Competition, 1951.

No. 13.—Register of Merit for Dairy Cattle.

Standards Pamphlets.

No. 47.—Seed Testing Explained.

Plant Industry Advisory Leaflets.

No. 245.—Pulse Crops (Beans and Peas).

No. 246.—The Peach.

No. 247.—Linseed Growing in Queensland.

No. 248.—Nut Crops.

No. 249.—The Apricot.

No. 250.—The Plum.

No. 251.—Beekeeping Legislation.

No. 252.—The Grape Scale.

Animal Industry Advisory Leaflets.

No. 34.—Grass Tetany or Oat Tetany.

No. 40.—Botulism in Poultry.

No. 42.—Portable Calf Bails.

No. 43.—Sheath Rot (Posthitis) of Sheep.

No. 45.—Cheesy Gland or Caseous Lymphadenitis of Sheep.

No. 46.—Milk Fever (Hypocalcaemia) or Pregnancy Toxaemia of Ewes.

No. 47.—Pink Eye or Blight of Sheep.

No. 50.—The Problem of Brand Damage in Wool.

No. 51.—Leptospirosis in Cattle.

Animal Industry Pamphlets.

No. 13.—The Overfat Pig—Causes and Remedial Measures.

No. 17.—The Feeding of Pigs.

No. 18.—Selection and Breeding of Dairy Cattle.

No. 19.—Fertility and Infertility of Sheep.

Recent Books.

"Insects Affecting Livestock, with Special Reference to Important Species Occurring in Australia."

By F. H. S. Roberts.

This book has particular usefulness for the Queensland stock-owner and student inasmuch as it is written by a research worker who has been engaged in investigational work in this State for over 20 years.

Dr. Roberts has not confined himself to the true insects but has dealt in detail also with mites and ticks. Numerous species of economic importance are described and illustrated. Their effects on livestock are recorded in detail, and current control measures are described.

For the student there are, in addition, sections on the structure and classification of insects, mites, and ticks.

The book is available from booksellers for 45s.

"Sheep and Property Management."

By E. H. Pearse.

A mass of information on many aspects of sheep husbandry and property improvements in Australia is contained in the new edition of the book previously titled, "Sheep, Farm, and Station Management."

Particularly useful are the sections on yards, gates, sheds, and water supply, but there is valuable reference matter also in the many chapters dealing wtih breeding, flock management, diseases of sheep, destruction of pests, and so on.

The book is published by The Pastoral Review Pty Ltd., of Sydney and Melbourne, and is sold for 27s. 6d.

"Veterinary Therapeutics."

By Geo. F. Boddie.

This is not a handbook for the farmer desirous of diagnosing and treating the ailments of his stock, but a textbook on drugs and the principles of their use in veterinary medicine. As such, it is a useful reference book for the student. Many stock-owners, however, would find the book a useful addition to their libraries.

Our copy is from Macmillan and Co. Ltd., St. Martin's street, London. The English price is 15s.

ASTRONOMICAL DATA FOR QUEENSLAND.

JANUARY

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

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	4.56	6.46	Cairns	48	9	Longreach	43	27
6	5.00	6.47	Charleville	29	25	Quilpie	33	37
11	5.04	6.47	Cloncurry	63	36	Rockhampton ..	18	2
16	5.08	6.47	Cunnamulla ..	28	31	Roma	19	15
21	5.12	6.46	Dirranbandi ..	16	22	Townsville	40	9
26	5.16	6.45	Emerald	27	12	Winton	51	30
31	5.20	6.43	Hughenden ..	48	22	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	7.42	5.26
2	8.19	6.23
3	8.52	7.19
4	9.23	8.13
5	9.51	9.06
6	10.18	9.57
7	10.46	10.48
8	11.16	11.41
		p.m.
9	11.49	12.36
10	..	1.34
	a.m.	
11	12.27	2.35
12	1.12	3.38
13	2.05	4.41
14	3.05	5.42
15	4.13	6.37
16	5.24	7.25
17	6.35	8.07
18	7.44	8.45
19	8.51	9.20
20	9.56	9.55
21	10.59	10.31
	p.m.	
22	12.02	11.09
23	1.06	11.50
24	2.08	..
		a.m.
25	3.08	12.36
26	4.04	1.26
27	4.55	2.21
28	5.39	3.18
29	6.19	4.15
30	6.53	5.11
31	7.24	6.06

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	18	29	26	44	1	20	29	52
6	19	19	35	36	10	10	41	41
11	29	11	45	25	20	0	52	28
16	28	13	44	28	19	2	51	31
21	15	24	31	40	6	15	35	46
26	9	30	25	45	0	21	26	53
31	14	24	30	40	5	16	34	47

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	8	52	36	65	21	50	8	44
3	16	44	41	60	26	46	14	37
5	26	35	47	55	32	40	22	30
7	35	25	54	47	39	32	29	22
9	44	15	61	41	45	26	37	14
11	53	6	67	34	50	20	44	7
13	55	3	68	32	51	18	45	4
15	53	7	67	35	50	21	44	8
17	43	17	60	42	45	27	36	16
19	32	29	52	50	36	35	26	25
21	20	40	44	58	29	43	18	34
23	10	49	37	63	22	49	9	41
25	3	53	34	66	18	51	4	44
27	5	55	35	67	19	52	5	45
29	10	50	37	63	22	49	9	42
31	19	41	42	58	27	44	17	35

Phases of the Moon.—Last Quarter, January 8, 8.09 p.m.; New Moon, January 16, 12.08 a.m.; First Quarter, January 22, 3.43 p.m.; Full Moon, January 30, 9.44 a.m.

On December 15 the sun will rise and set 23 degrees south of true east and true west respectively, and on the 6th and 19th the moon will rise and set approximately at true east and true west respectively.

On January 30 there will be a total eclipse of the moon, but it will not be visible from Queensland.

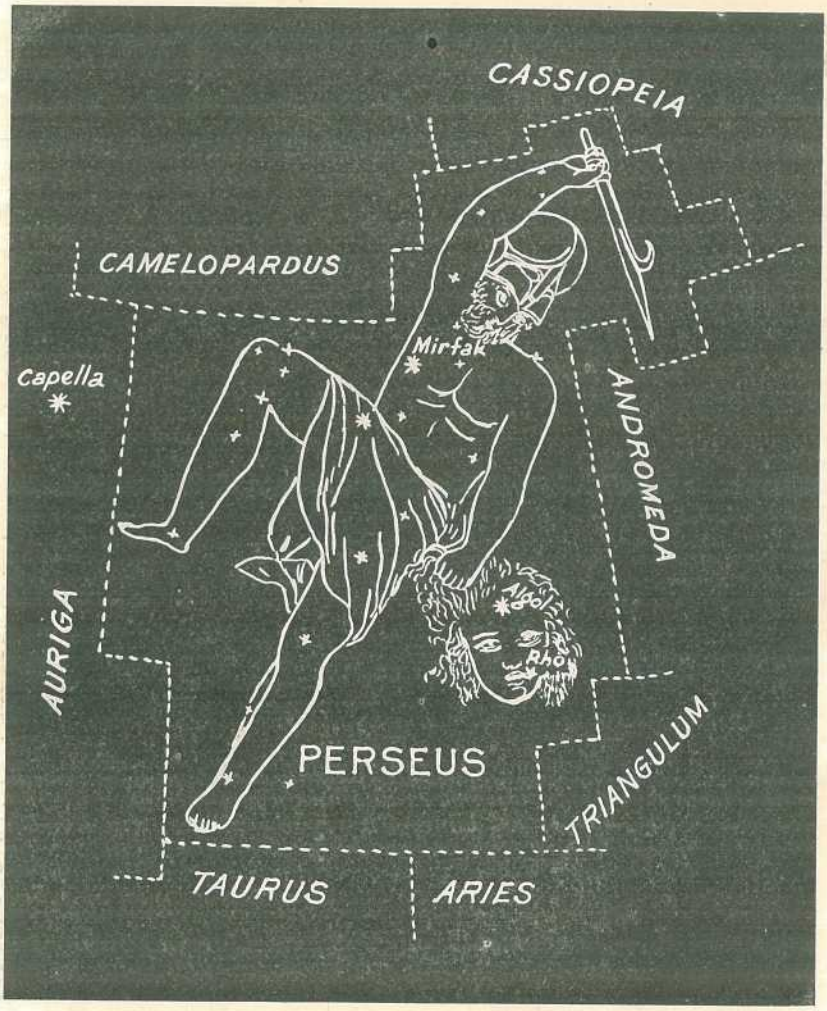
Mercury.—At the beginning of the month, in the constellation of Ophiuchus, will rise 1 hour 17 minutes before the sun, and at the end of the month, in the constellation of Capricornus, will rise 10 minutes before the sun.

Venus.—Still a very brilliant object in the western evening sky, reaching greatest angle east of the sun on the 21st. At the beginning of the month, in the constellation of Capricornus, will set 2¾ hours after the sun, and after passing Mars about the 18th will be placed in the constellation of Pisces at the end of the month, when it will set 2 hours 15 minutes after the sun.

Mars.—In the constellation of Aquarius at the beginning of January, will set between 9.45 p.m. and 11 p.m.; at the end of the month, in the constellation of Pisces, will set between 8.45 p.m. and 10 p.m.

Jupiter.—In the constellation of Aries, will set between 1.30 a.m. and 2.45 a.m. on the 1st and about midnight on the 31st.

Saturn.—Situated in the constellation of Virgo, will rise about midnight at the beginning of the month and between 10.31 p.m. and midnight at the end of the month.



THE CONSTELLATIONS.

PERSEUS.

Perseus is named for the hero who rescued Andromeda from the monster and vanquished the Medusa. It is a large group but lies well to the north and is more suitable for observation from the north of Queensland than from the south of the State. A line from the Belt of Orion through Aldebaran and produced to about its own length will bring the eye to the vicinity of Algol (Beta Persei), the prototype of the "Algolid" or "dark eclipsing" variables. Its arabic name, Algol, which means "The Demon," suggests that its variability was well known to the Arabs centuries ago. Its magnitude for about 59 hours is practically constant at 2.3, but with a slight secondary fall and rise of one-twentieth magnitude about halfway. It then decreases rapidly to magnitude 3.5 in about 5 hours and in the next 5 hours regains its former brightness. The total period is about 69 hours. The variation in light is due to two stars, one bright and the other faint, very close together, revolving about a common centre of gravity and mutually eclipsing each other. About 3 degrees south of Algol is Rho Persei, which is a good star with which to compare Algol's brightness. Algol is much brighter usually, but at minimum will be quite as faint as Rho. Mirfak (Alpha Persei) is a second magnitude star about 10 degrees north of Algol. Algol is near the meridian about 8 p.m. at the beginning of January; from Brisbane it is seen about 20 degrees above the northern horizon, but from Cairns and districts in that latitude it will be seen about 30 degrees above the horizon when on the meridian. The group does not contain a first magnitude star.