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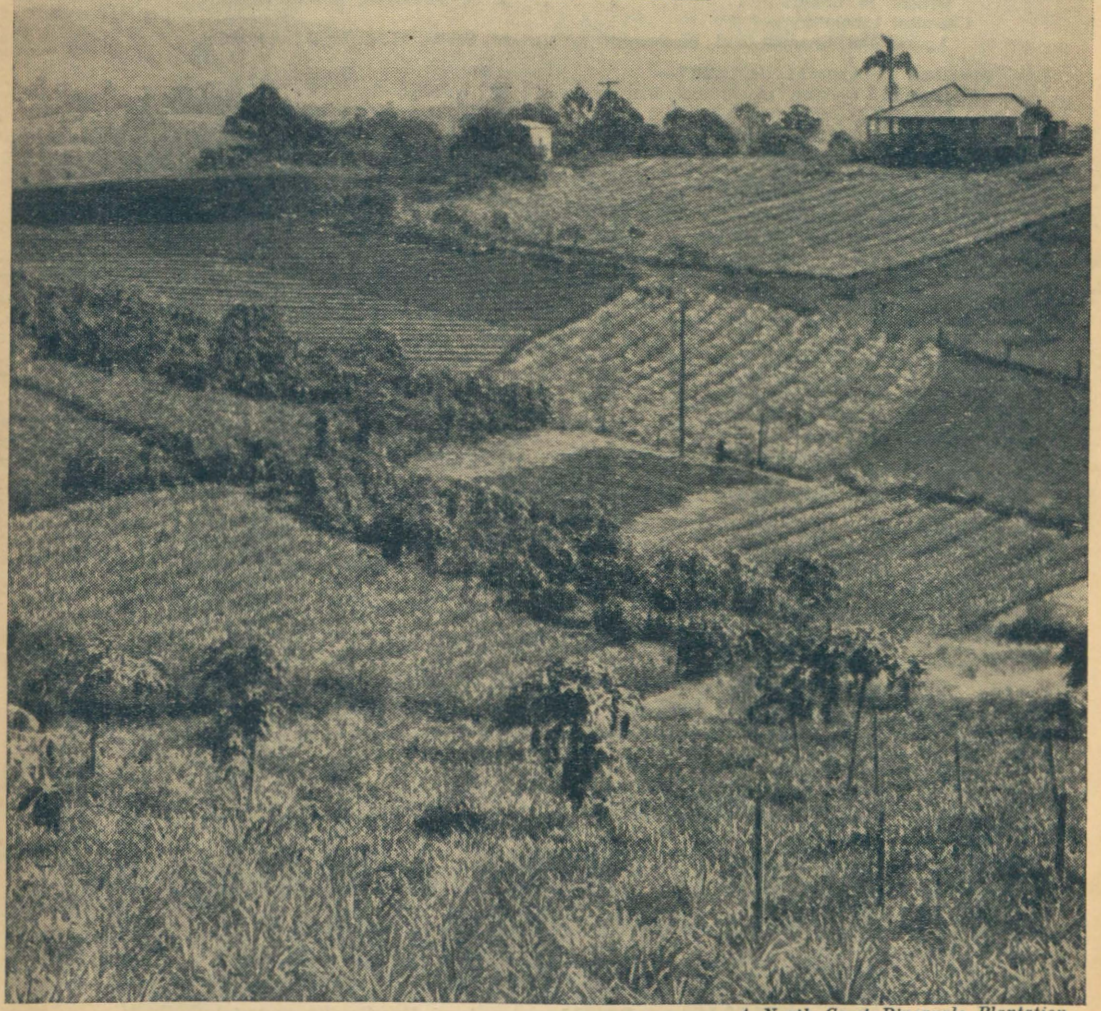

A North Coast Pineapple Plantation.

LEADING FEATURES

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Contents

Crop Rotations for Soil Conservation in the Lockyer Valley.

E. C. DARLEY (formerly Assistant Agronomist, Agriculture Branch).

THE Lockyer Valley and the catchment area surrounding it occupy an area of about 1,140 square miles in south-eastern Queensland. The principal towns—Gatton, Laidley and Helidon—are situated on the rich alluvial soils formed by the various creeks within the region. Rolling hills and steeper country are characteristic of the non-alluvial land.

The area has warm to hot summers, and a number of frosts occur during the winter months. The rainfall is mainly of summer incidence and is sufficient to support mixed farming and dairying. Supplementary irrigation enables a system of intensive cropping to be followed on the alluvial soils.

The soils of the Lockyer Valley can be divided into two main categories:—

(1) Non-irrigated soils of the slopes which are mostly used for dairying and its attendant crops. These soils may be divided further into two main groups depending upon their climax vegetation:—

(*a*) The scrub soils, more fertile and often used for cultivation in conjunction with dairying.

(*b*) The forest soils which are poor in fertility and are not often used for cultivation. These soils find their main use in providing herbage for grazing.

(2) Irrigable soils comprising the dark brown to black fertile clay loams of the flood plains along the various creeks.

EROSION IN THE LOCKYER VALLEY.

Soil erosion in the Lockyer Valley is on the increase.

Sheet erosion is of prime importance and is found on the cultivated, non-irrigated soils of the slopes. Cases of severe damage due to sheet erosion are very evident in the Prenzlau, Hatton Vale, Plainland,

Blenheim, Ropely and Woodlands areas. This type of erosion is most severe on the cultivated paddocks, but does occur to a slight degree on the lands carrying the poorer pastures. Such pastures do not supply sufficient cover to fully protect the soil, especially after droughts and burning.

Gully erosion is not widespread, but is evident in cultivated areas, more particularly in the Blenheim and Ropely areas, and along roadsides.

Tunnel erosion occurs in isolated areas, for example in the Helidon area.

Riverbank erosion affects the alluvial land and is perhaps more severe in the sandy creek banks of Lockyer Creek near Gatton. This type of erosion has also proved expensive in the maintenance of the O'Reilly Weir on Lockyer Creek.

During 1950, landslips appeared on treeless well-pastured scrub soils at Mulgowie and Mt. Berryman, but such phenomena are perhaps outside the scope of ordinary soil conservation measures.

RAINFALL OF THE AREA.

The average annual rainfall for the area is approximately 29 inches and is mainly of summer incidence (Table 1).

TABLE 1.

AVERAGE RAINFALL FOR TWO CENTRES IN THE LOCKYER VALLEY BASED ON 30-YEAR RECORDS.

Month.	Gatton.	Laidley.
	Points.	Points.
January	481	428
February	350	364
March	291	280
April	201	199
May	137	119
June	186	190
July	137	131
August	83	78
September	138	136
October	185	184
November	301	295
December	403	409
Annual Average	2,893	2,813

The character of this rainfall distribution is of importance in determining what rotation of crops will afford the soil the greatest protection during the months of heavy rains. Heavy summer storms and unusually heavy monsoonal falls during January, February and March constitute the main erosion hazards.

NON-IRRIGATED SOILS OF THE SLOPES.

Scrub soils are usually reddish brown in colour, with marginal soils being of a lighter hue. In texture they are loamy, and often include open sandy loams. Their depth is usually not very great, the surface soil often being no more than six inches in depth and sometimes less. Originally they were fairly fertile, being well supplied

with potash and phosphate but often lacking adequate nitrogen and organic matter. They are freely drained, and do not possess a high water-holding capacity. Areas where these soils occur are primarily used for dairying and for the production of such crops as suit the requirements of the dairy farmer. Observations suggest that nitrogenous fertilizers would be useful for non-leguminous crops.

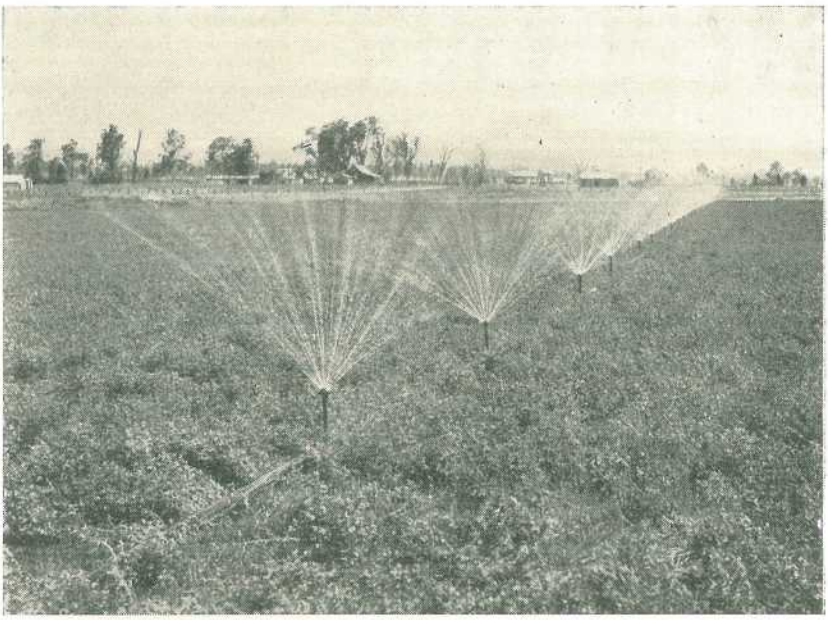


Plate 1.

Irrigating Lucerne in the Lockyer Valley.

The cultivated forest soils are sandy loam types, light in colour, low in organic matter and fairly well supplied with phosphate and potash, although they are uniformly low in nitrogen; hence nitrogenous fertilizers will give good growth responses. Their physical structure is poor and water-holding capacity low. They are freely drained for the most part and have a clayey layer at a depth of about 9–12 in.

Certain areas of these non-irrigated soils show very obvious signs of over-cultivation. It is known that many of the paddocks have been cultivated continuously for the past 50–60 years. Apparently there has been a general reluctance to adopt proper rotation principles and turn cultivated areas back to pasture and use land out of pasture for cultivated crops.

Crops Grown and Rotations Practised at Present.

In order of importance the crops grown on these hillside soils are:—

Maize and fodder sorghums for grain and cow-feed; pumpkins for market; Sudan grass for grazing; oats for grazing; sweet potatoes for market and pigs; cowpeas for grazing and green manure; white panicum for grazing and hay; Japanese millet for grazing and hay; lucerne for grazing and hay; cotton; and broom millet.

In practice, crop rotations may be interrupted by weather conditions, labour and machinery difficulties, economic considerations, and so on. However, two examples of typical crop rotations, covering three to four years, which have been followed on these soils for some years are shown hereunder.

1.	Pumpkins	August-November.
	Sorghum	January-June.
	Sweet potatoes	August-November.
	Oats	March-August.
	Cowpeas	October-February.
	Fallow	February-September.
	Sudan grass, white panicum or Japanese millet	September-April.
2.	Maize	August-April.
	Fallow	April-August.
	Pumpkins	August-December.
	Oats	March-August.
	Sudan grass	October-April.
	Fallow	April-August.
	Cowpeas	September-December.
	Sorghum	February-June.

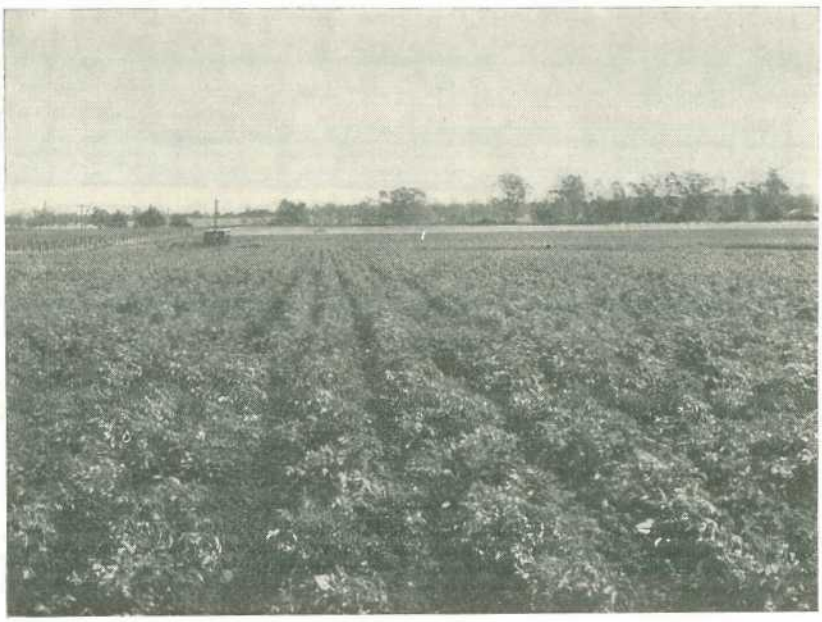


Plate 2.

Irrigated Potato Crop, with Lucerne Field in the Background, Gatton District.

For successful cropping with these rotation systems under dry-farming methods, land preparation and cultivation must be thorough to keep weeds in check, to trap rainfall (thus building up subsoil moisture), and to create conditions for maximum soil nitrate development. These requirements can be met only by frequent working of the land to destroy weed growth and conserve moisture, which is so necessary in view of

the limited seasonal rainfall. Thus the soil is frequently reduced to a fine state which is susceptible to severe erosion by summer storms and the heavy seasonal rains of the January to March period.

The rotations are not satisfactory because the soil is more or less exposed continuously to erosive influences and inadequate provision is made for the regular addition of organic matter to the soil, while the absence of a pasture phase in the rotation to restore soil structure is a serious omission.

The main crops planted and grown during the November to March period, which is the critical time for soil losses due to water erosion, are fodder sorghums, maize, Sudan grass and cowpeas. Sorghum and maize do not provide much protection for the soil, as they are row-cultivated and require clean cultivation for the best results. Cowpeas and Sudan grass are much more satisfactory in protecting the soil and preventing the movement of soil particles. The worst erosion hazards are the bare areas of land which are present during the latter end of this period prior to the planting of oats in March.

Crops such as pumpkins, sweet potatoes, Sudan grass and cowpeas, once established, give a good cover of vegetation to protect soil against the spring and early summer storm rains.

The infiltration capacity of the soil has decreased as a result of these rotations, since cultivation is fairly continuous. This is largely influenced by the loss of organic matter from the soil and the deterioration in soil structure. The rotations are not designed to return much organic matter to the soil. Although a certain amount is supplied by the pumpkins, sweet potatoes, cowpeas, maize and Sudan grass, the overall effect appears to be negligible.

The main fault of the rotations is the lack of a period devoted entirely to pasture. This period under pasture would need to be, for practical reasons, for as long as five years or even more. The prime benefit of this pasture would be in affording the soil good vegetative cover while improving the soil structure.

Suggested Rotations.

The rotations at present being used are not efficient from the point of view of soil maintenance and improvement. In this respect the following type of rotation is suggested as being more satisfactory:—

Pasture	5 or more years.
Fallow	June-August.
Sweet potatoes	August-November-December.
Oats	Early March-August.
Cowpeas	October-March.
Fallow	March-August.
Sudan grass	September-April.

This rotation allows the cash crop sweet potatoes to take advantage of the improved soil structure due to the pasture, and both summer and winter crops for the dairy cows are provided for. Unfortunately, it is not possible to avoid bare soil over the summer months of heavy rainfall, when land is prepared for oats, but by the inclusion of a pasture phase it does mean that soil in such a highly erodible condition is not exposed more often than once in every seven years or so.

The above rotation omits very useful crops such as maize, sorghums and pumpkins, and the following rotation is suggested as one in which these crops could be incorporated:—

Pasture	5 or more years.
Maize	August-June.
Pumpkins	August-November.
Cowpeas	January-April.
Fallow	April-August.
Sweet potatoes	August-December.
Foder sorghum	January-July.

This rotation allows ample scope for cash crops (maize, pumpkins and sweet potatoes). It includes also fodder crops in the form of sorghum and cowpeas, and it does allow of some return of organic matter to the soil. The crops grown during the November to March

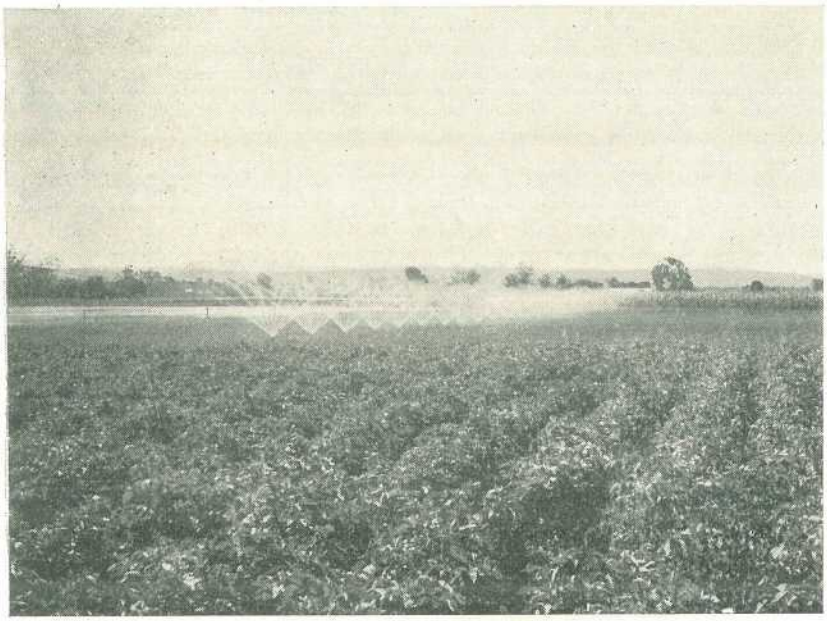


Plate 3.

Irrigated Crops in the Lockyer Valley. Potatoes in foreground, lucerne being irrigated, and maize in background.

period in this rotation are maize, sorghums, cowpeas and sweet potatoes. The last two crops give a good vegetative cover, but row-cultivated maize and sorghums are less efficient in this regard. However, at no stage is there a bare fallow exposed to the heavy summer rains.

For practical purposes, dairy farmers would probably need to use both types of rotation, and in some circumstances a combination of both rotations may be desirable. The significant factor in each rotation is the inclusion of a pasture phase of at least five years' duration. There is little doubt that the use of a pasture phase would be most useful in conserving the soil and improving crop production.

Other Necessary Soil Conservation Practices.

On the slopes, rotations alone will not meet the problem completely and attention should also be given to contour farming and allied mechanical soil conservation measures.

Greater emphasis must also be placed by dairy farmers on fodder conservation, adjustment of stocking rates and rotational grazing to reduce the overgrazing of pasture paddocks. On slopes, overgrazed pasture in some circumstances can be just as susceptible to sheet and gully erosion of the soil as cultivated fields.

Plate 4.

Irrigated Crop of Young Onions, Lockyer Valley.

IRRIGABLE SOILS OF THE FLOOD PLAINS.

These soils are alluvial in origin, are brown to black in colour and vary in texture from loams and sandy loams at the heads of the valleys to clay loams and clays as the distance from the source of the streams increases. They are deep soils, but the drainage of the clays and clay loams is not all that could be desired. Sometimes they are self-mulching and in nearly all cases they have excellent water-holding capacity. High fertility is general, although cropping may lead to an overall deficiency of nitrogen, while potash is not well supplied in some soils along Laidley Creek. In addition, a deficiency of sulphur in some localities will retard lucerne growth if not corrected. The nitrifying capacity of the heavy soils is high and little response to nitrogenous fertilizers can be expected if a bare fallow of two to three months has operated prior to planting of the crop.

Generally speaking, these soils are used principally for the production of crops under irrigation, although some areas (where the water is unsuitable for irrigation) are used for dairying. Thus this land is kept continuously under one crop or another, and is worked frequently by cultivation implements. Consequently, some deterioration of the physical structure of the soil has occurred. The slope of these soils away from the creek banks is very slight and soil erosion is not a problem.

The factors responsible for the deterioration of structure on these soils are intensive cultivation; intensive spray irrigation on unprotected soils; frequent irrigation, in some cases with waters almost unsuitable for irrigation due to their salt content; the small return of organic matter; and the absence of a pasture phase in association with grazing animals in the crop rotations practised.

Crops Grown and Rotations Practised.

In their approximate order of importance, the crops grown are lucerne, onions, potatoes, pumpkins, maize, cowpeas, winter cereals and linseed.

These crops are grown in definite zones on the farms, and on the lighter soils of the creek banks a typical rotation would be:—

Lucerne	3 or more years.
Potatoes	Autumn crop.
Pumpkins	Spring crop.
Potatoes	Autumn crop.
Cowpeas	Spring crop.
Potatoes	Autumn crop.
Pumpkins	Spring crop.

In this type of rotation the emphasis is on the production of potatoes and lucerne primarily, while pumpkins enable a widening of the rotation. Cowpeas are included as a green manure crop in an attempt to keep the soil in a condition suitable for potatoes.

On the heavier soils the following is a common rotation:—

Lucerne	3 or more years.
Pumpkins	Spring crop.
Onions	Winter and spring.
Fallow	Summer.
Onions	Winter and spring.
Pumpkins	Summer and autumn.
Onions	Winter and spring.

In this rotation the onion crop is the first consideration, but lucerne is also given careful attention. The pumpkins are often planted as a catch crop, and are not given a great deal of attention. This rotation is operated so as to keep the land relatively free from weeds for the onion crop. Some farmers include a green manure crop in this rotation, and the practice is to be commended.

Maize, winter cereals and linseed are included in these rotations somewhat haphazardly, depending upon the need of the moment. In general, they do not figure very largely in the agricultural programmes of the irrigated soils of the flood plains. For the most part the rotations practised have given satisfactory results on these fertile soils and a good level of production has been maintained. In recent years the wider application of fertilizers has been beneficial, especially where the soils have shown response to the use of fertilizers containing potash, sulphur and nitrogen.

Plate 5.

Wheat Varietal Trial, Bureau of Investigation's Irrigation Research Station, Gatton. Wheat is used as a rotation crop in some parts of the Valley.

The use of lucerne in the rotations is most beneficial, particularly in favouring the build-up of soil nitrogen and in spelling the soil for a few years from intensive cultivation. This crop, however, does not function to any great degree in restoring soil structure and it is felt that more attention needs to be given in the future to introducing a pasture phase in the rotation for this purpose.

The irrigated pasture investigations at the Bureau of Investigation's Irrigation Research Station at Gatton have shown that irrigated pastures of high productive capacity can be grown on the flood plain alluvials. The inclusion of an irrigated pasture phase in the crop rotations would be desirable. The problem is to fit this

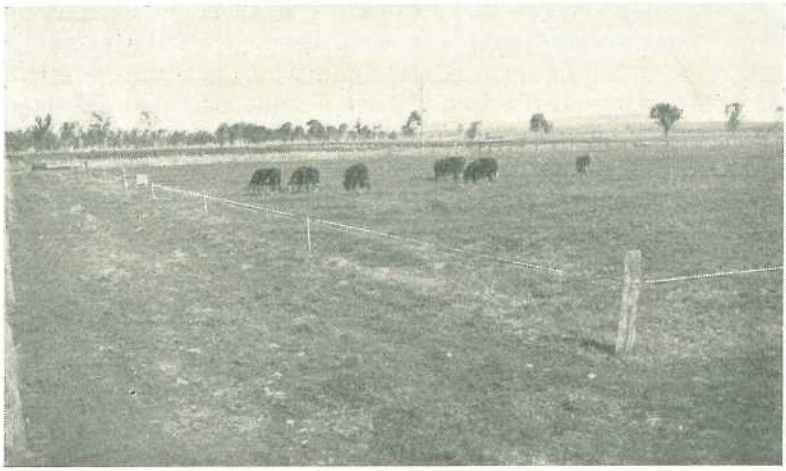


Plate 6.

Beef Cattle Grazing on Irrigated Pasture, Bureau of Investigation's Irrigation Research Station, Gatton.

phase into the routine of farms which are mainly devoted to crop production only. The use of grazing animals would be necessary if irrigated pastures were to be grown. There is little doubt, nevertheless, that a combination of both crop and animal husbandry would lead to greater stability and a permanently high level of fertility in these rich irrigated alluvials.

PUBLICATIONS AVAILABLE.

The following recent publications are available free of charge to Queensland primary producers. Please ask only for publications connected with your particular branch of farming.

Plant Industry Advisory Leaflets—

No. 264. White wax scale on citrus.

No. 266. Red spider mites and their control.

No. 267. Propagation of fruit trees.

No. 279. Tomato, cape gooseberry, egg plant and capsicum.

Plant Industry Pamphlets—

No. 153. Buffel grass (Cenchrus ciliaris L.)

No. 154. Citrus virus diseases in Queensland.

Animal Industry Advisory Leaflets—

No. 52. Useful cattle feeding stalls.

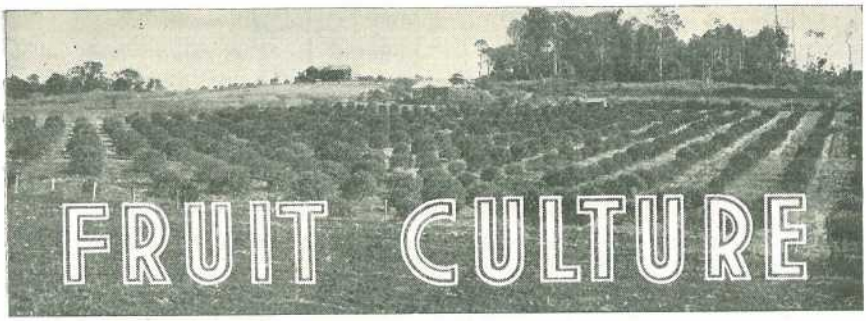
No. 54. Blackleg.

No. 56. Green cestrum—a plant poisonous to stock.

Animal Industry Pamphlets—

No. 22. Shade trees and windbreaks on the pig farm.

No. 23. Beef production in association with cultivated crops.



The Banana.

J. McGREGOR WILLS (Senior Adviser in Horticulture) and F. W. BERRILL (Assistant Horticulturist), Horticulture Branch.

THE cultivated banana has a very respectable antiquity. Alexander the Great found it growing in India during the course of his campaign in 327 B.C., but the plant was well known in Egypt and Assyria at a much earlier date. The crop is linked traditionally with the Garden of Eden as the tree of knowledge of good and evil; hence the name (*Musa paradisiaca*) given by the early botanist Linnaeus to the species now commonly referred to as the plantain.

The banana is a more or less typical monocotyledon and belongs to the family *Musaceae*. In the earlier systems of botanical classification this family included not only the genus *Musa*, which contains both the cultivated and wild forms of the banana, but also the genera *Ravenala*, *Strelitzia* and *Heliconia*. Probably the best known member of *Ravenala* is *R. madagascariensis*, the traveller's tree of Madagascar, which is grown as an ornamental. The species of *Strelitzia* are natives of South Africa and produce rather curious and highly ornate "bird of paradise" flowers. *Heliconia* is somewhat rarer, being confined mostly to the West Indies and South America, where it is sometimes referred to as a wild plantain.

These three genera are now no longer classified with the true bananas, and the family *Musaceae* therefore contains only the true bananas, the cultivated seedless types being confined to the genus *Musa*. The family contains a comparatively large number of species widely spread over the tropical and subtropical regions of the world. Only three, however, are indigenous to Queensland, namely *Musa banksii*, *M. hillii* and *M. fitzalani*, all of which are seeded forms of no commercial importance.

The most widely grown commercial variety in Queensland is the Cavendish. In 1826 a few plants of this variety were taken from Southern China to Mauritius. In 1829 offshoots from these were sent to England and grown in the Duke of Devonshire's hothouses at Chatsworth. The owner's family name was Cavendish and hence the variety became known as *Musa cavendishii*. In 1838, plants were taken by the missionary John Williams from Chatsworth to the South Sea Islands, where their high-bearing capacity and low stature made them very popular. Since the plant reproduces itself only by vegetative offshoots, it is very probable that many of the Cavendish banana plantations established in Pacific countries originated from the plants owned by the Duke of Devonshire over a hundred years ago.

HISTORICAL DEVELOPMENT.

The commercial production of bananas in Queensland commenced independently and at different times in various parts of the State. On the extreme south coast, the first planting was made in the Currumbin district in 1903, the varieties being Lady Finger and Sugar, followed a little later by Cavendish. Prior to that time banana shipments from North Queensland to southern capitals were heavy, but Fiji captured these markets after the Leonta cyclone which crippled Australian production in 1903. Subsequent to large-scale plantings on the Tweed River in New South Wales, the industry spread to southern Queensland. In these early years the total acreage under crop was small, as payable markets were practically non-existent in Brisbane. The Sydney market was usually well supplied from Fiji and consignments of fruit to Melbourne often opened up in poor condition and showed considerable wastage. Nevertheless, the industry expanded slowly along Currumbin Creek to Tallebudgera, Mudgeeraba, Nerang, Coomera and adjacent districts.

On the Near North Coast, Buderim Mountain was opened up for settlement about 1867. Shortly afterwards bananas, mostly of the Cavendish and, to a lesser extent, the Lady Finger variety, were introduced, and the crop developed on a considerable scale, the fruit being carried to Brisbane by sea. At the same time, production began further north in the Gladstone, Rockhampton and Bowen districts. In the far north, however, production was well under way much earlier, the crop being grown on the alluvial flats, principally by Chinese settlers, and shipped to Brisbane.

The virus disease known as bunchy top was introduced into New South Wales with imported planting material, and after the initial outbreak in the Tweed River district reached Queensland in 1920. By that time the industry had expanded considerably and was estimated to be worth more than £1,000,000 to the State. In the absence of control measures for the disease, plantations south of Brisbane were virtually wiped out and the industry consequently came into much greater prominence on the north coast. In the late 1920's, control measures for the disease had been evolved and the south coast area again became an important producing centre.

PRODUCTION.

The banana is now an important food crop in most parts of the world between the latitudes of 29° N. and 29° S. In Queensland it is grown along the whole of the coastal strip from the New South Wales-Queensland border to Mossman, a distance of some 1,200 miles. Climatic conditions vary considerably within this area and production is influenced correspondingly. However, most of the crop is produced south of Gympie at the present time, mainly because of the close proximity of this area to the more important metropolitan markets of Brisbane, Sydney and Melbourne. In the year 1952-53, the total area of bananas in Queensland actually in production was estimated to be 8,707 acres.

STRUCTURE AND GROWTH HABITS.

The banana is a broad-leaved herbaceous perennial plant (Plate 1) which flourishes in warm, moist, sheltered situations exposed to neither high winds nor low temperatures, and having a well-drained fertile soil.

The Corm.

The true stem is a condensed rhizome known as a "corm," which remains underground for the greater part of its life. It is a thick massive structure with rudimentary or scale leaves. The roots arise mainly from the sides but also from the base of the corm. Suckers or offshoots are produced from buds in the axils of the scale leaves, which follow a spiral pattern, and sucker buds or "eyes" occur in pairs, the buds in each pair being almost opposite to each other on the corm. Thus vigorous plants tend to throw suckers of approximately equal age in pairs, the suckers in each pair being on almost opposite sides of the aerial pseudostem.

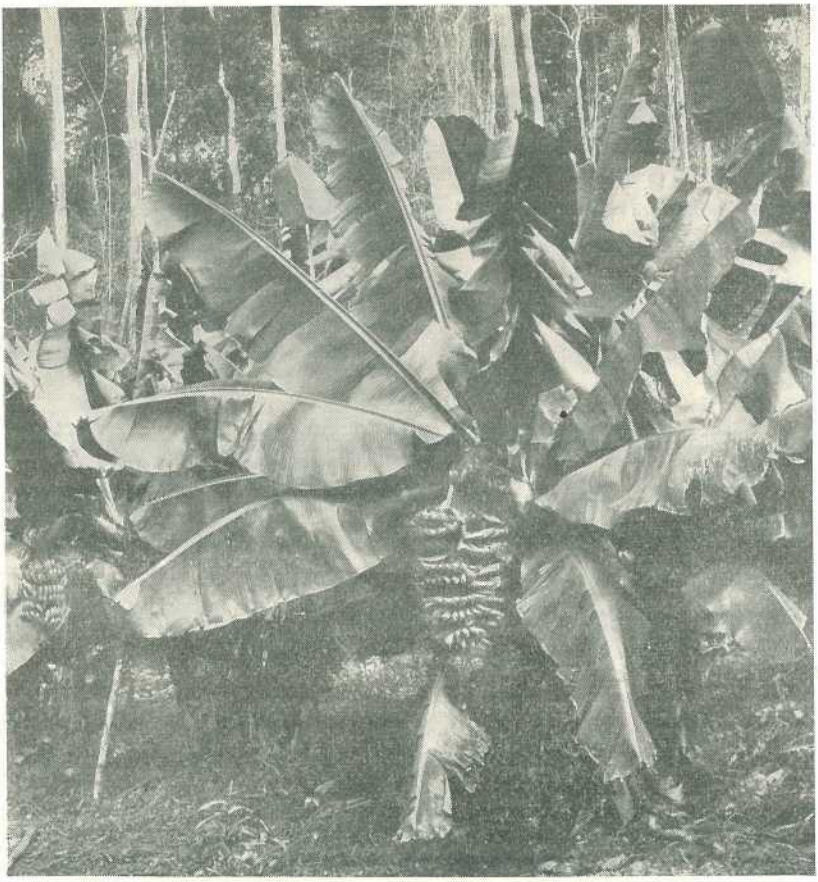


Plate 1.

Cavendish Banana Plant Bearing a Crop. Bunch at right about three weeks old; bunch at left about 10 weeks old.

Plant foods are accumulated in the corm not only for the maintenance of growth in the plant itself and its suckers, but also for the production of fruit. These reserves of food material are mainly starch. When an eye begins to grow, the insoluble starch in that part of the corm is rapidly converted to soluble sugars which are essential for the formation of new plant tissues. A similar process

takes place when the bunch is initiated. The vigour of a plant and its suckers, and the size and quality of the bunch produced, are related therefore directly to the amount of food material stored in the corm.

If the corm is cut in halves horizontally three distinct regions will be observed. Between the central, tough, white, fibrous portion and the outer surrounding tissue is a ring of somewhat transparent material from which the sap conducting vessels of the roots originate.

The Roots.

As in all monocotyledons, the roots are relatively long, cordlike and fleshy, do not thicken and form wood with age, and although tough, are nevertheless easily damaged. Near the ends of the main roots are the fine secondary roots known as hair roots. The actual

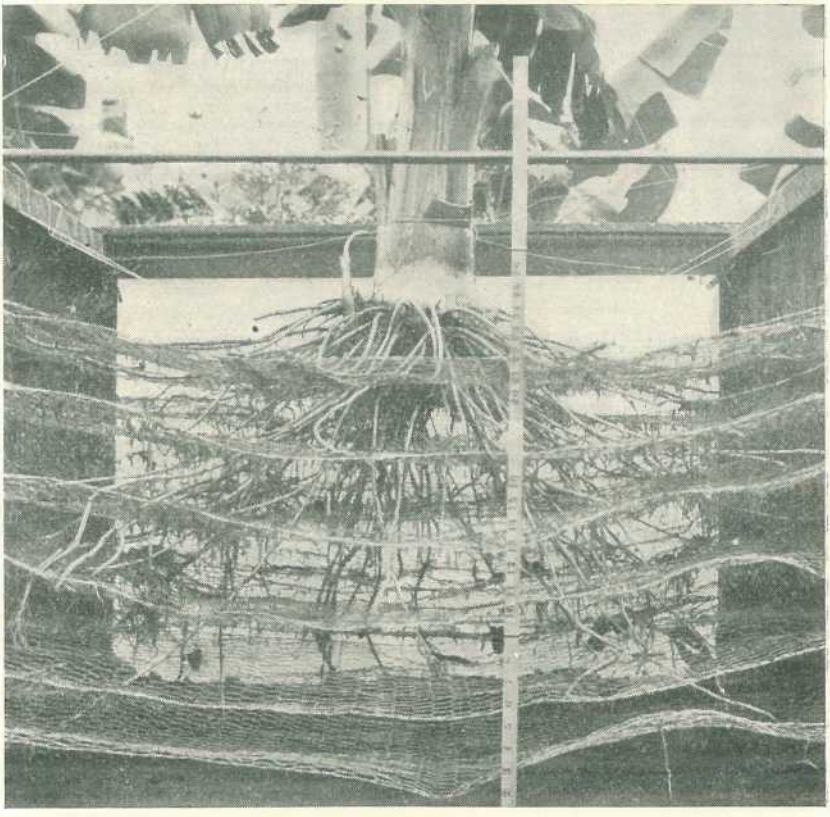


Plate 2.

Root Distribution of the Banana. Cavendish plant approximately six months old. Note the lateral spread of roots and depth of penetration. The box is 31 in. deep.

absorption of food materials from the soil takes place through very small root hairs which occur on roots of all sizes and are connected with the internal sap-conducting vessels of the root and hence to the corm.

In a moist but well-drained, deep, friable soil with a high humus content, the roots extend laterally for several feet from the base of the plant but are usually relatively shallow. The depth of penetration depends largely on the structure of the surface soil and the subsoil, but as a general rule, few roots go below the 30-inch level, and in many soils rarely if ever get even to that depth (Plate 2). Soils with a poor structure are associated with shallow root systems in the banana plant.

The Leaves.

The part of the plant commonly referred to as the trunk or pseudostem is made up of the expanded leaf bases which protect the younger leaves and the flower in their early stages and support them several feet above the ground.

The leaf proper consists of a midrib and broad undivided blade. It arises from the central growing point at the apex of the corm and is forced up through the pseudostem, finally emerging at the top or "throat" with the blade tightly rolled round the strong fibrous midrib. One side of the blade is slightly longer than the other and folds over to form a cap. When growth is vigorous, the young leaf does not unfurl until it is clear of the throat, but during cold or excessively dry weather unfurling may begin earlier and induce what is generally known as a compacted pseudostem.

The total number of leaves produced by a plant before it bunches varies from 30 to 40 or occasionally more. The last two leaves produced are shorter than those preceding them, the final one being extremely short and having a tendency to hang over the flower bud. In addition, the flower stalk itself bears one or more elongated sheathing structures called bracts, which shrivel and dry out soon after the bunch is thrown.

Flowers and Fruit.

The flower buds are initiated at the growing point of the corm and hence some are actually differentiated at or just below ground level (Plate 3). From this time onwards the corm elongates vertically to form an aerial stalk which carries the flowers up through the pseudostem in much the same manner as the petiole has carried its leaf blade to the top. The thickness of the flower ranges from 2 to 4 inches but its diameter varies with the vigour of the plant and the variety.

As the stalk elongates it carries up with it the last few leaves, whilst at its tip are the developing flowers. Apart from the elongation of the stalk and increase in size of the fruit, there is no further growth of the aerial portion of the plant once the flowers appear. As the stalk elongates, the weight of the fruit causes it to bend downwards, so that the bunch finally hangs vertically with the distal end downwards. The pseudostem and leaves quickly die when the bunch matures its fruit, but the original corm persists for some months before finally rotting away.

The flowers are grouped in double-row clusters known as hands. The hands are arranged spirally around the stalk, the number of flowers in a hand varying from 10 to about 25 or more and the oldest hands towards the base of the stalk generally have the greatest number. Each hand is subtended by a reddish-purple or green bract (the colour differs with the variety) and development proceeds from the base upwards, each bract in turn lifting to expose the flowers underneath.

Before the bunch begins to move up the pseudostem, each flower is potentially bisexual or hermaphrodite. Differentiation, however, takes place during development, so that commonly the opened flowers are described as female, hermaphrodite or male. The fully developed flowers at the base of the bunch have well developed ovaries, styles, stigmas and stamens, but the stamens have no anthers. This type of flower, which gives rise to the fruit, may account for 12 or more of the basal hands. In the flowers following these, the ovary is small and the

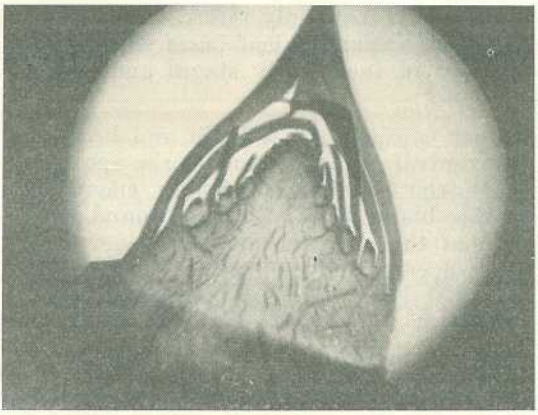


Plate 3.

Longitudinal Section Through Growing Point of Corm after the Bunch has been Initiated. Note the embryonic flower buds and the elongation of the apex, which will become the bunch stalk. The outermost structure is a section through an immature leaf.

stamens become more and more pronounced, until in the lower hands the flowers have normal anthers, whilst the female structures are imperfect. In the Cavendish variety the hermaphrodite flowers form a cluster of short rudimentary fruits, immediately below the last true hand of fruit; in the Mons Mari, these are mostly deciduous (Plate 4).

The cultivated banana is parthenocarpic—that is, the flowers produce fruit without being pollinated and the fruit is normally seedless. If, however, two varieties are cross-pollinated, seed may be produced; this method has been used for breeding new hybrids for disease resistance and other purposes.

Since the flowers are initiated at the apex of the corm, the number of flowers and hence the possible number of fruit is determined long before the bunch appears in the throat. The actual period before the bunch is initiated varies with the growing conditions, but as a general rule in southern Queensland the so-called initials or foundations of the bunch are laid down within about four months of planting. The availability of plant foods at that time therefore determines the total number of fruit which can be formed. During the later development of the embryonic bunch, however, both food reserves and climatic factors influence bunch development, and what was potentially a very large bunch may only be a poor one when it is thrown if it has developed under unfavourable climatic conditions.

A typical example of such an effect is the so-called "November dump" fruit which occurs in southern Queensland, generally in bunches thrown about November. Such fruit commences development in mid-winter, when cold air at the base of the plant tends to check the elongation of the fingers and may even prevent their development altogether. The result is a bunch with comparatively few hands and

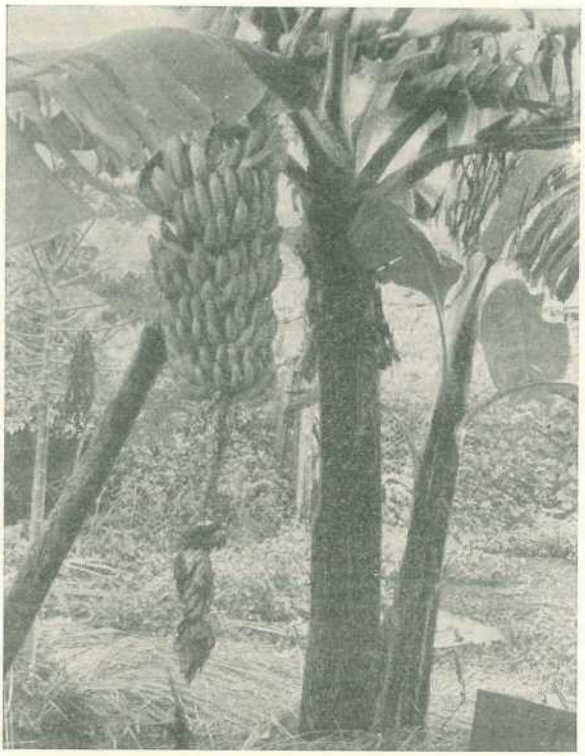


Plate 4.

Bunch Structure. A few rudimentary fingers derived from hermaphrodite flowers may be seen immediately below the last hand of fruit, with another cluster lower down the bunch stalk. At the extreme tip is the "bell" containing the male flowers.

very short fruit which become correspondingly fat and "dumpy" as they fill. Usually the more severe the winter, the worse are the "dump" bunches; the condition is not well known in the tropics.

VARIETIES.

The most popular variety grown commercially in Queensland is the Cavendish, a sturdy type which often escapes wind damage by virtue of its short pseudostem and which bears very heavy crops of fruit. In this country it is immune to Panama disease, which commonly affects tall-growing varieties, such as Lady Finger and Sugar.

The semi-dwarf Mons Mari and the very similar Williams Hybrid are bud mutations from the dwarf Cavendish, the former being first selected for commercial production at Buderim Mountain and the latter near Coff's Harbour in New South Wales. Mons Mari and Williams

Hybrid may attain a height of from 8 to 12 feet when grown on suitable soils. Under comparable conditions, the bunches are larger than those of Cavendish, the fruit grades better and the hands are more widely spaced. Furthermore, these mutants are often more tolerant of marginal soil and climatic conditions than Cavendish. They are generally preferred for commercial production at higher altitudes where Cavendish often proves least satisfactory.

The tall varieties, Lady Finger and Sugar, are generally grown on frost-free river flats. However, the severity of Panama disease in these areas has induced some growers to plant them on higher land which would normally be used for dwarf and semi-dwarf varieties such as Cavendish and Mons Mari. Provided the tall varieties are effectively protected from high winds by the topography of the plantation, they do well on the higher slopes. In the Near North Coast district, the Lady Finger is often planted on Cavendish replant land, mainly because of its relatively deeper rooting system, with quite satisfactory results.

The Anamalu, imported from Ceylon some years ago, is the tallest commercial variety grown in Queensland but production is still on a small scale. It attains a height of 16-18 ft. and can be grown either on alluvial flats or on slopes. However, owing to its great height, slender pseudostem and very large bunch, efficient propping is impracticable and heavy losses are inevitable if the plantation lacks good natural protection from strong winds. The fruit is particularly attractive, has an excellent flavour and carries well to distant markets.

The Gros Michel, although the most important banana variety in world commerce, is not grown commercially in Queensland, though isolated small areas still exist in the north of the State. Its lack of importance is due primarily to a marked susceptibility to Panama disease and its tendency to suffer severely from strong winds.

Other varieties which are grown in Queensland but of little commercial interest include Viemama, Red Dacca, Green Dacca (or Raja), Ducasses Hybrid, Blue Java, Lubin (or Bookabooka), Embul Hondrawala and the Common Plantain.

The main characteristics of the more important commercial varieties of banana in Queensland are given below (measurements given are only approximate) :—

Cavendish.—Pseudostem 6 ft. high; green but heavily pigmented. Leaves 5 ft. long and up to 24 in. wide; stalk short and sturdy. Bunch medium to large with 8-12 hands; compact and tapering. A very popular variety which is resistant to Panama disease.

Mans Mari and Williams Hybrid.—Pseudostem 8-12 ft. high; green but heavily pigmented; somewhat thinner than Cavendish. Leaves 6 ft. long and up to 26 in. wide; stalk moderately long and sturdy. Bunch long and cylindrical, with 10-15 well-spaced hands. Both are tall mutants from Cavendish and require propping.

Lady Finger.—Pseudostem 12-16 ft. high; bright green with little pigmentation. Leaves 8 ft. long and up to 28 in. wide; light green and slightly drooping; stalk long and sturdy. Bunch medium, with 5-8 hands of short, thick and rather angular fruit. A tall variety which is tolerant of cool weather and does not require propping; susceptible to Panama disease.

Sugar.—Pseudostem 10-12 ft. high; slender; light green; slightly pigmented. Leaves 6-7 ft. long and up to 24 in. wide; stalks long, slender and tinged with pink. Bunch usually small with 5-6 hands of short, thin-skinned fruit which has a sweet flavour. Very susceptible to Panama disease.

Anamalu.—Pseudostem 14 ft. high; tapering; light green with some pigmentation. Leaves 10 ft. long and about 30 in. wide. Bunch long and cylindrical, with well-spaced hands; fruit abruptly curved at base. Requires a sheltered situation as propping is impracticable.

SELECTION OF LAND.

Important factors in the selection of land for banana production are a rainfall of from 50 to 100 in. per annum, high soil fertility, and a subsoil which, while not impeding drainage, holds sufficient moisture to tide the plant over dry periods whenever they occur. These conditions are best satisfied by virgin soils (Plate 5) which have not been exploited for horticultural purposes and are therefore rich in plant nutrients, contain a large amount of organic matter and possess a good structure. Frequently, therefore, bananas are handled as a developmental crop which is planted on land to be used for other purposes when the cropping period for bananas has ended.

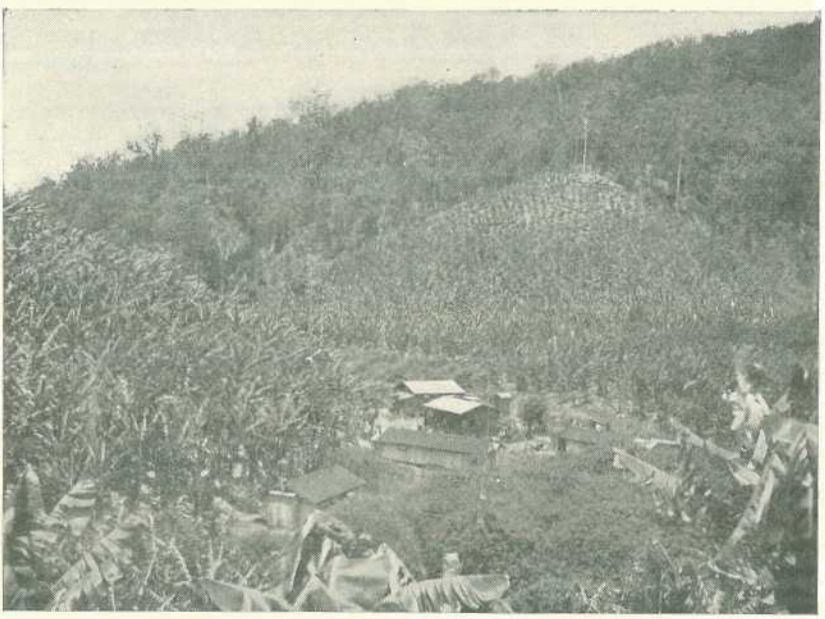


Plate 5.

Banana Plantation at Upper Coomera. Lady Fingers in left foreground; Mons Mari in near centre. Note the protection afforded by standing timber.

An exception occurs in the case of alluvial areas where irrigation can be applied from either river or underground sources of water (Plate 6). In North Queensland, dwarf and semi-dwarf varieties such as Cavendish and Mons Mari are grown frequently on alluvial soils, but in southern Queensland, tall varieties such as the Lady Finger are preferred on this type of country.

When selecting land, the natural vegetation is often a guide to its suitability for bananas. Potential banana soils occur in both rain forest and open forest associations. The rain forest or scrub soils are usually deep, friable loams, rich in humus and well drained. When derived from basalt they may be stony on the surface, but this is not a serious drawback as the stones impede surface runoff during heavy rains and therefore minimise soil erosion even on steep slopes. Dense vine growth and tall, straight softwood timbers such as carrabean, crow's ash, bolly gum and cedar are typical of this type of country.

Plate 6.

A Typical River Flat Plantation. With a long frontage to the tree-lined river, irrigation presents no difficulties.

Most of the rain forest in southern Queensland has already been cleared and it is difficult to find areas of virgin scrubland for bananas, except in relatively inaccessible situations at the heads of gullies or high up on mountain slopes. In Central and North Queensland, suitable land of this type is still available in quantity.

Scrub soils now under pasture can, if necessary, be utilized for bananas, provided the area is ploughable and can be prepared for planting at a reasonable cost. Slopes formerly used for bananas and now covered by lantana and sapling regrowth up to several years old may also be cleared and planted to the crop. In both cases, heavy applications of fertilizer will be needed for maximum production.

Open forest soils are normally less fertile than rain forest soils in coastal areas where bananas can be grown. However, if the land is selected carefully and the plantation managed efficiently, payable crops can be produced. In the open forest soils, trees such as bloodwood, grey gum and tallowwood, especially if accompanied by dense undergrowth, are indicators of a reasonably deep, well-drained, friable loam containing

fair amounts of organic matter. Open forest soils supporting mahogany, turpentine or spotted gum are usually shallow and erode rapidly if adequate precautions are not taken to prevent soil wash.

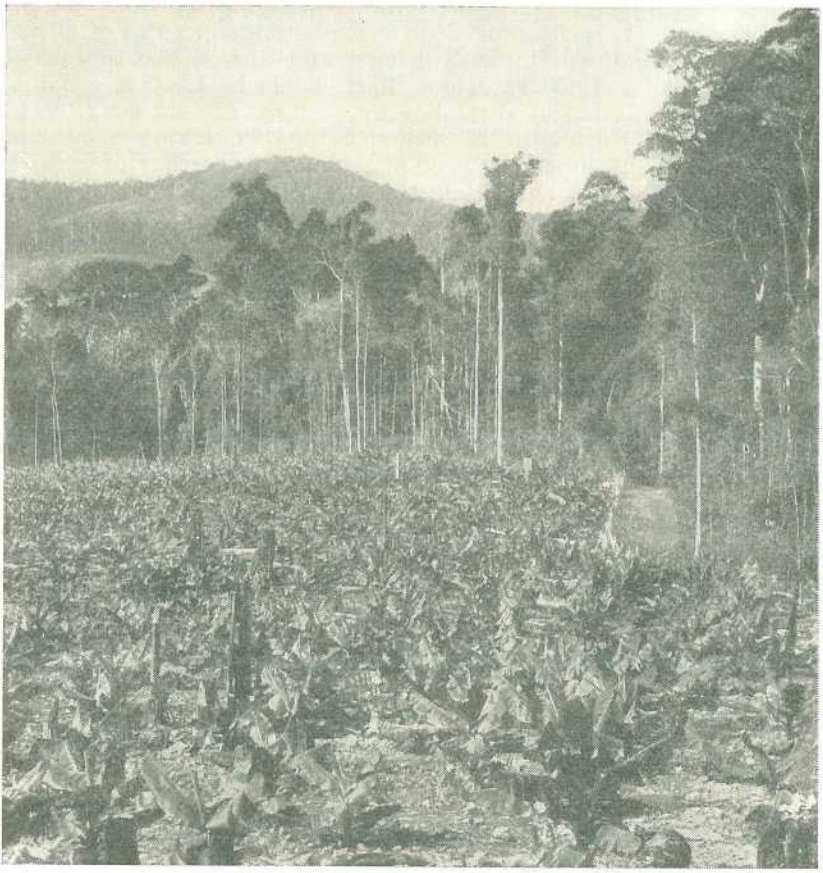


Plate 7.
Cavendish Banana Plantation, South Coast, on Virgin Rain Forest Land.

Alluvial soils vary considerably. Some are relatively heavy silts overlying a porous subsoil; others are heavy loams overlying clay. Except in very wet areas, the light alluvials are of little value for bananas unless the crop can be irrigated and fertilizers are regularly applied. The heavier alluvials are capable of producing good crops of bananas if care is taken to provide the requisite drainage.

SELECTION OF SITE.

The banana plant requires ample moisture and relatively high temperatures for its best development. Both are influenced by the elevation, aspect and natural shelter of the plantation area. Freedom from frost is essential, but tall varieties such as Lady Finger and Sugar are rather more tolerant of cold conditions than the dwarf and semi-dwarf types. This tolerance of cold conditions is mainly due to the rapid growth of the plants during the first year after planting; throat and leaves are well above ground level, where cold air accumulates at

night in the winter months. Such accumulation of cold air at the base of the stools may, however, be detrimental to plants with a bunch in the embryonic stage, for the size and quality of the bunch are affected.

In southern Queensland, where the frost risk is most serious, there is a rather distinct segregation of varietal plantings in terms of altitude, as follows:—0 to 1,000 ft., Lady Finger and Sugar; 400 to 1,000 ft., Cavendish; 400 to 1,300 ft., Mons Mari; 1,000 to 1,500 ft., Williams Hybrid. Sites affected by down-flowing currents of cold air from hills are unsuitable for bananas, as severe chilling in winter is associated with retarded plant growth, delayed bunching and severe fruit blemishes. Tops of ridges should not be cleared for bananas if wind damage is likely to occur. Except in North Queensland, where aspect is not important and planting on level ground is desirable, plantations should face from east to slightly west of north. Such aspects are naturally warm and moist, since they are open to the morning sun and protected from strong southerly and westerly winds by either topography or natural timber.

PREPARATION OF THE LAND.

In virgin rain forest or scrub, undergrowth is usually brushed and the standing trees are felled from April to June so as to allow ample time for the timber to dry out before burning between September and November. In open forest, clearing may be delayed until June or July, since most hardwood trees burn well within a few weeks of felling. In replant land, the lantana is brushed and young saplings are cut down about six weeks before the actual burn, when, if the day is calm and sunny, an effective clean-up can be expected. Old pasture land should be rough-ploughed across the slope during the early spring and as much grass as possible worked out of the soil before planting; blady grass or bracken must be grubbed with a sharp mattock to ensure its destruction.

Felling and Clearing.

In preparing virgin land for bananas, the undergrowth should first be cut close to the ground. As far as possible, trees should be felled across the slope, for scorched logs left in this position after the burn reduce soil drift down the slope. On relatively flat country this consideration is less important. A good burn can be expected only if all upright branches are lopped and stacked around the larger timber before starting the fires.

After burning off, the layout of the plantation should be finalised, planting distance selected, and, if the land is steep, the position of wiring systems fixed so that fruit can be conveniently despatched to the packing shed.

Contouring.

As bananas are very largely grown on steep slopes in the main producing areas, steps must be taken to minimise soil erosion by controlling the flow of surface water during periods of heavy rain. Contouring is, therefore, a necessary practice in many banana districts (Plate 8).

In preparing land for contour planting, it is first necessary to construct a contour drain above the proposed plantation site to divert surface water to a suitable outlet such as a grassed gully. Below this diversion drain the banana rows are marked out on near-contour lines with a fall of 2 in 100 and shallow drains about 12 in. deep are dug

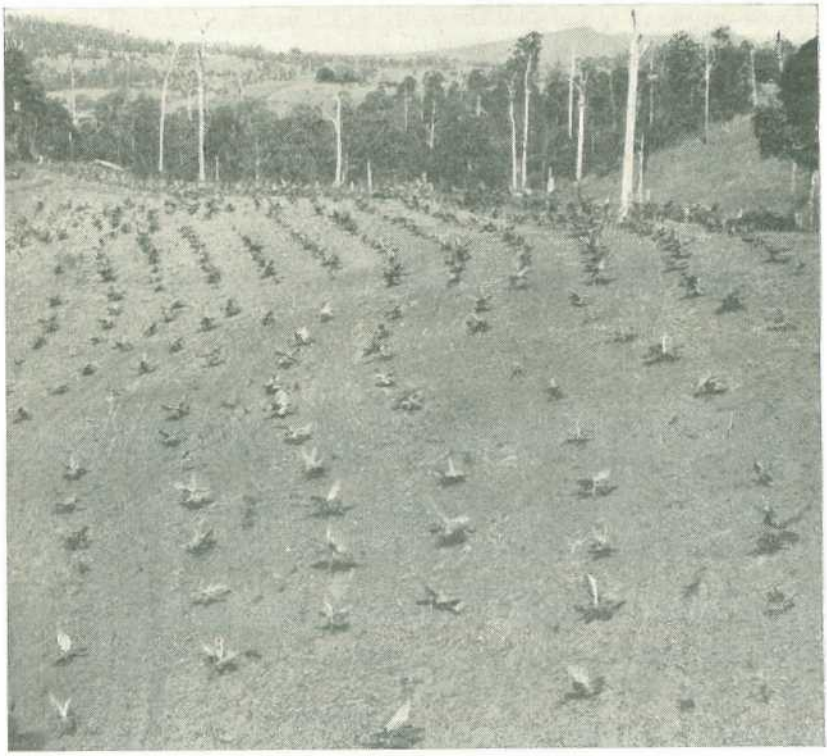


Plate 8.
Contour Planted Bananas, North Coast District. The bananas have been planted six weeks.

between every two adjacent rows of bananas to carry surface water slowly from the plantation. These drains usually lead to the same natural runway as the diversion drain.

In new plantings, the plant rows are spaced at intervals of 9-14 ft., depending on the requirements of the variety to be grown.

An alternative method of marking out the area is to form the contour drains first and then set out rows between each pair of drains in the most practicable way. If the drains are several degrees off parallel, as they often are, it will be necessary to provide one or more short spur rows to maintain the required plant and row spacing. In order to avoid awkward spur rows, it is sometimes preferable to construct the contour drains and then plant the area on the square system, moving the stool position slightly uphill whenever it coincides with a drain.

In banana areas already established and not planted on the contour, it is still practicable to install cross drains to divert surplus water and reduce soil erosion. These drains need not necessarily follow the plant rows and may deviate from the normal fall in order to avoid the destruction of existing stools. The construction of such cross drains involves little labour and does much to prolong the life of the plantation.

RECONDITIONING OLD BANANA LAND.

Old banana land is often allowed to develop a natural cover of lantana, a plant which is usually slow to establish itself, difficult to remove when the land is required for replanting, and, furthermore,

very susceptible to attacks by the root knot nematode. A tall perennial legume, such as the pigeon pea (*Cajanus cajan*), which makes rapid growth when the bananas are eradicated and enriches the soil during the resting period, is much more effective (Plate 9).

Plate 9.
Pigeon Pea, a Reconditioning Crop for Old Banana Land.

If the plantation is to be dug out in winter, the crop is sown in the preceding September or October. The seed may be broadcast at a rate of 8 lb. per acre and then ploughed or rotary-hoed into the ground. On relatively steep slopes where implements cannot be used, the seed may be hand-hoed into the ground at a rate of approximately 16 lb. per acre. When the plants are 12 months old and the first crop of seed has been harvested, the pigeon pea is either disced or cut back to 18 in. above ground level. Regrowth will soon renew the ground cover and within a few months the plants will be 9-10 ft. high. The dense stand of pigeon pea effectively smothers out most weeds, but wild tobacco (*Solanum auriculataum*) can hold its own against the legume and should therefore be dug out when present. The crop may be left on the area for several years until the land is required for replanting.

When bananas are again to be planted, the pigeon pea is brushed to ground level about three months before planting begins. In this period the mulch decomposes fairly rapidly and planting should be relatively easy. Under no circumstances should the brushed material be burned. Any regrowth which appears after the bananas are planted can be grubbed out during routine cultural operations.

[TO BE CONTINUED.]

PLANT PROTECTION

Diseases of Potatoes.

R. B. MORWOOD (Formerly Senior Pathologist, Science Branch).

(*Continued from page 148 of the September issue.*)

OTHER WILT DISEASES.

Potato plants can wilt from causes other than the diseases already mentioned. Verticillium wilt is very similar to Fusarium wilt but is not of frequent occurrence in this State. Shortage of water can, of course, produce wilting, so also can excessive water when the soil is waterlogged for some days. As well as causing wilting of the plants, waterlogging may be responsible for rotting of the tubers. Complete loss of crop in lowlying areas is of not infrequent occurrence when heavy rains occur as the crop matures. At the other end of the growing period, waterlogged soils may induce rotting of seed pieces. This is more likely to occur at high temperatures and when cut seed is used. This accounts for the use of whole seed for sowing for the autumn crop, as in February and March soil temperatures are high and rainfall is liable to be excessive. Potatoes should be grown on a well-drained site and growers should at least attend to surface drainage so that water does not stand between the rows of potatoes after heavy rain.

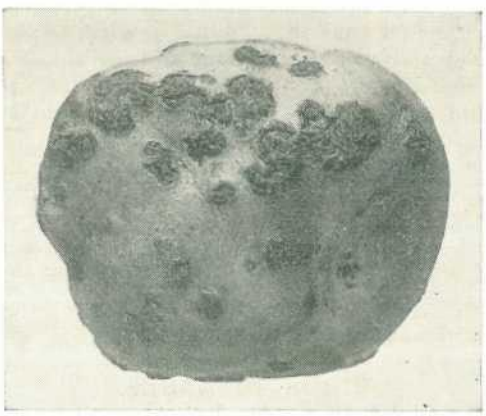


Plate 7.
Common Scab.

SCAB.

The disease of potatoes most frequently occurring in Queensland is common scab. It affects only the tuber, producing cracked and scaly areas and depressions on the tuber surface (Plate 7). The infection does not penetrate deeply and there is little direct loss of the edible portion. However, scabby potatoes will not keep, as the affected areas allow the entrance of rot organisms which soon cause breakdown during storage. On this account, as well as because of their unsightly appearance, all scabbed potatoes should be sorted out when digging, and no attempt should be made to dispose of them by sale in the ordinary way. They may be used for pig food.

Scab is caused by a lowly fungous organism (*Actinomyces scabies*). It forms a delicate surface growth, and the scab is the potato's reaction to the irritation of the fungus. The organism is introduced on seed potatoes and survives in the soil for a number of years. It is serious on land having a neutral or alkaline soil reaction, and the acidification of the soil with sulphur has been advocated for its control. The process, however, is somewhat expensive and it has not been extensively practised.

Control.

(1) Rotate crops. If sufficient potato land is available only one potato crop should be grown in the soil and then it should be planted to lucerne or other crops for three or more years, when potatoes can again be planted.

(2) Use seed free from any obvious signs of scab.

(3) Treat the seed to eliminate the scab organism. The most convenient treatment available at present is dipping in a solution of one of the commercial organic mercury compounds, such as Aretan, Baytan and Mertan. Directions for the use of these are printed on the containers. Another method of treatment is that of using acid corrosive sublimate. Directions for this method can be supplied if required.

BLACK SCURF OR RHIZOCTONIA SCAB.

A second type of scab of the potato produces small black lumps on the surface (Plate 8). These lumps resemble black soil, but may be distinguished by the fact that they cannot readily be washed off. They are an intense black colour when wetted, and are the sclerotia or fungus resting bodies, which revive when the tuber is planted in moist soil. The fungus (*Corticium solani*) then produces a mould-like growth which attacks the stalks of the plant about ground level. The affected stalk rots away, or, if dry weather supervenes, it shrivels and the top of the plant dies. A common feature of this phase of the disease is the production of aerial tubers. These take the form of swellings on the stems of the plant, resembling tubers but being green, soft and useless.

The control of this disease consists in taking the same precautions as are used to prevent common scab, including crop rotation, seed selection, and seed treatment.

VIRUS DISEASES.

The diseases considered so far are caused by fungi or bacteria. The effects of these pathogens are readily observed as conspicuous spots or obvious wilting and death of the plant. The virus diseases, on the

other hand, are often overlooked by the grower, but nevertheless they seriously reduce the crop yield. They usually produce an abnormal appearance, such as stunting of the plant, rolling, crinkling, yellowing, or mottling of the leaves, and the development of numerous close-set

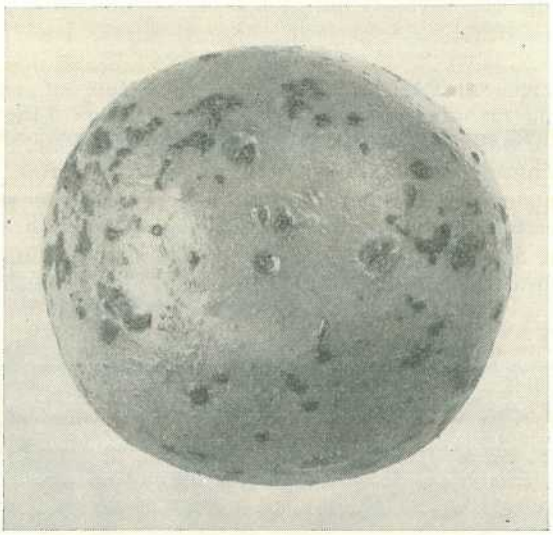


Plate 8.

Rhizoctonia Scab.

shoots. These diseases are sometimes known as degeneration diseases and ascribed to run-out seed. In a general sense that is correct, but the running-out is due to the spread of the diseases to a greater extent in each succeeding crop planted from unselected seed. These diseases are actually caused by a virus or infectious agent, individuals of which are so small that they cannot be seen even with a high-powered microscope.

The virus usually spreads through all parts of the plant, including the tubers. When such tubers are used for seed, the resulting plant is infected from its inception. The disease will then spread to other plants, being carried by insects such as aphids which suck the sap from diseased plants containing the virus and subsequently turn their attention to the healthy ones. Plants affected by this secondary spread of the disease show the symptoms only in those leaves which are developed after infection takes place and little direct loss results. However, the virus may travel down into the tubers, which are then a potential source of serious disease in the subsequent crop.

The four diseases next discussed are the most important virus diseases of potato in this State.

Mosaic.

Mosaic is actually a group of diseases which are distinguished from each other only with difficulty. The appearance of a lightly affected potato plant is not very different from that of a healthy plant,

but the disease is readily recognised in a badly affected plant or if an affected plant is seen growing among a number of healthy ones, when its debilitated appearance is evident by contrast. The principal symptoms are a crinkling and yellow mottling of the leaves, with more or less stunting and bunching of the plant. The yield is considerably less when plants are severely affected.

Leaf Roll.

As its name suggests, the principal symptom of leaf roll is a rolling inwards or curling upwards of the leaflets (Plate 9). The leaves are abnormally thickened, stiff, and pale in colour. The stiffness serves to distinguish plants affected with leaf roll from those whose leaves have curled due to the effects of dry weather, wilt or other diseases of the stem which interrupt the supply of moisture to the tops. The tubers on a leaf-roll plant are fewer in number and smaller in size, but are otherwise no different from those of a healthy plant.

Plate 9.

Leaf Roll.

Control of Mosaic and Leaf Roll.

An infected plant cannot be cured, and no spray is of use either as a cure or as a preventive. Control therefore consists in the use of disease-free seed. Disease-free seed is obtained in the first instance by planting seed carrying a low percentage of infection in a small stud plot in a locality in which virus diseases do not spread rapidly. This plot is carefully rogued for the elimination of diseased and other undesirable plants. The resultant tubers are used to plant a larger

area and by selection and rogueing a supply of good seed is built up. Once it is established, disease-free seed is used for the stud plots, but constant attention is still necessary to maintain the standard. Such seed produced with adequate precautions under Government supervision is known as certified seed.

Queensland is dependent on the southern States for its main seed supplies. From this source Government certified seed may be obtained, and the use of such seed is an effective safeguard against losses from the common virus diseases. Certified seed is also superior in general agronomic characters such as trueness to type.

Purple Top Wilt.

This disease is very serious in the autumn crop in the Lockyer Valley in some seasons. It is a virus disease caused by the same virus as big bud in tomatoes and affects many crops and garden plants and also a number of weeds. On infected plants the young leaves are rolled and have a purple tinge most pronounced at the bases of the leaflets (Plate 10). The plant may wilt or develop a bunchy appearance, with

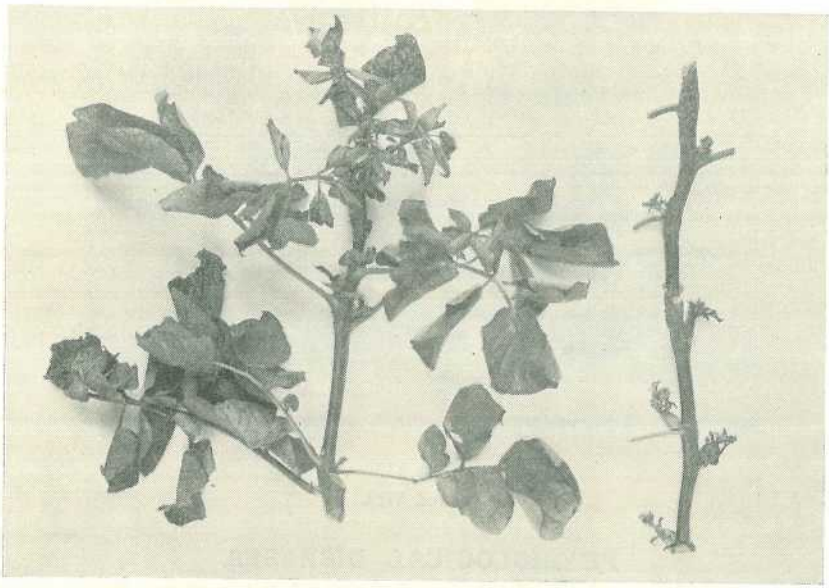


Plate 10.
Purple Top Wilt.

aerial tubers in the axils of the leaf stalks. Normal tuber formation is reduced and any tubers formed may be soft. The disease is spread by insects and difficult to control. There is some reason to believe that later-planted crops are less affected than early ones and that crops on soils with adequate organic matter show less effect of the disease than those on deficient soils. Investigations are being made into this disease and further information may be available later.

Spotted Wilt.

Spotted wilt is more generally known as a disease of tomatoes, but it attacks a wide range of plants, including potato. It can be recognised by the presence of spots or necrotic areas on leaves and stems. The spots are very like those of target spot but they appear on the youngest leaves first and are sometimes seen as a small ring surrounding an island of green tissue (Plate 11). It can affect the plant very seriously and in the cooler southern States affected plants frequently form few if any tubers. In Queensland the disease does not usually affect the plant so severely, tuber yield being only moderately reduced.

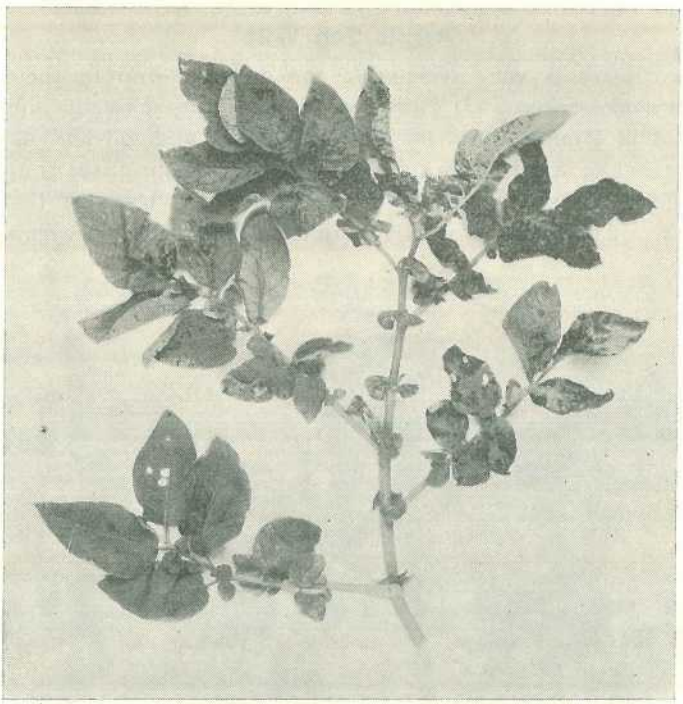


Plate 11.
Spotted Wilt.

PHYSIOLOGICAL DISEASES.

In addition to the infectious diseases of the potato, there are a number of diseases caused by conditions under which the crop is grown. The exact nature of these conditions is not known in all cases, but it is fairly well established that the physiological diseases do not spread in the way that the fungous, bacterial and virus diseases do.

Black Heart.

Tubers affected with black heart are quite normal on the outside, but on cutting are seen to have a black irregular area in the centre. Black heart is caused by overheating or poor ventilation in storage, and can be prevented by providing better storage conditions.

Hollow Heart.

Hollow heart is not discernible on the outside of the tuber, but consists of an irregular hollow in the centre of the potato. It is caused by too rapid growth and is not of any particular consequence.

Brown Fleck.

As with the two previous diseases, potatoes affected with brown fleck are normal on the outside. They have, however, scattered through their substance a number of small, hard, brown portions of tissue (Plate 12). The affected portions do not soften on cooking, and if at all numerous entirely spoil the potato. There are no parasitic organisms present in the brown tissue. The cause is not definitely known, and consequently no means of cure or prevention can be devised.

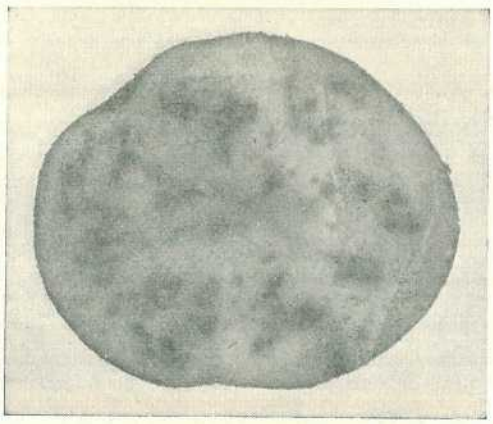


Plate 12.
Brown Fleck.

Glassy End.

In tubers affected with glassy end, the central portions, more particularly towards the stem end, are watersoaked and have a translucent glassy or greasy appearance. The affected area looks dull in contrast to the crisp white appearance of a cut healthy tuber. Such tubers are frequently referred to as being soapy. The affected portions are deficient in starch, and when cooked rapidly break down into an unpalatable mush. The trouble is caused by interruption in the regular development of the potato plant after the tubers have commenced to form. If the plant receives a check in dry weather the tubers will stop growing. When rain falls it may start into secondary growth or other tubers may form. In either case the earlier-formed tubers or portions of tuber give up some of their starch content to the fresh growth, resulting in the trouble under discussion.

GENERAL CONSIDERATIONS.

The average yield of potatoes in Queensland is low, partly due to climatic and soil conditions and partly due to losses from pests and diseases. To avoid the loss from disease every grower should:—

(1) Select a well-drained, friable soil for the crop.

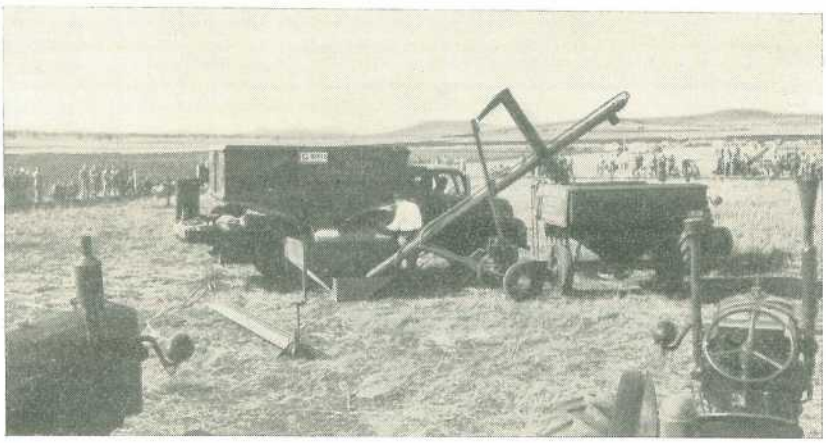
(2) Rotate potato lands with other crops, such as lucerne, maize and pumpkins.

(3) Grow a variety resistant to Irish blight.

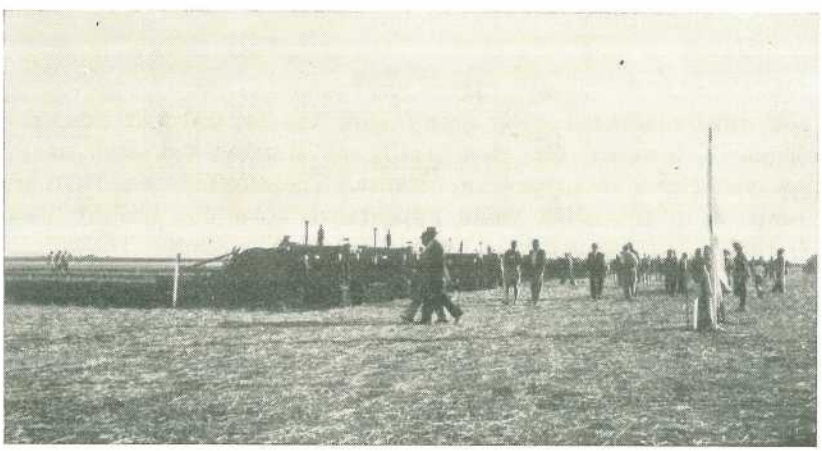
(4) Use certified seed.

(5) Treat the seed with one of the fungicidal dips.

(6) Plant at the correct time for the locality.



Farm Mechanisation Field Day. Interest is shown in bulk-handling equipment for grain.



Farm Mechanisation Field Day. Farmers watch a mass ploughing demonstration by a team of tractors.

Cutworm Control in Field Crops.

A. W. S. MAY, Entomologist, Science Branch.

SEVERAL species* of cutworms periodically infest field crops in many parts of Queensland, and when pest numbers are large, severe damage results. Infestation occurs at various stages of plant growth, and in older crops may lead to partial defoliation with the inevitable reduced yields. It is more usual, however, to associate these pests with newly germinated crops, particularly in autumn and early spring, when they may be responsible for reduced stands.

A wide range of plants furnish suitable food for these pests. In addition to most field crops, including lucerne, cotton, cereals, onions, potatoes and tobacco, many pasture grasses and weeds may be attacked. Weeds along headlands or in old cultivation often provide the site for the initial infestation which later moves to adjacent crops. Under some conditions cutworms show a preference for weed growth within a crop but later attack the crop when the weeds have been consumed.

All cutworms are larvae or caterpillars of night-flying moths, which are drab-coloured, stout-bodied insects with a wingspread of up to 1½ in. The eggs are laid in batches in the moist soil at the base of food plants. On hatching, the young larvae disperse before settling down beneath a convenient host plant. They hide in the soil during the day, coming out to feed at night. For a time the young larvae merely erode the leaf tissues, but with increase in size they develop the true cutworm habits of cutting through the stems of seedlings and pulling the leaves down into the soil, where they are eaten. The duration of larval life is from one to two months. When mature, the cutworm forms an earthen cell and turns into a shining brown pupa or resting stage from which the moth emerges to complete the life cycle.

The Timing of Control Measures.

As cutworms approach maturity their capacity for food increases rapidly, and damage may not become obvious until the infestation is well established. Therefore, once the presence of these pests is noticed prompt implementation of control measures is necessary. Failure to check an infestation in its early stages may mean the complete loss of a stand at a time when replanting is not feasible.

Control Measures.

Where spraying machinery is available, cutworms can be checked rapidly and effectively. **DDT, preferably in the emulsion form, applied at the rate of one-half pound of active ingredient per acre, is the most effective insecticide for this purpose.** At this rate of application, one gallon of 25% DDT emulsion contains sufficient of the active ingredient to treat five acres of crop.

---

* *Euxoa radians* (Guen.), *Agrotis ypsilon* Hfn., *Agrotis infusa* (Boisd.), *Mocis frugalis* F.

Should spraying equipment be unavailable, the broadcasting of a poison bait throughout the infested area will give good results. Baits may be prepared and used as follows:—

Thoroughly mix 25 lb. bran and 2 lb. BHC 4% dust (0.5% gamma isomer), and immediately prior to use dampen with 2 gallons of water to which 1-2 quarts of molasses have been added. One pound of Paris green or 2 lb. of lead arsenate may be substituted for the BHC dust. The bait, when ready for use, should be crumbly and not over-moist and is best applied in the late afternoon. For general broadcasting on a crop, the quantity of bait mentioned will prove sufficient to treat half an acre.

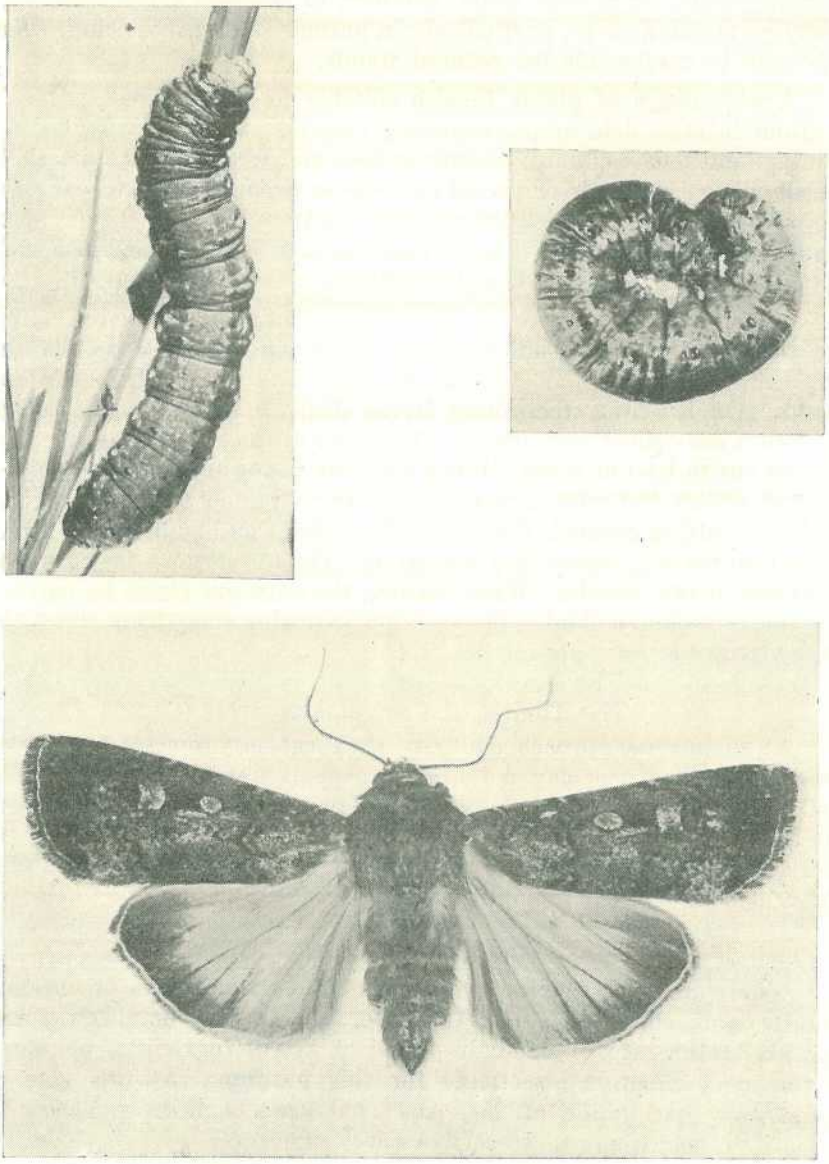


Plate 1.

Caterpillars and Moth of the Cutworm Agrotis infusa.

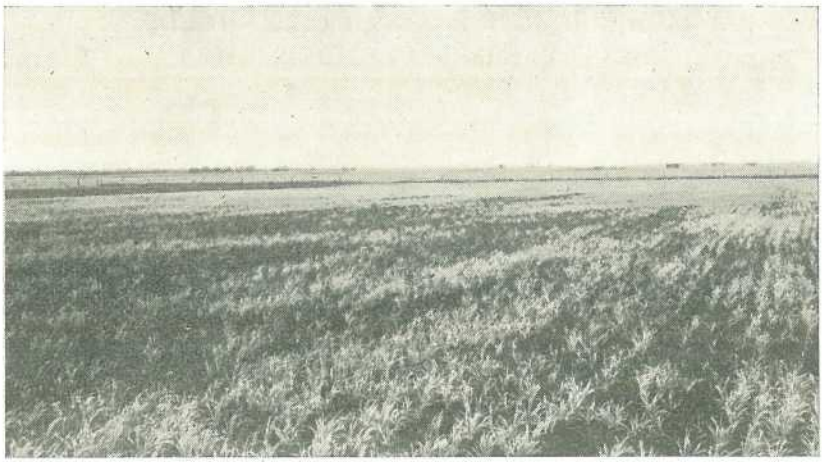
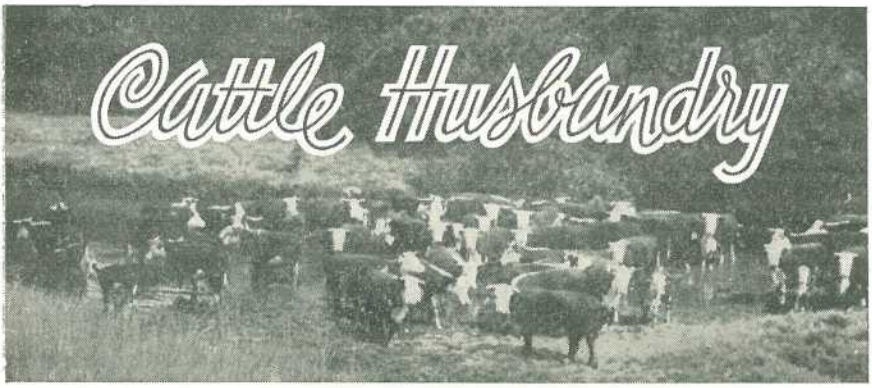


Plate 2.
A Poor Stand of Wheat Caused by Cutworms.

Where the cutworms are moving into a crop from adjacent cultivation or pasture, spraying or baiting a broad strip ahead of the larvae will prevent infestation. If a seedling crop has been damaged to the extent that resowing is contemplated, it will be necessary to destroy the cutworms in that field before the new crop is sown.

TUBERCULOSIS-FREE CATTLE HERDS.
(AS AT 15th SEPTEMBER, 1953.)

Breed.	Owner's Name and Address.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas
	F. H. Hutton, "Bingegang," Dingo
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "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
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Groveley," M.S. 195, Pittsworth
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
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
	C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
Jersey	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	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
	Estate of J. A. Scott, "Kinora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meier and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	C. A. Edwards, "Grasmere" Jersey Stud, Woodford
Polled Hereford	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla



Some Aspects of Dairy Calf Management.

J. G. YOUNG, Husbandry Officer, Cattle Husbandry Branch.

THERE are several methods of rearing dairy calves, some of which are capable of considerable modification to suit local conditions and to satisfy local needs.

In the main, the system finally adopted in any area or on any particular farm depends on the feeds available and the alternative markets or uses for those feeds. The selection of a particular method is, therefore, largely an economic problem.

Irrespective of the method of rearing adopted, there are certain practices and precautions which are not only desirable but which in very many instances determine the success or failure of the calf-raising programme. These are concerned chiefly with management and hygiene, and unfortunately are frequently neglected on dairy farms.

IMPORTANCE AND FUNCTION OF COLOSTRUM.

Nearly all dairymen are aware of the importance of the first milk or colostrum and some have experienced the difficulty in rearing a calf which, for one reason or another, has not had at least one feed of this first milk.

Many farmers, however, are not aware of the reasons for the benefits derived by the calf from colostrum. They still regard its chief function as that of a laxative needed for the removal of the meconium, the original material discharged from the newborn calf's bowels.

The main function of the colostrum is, however, that of conferring passive immunity against disease on the young calf. Without this immunity, most calves would succumb to infection by disease organisms. The immunity derived is passive and temporary but bridges the gap until the calf is able to develop its own active immunity against disease infection later in life.

The establishment of passive immunity is associated with and dependent upon the presence of chemical substances called "antibodies" in the colostrum which are lacking from the blood of the calf at birth. The concentration of antibodies in the colostrum rapidly diminishes after the birth of the calf. Furthermore, the ability of the calf's digestive tract to absorb antibodies into the blood stream rapidly

decreases after birth, until by the second or third day of life absorption of antibodies by the calf is not possible nor is their concentration in the colostrum then very great.

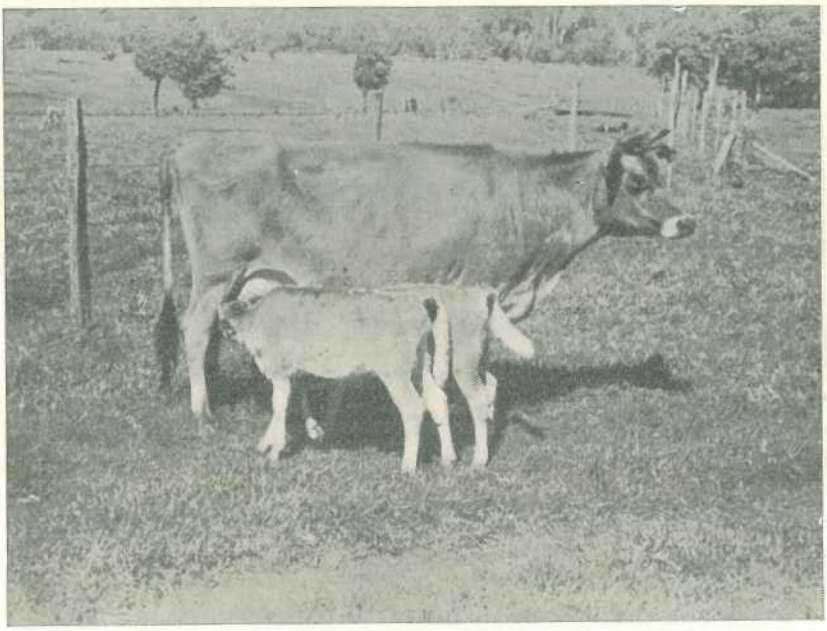


Plate 1.

Colostrum is Essential to Keep Young Calves Healthy. It is best supplied direct from the cow.

It is, therefore, essential that the calf receives colostrum in the first day of life, and preferably direct from the cow so that risk of contamination is eliminated.

The function of colostrum in supplying the calf with vitamins, especially vitamin A, is also of great importance. Colostrum often contains 10 to 20 times as much of the essential protective vitamin A as ordinary milk. This is significant in view of the fact that calves at birth have a low level of vitamin A in their bodies.

A dietary deficiency of vitamin A, besides being responsible for certain eye disorders and chronic changes in the lining of the respiratory and digestive tracts, has as a widespread effect a loss in bodyweight and a decreased resistance to disease. Vitamin A is essentially a "protective vitamin".

Calves up to the age of one month, or at least until they are old enough to consume appreciable quantities of pasture or meal, depend on their milk ration for this essential vitamin, and the value of milk in supplying it in turn depends on the vitamin A content of the feedstuffs fed to the cow. The vitamin A in milk is entirely in the fat fraction (compare vitamin A values of butter and skim-milk in Table 1) and the content varies greatly in accordance with the content of the feeds consumed by the cow.

Variations in vitamin A intake do not materially alter the cow's milk yield but profoundly influence its quality in respect of this vitamin.

Table 1 illustrates the relative vitamin A potency of a number of common feeds. It will be readily seen that green pastures and good hays are the only readily available sources. Concentrates, in general, are entirely lacking in this vitamin.

TABLE 1.
VITAMIN A POTENCY OF VARIOUS FEEDS.

Feedstuff.	Vitamin A Potency.
Good Lucerne Hay (Green and Leafy)	†† to †††
Poor Lucerne Hay	0 to †
Good Cereal or Grass Hay	† to ††
Cereal Straw	0
Lucerne (at Grazing State)	†††
Grasses (Green and Actively Growing)	†††
Grasses (" Standing Hay " Stage)	0
Maize Grain (Yellow Varieties)	†
Maize Grain (White Varieties)	0
Oat (Grain)	0
Wheat (Grain)	0
Wheaten Bran	0
Linseed Meal	0
Meatmeal	0
Skim Milk	0
Butter	†† to †††
Livermeal	††
Cod Liver Oil	††††

It is becoming increasingly evident that many dairy calves in Queensland are reared on an inadequate vitamin A diet, especially when the cows are being fed heavily on concentrates during the late winter and spring months. The position is further aggravated during this period by the almost total absence of the vitamin in the natural pasture.

During the winter and spring months, and at other times when the herd diet is likely to be low in the vitamin, calves up to the age of one month and receiving a ration of wholemilk daily should be given a small daily supplement rich in vitamin A, such as cod liver oil or shark-liver oil. Some proprietary preparations of these materials are available; they should be used as directed, since some variation in their vitamin A potency occurs.

The oils can be fed together with the milk at the normal feeding times, but thorough cleaning of the calf-feeding buckets will be needed to remove the "fishy" odour. Alternatively, the calves can be periodically dosed with the oil.

If green and growing pasture or good hay is available at the age of four to five weeks, then the addition of the supplement can be gradually discontinued. A supplement such as this should always be fed to young calves when skim-milk and meals are substituted for wholemilk at an early age or when any of the "limited wholemilk" methods of feeding are used.

Losses from scours and pneumonia can, in very many instances, be much reduced by the use of a vitamin A supplement and greater liveweight gains achieved in the young stock.

HYGIENE IN THE CALF PEN.

Once the calf has been removed from the dam, usually after one or two days (and there is little point in leaving the calf with its dam for a longer period than this), it is often exposed to serious infection

by being placed, together with other calves of various ages, in a permanent calf pen or small paddock which in many cases has been used solely for this purpose for years.

Heavy concentrations of worm eggs build up in the soil in these situations and there is also an accumulation of organisms causing scours and other diseases. Many failures in calf rearing can be directly attributed to the unhygienic single calf pen or small bare or weedy paddock.

A good percentage of calf ailments can be avoided simply by regularly moving the young calves onto clean ground.

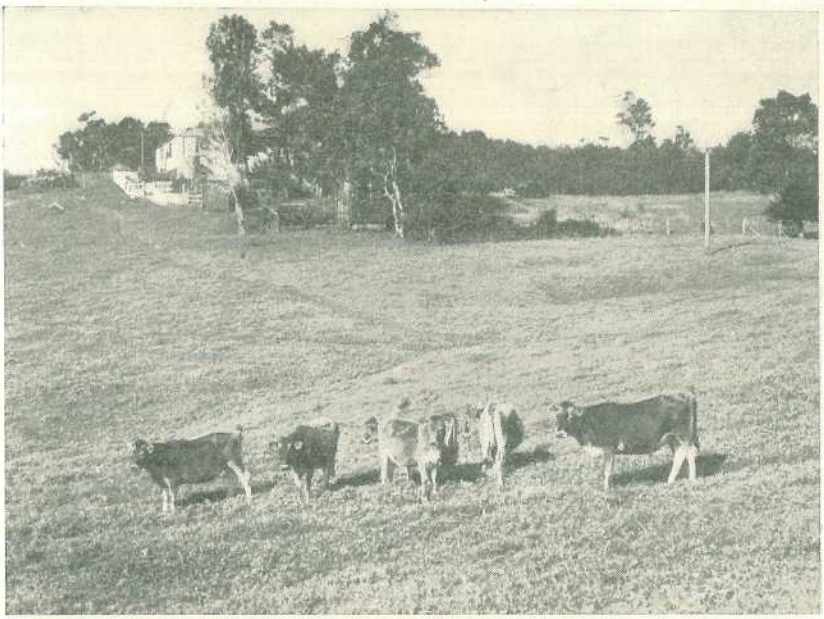


Plate 2.
Well Grassed Paddocks Assist in Maintaining Maximum Growth Rate in Calves.

The most desirable management method of achieving this is by providing a series of small grass paddocks so that individual paddocks may be spelled for at least one month before being restocked with calves. For preference, the stocking period should not exceed one week, so five small paddocks are needed to achieve a stocking period of one week and a spelling period of four weeks.

Under most circumstances in Queensland dairying areas, the provision of such a series of calf paddocks to allow regular monthly spelling could not be described as "rotational grazing" but rather as "rotational stocking".

The primary objective of rotational grazing is to supply the calves with a regular and continuous supply of young palatable pasture of high nutritive value, with the control of worm infestations playing a rather secondary and incidental role. For instance, where a pasture containing mixed clovers and fine-stemmed grasses is available, as in areas where a good winter and spring rainfall occurs or where pastures are irrigated, then supplementary feeding of the calves can be largely eliminated and they can be weaned from milk at a comparatively early

age by adopting a good fast rotation method. Under these good pasture and management conditions, the best growth increases are obtained in the young stock and worm burdens are kept at a minimum.

In most of the dairying areas of Queensland, however, the available native grasses can be maintained in a young and nutritious stage for only a comparatively short period in the summer. During most of the year the grasses are mature or in the "standing hay" stage. Under these circumstances, the control of internal parasites is likely to be the more important result achieved.

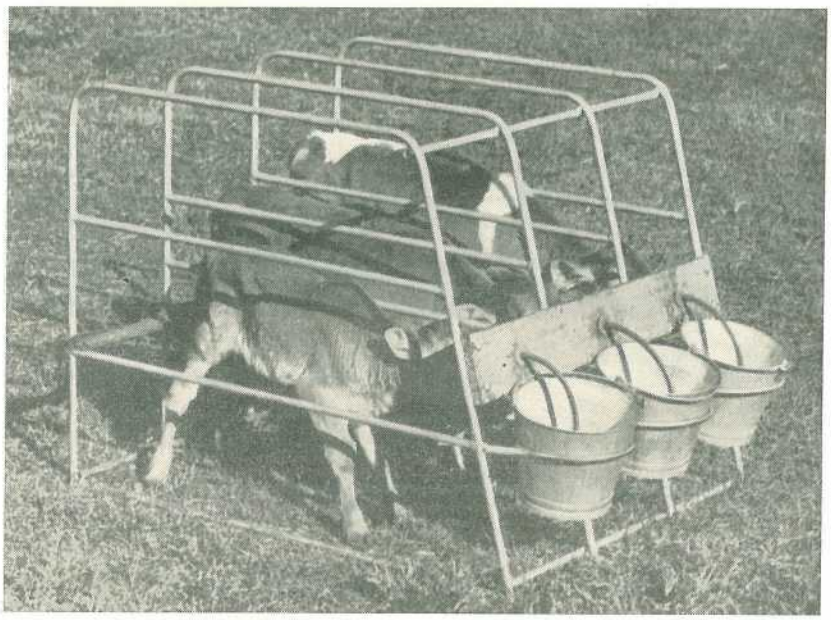


Plate 3.

Healthy Calves Go Hand in Hand with Hygienic Surroundings.

During recent years more and more attention has been focussed on the losses caused to dairymen by the ravages of internal parasites in their young stock. Winter and spring months almost invariably reveal many calves suffering extremely heavy worm infestations, with resulting cessation of growth and at times heavy mortality.

One of the principal keys to successful calf rearing is the regular movement of young calves onto clean ground to which cows and other calves have not had access for at least four weeks previously.

If fencing materials or other facilities are not available, or subdivision is impracticable for any other reason, then much can be achieved by using dog collars and dog chains attached to a heavy-gauge wire staked at each end. A calf secured by a leather collar and attached to a 6-ft. dog chain running along such a wire 50 yards long has access to about one-twentyfourth of an acre, and if it is moved weekly, this area is ample. Such wires can be readily moved. In addition, should an infection break out amongst the calves, suitable isolation methods are ready to hand and the risk of spread and possible losses is reduced to a minimum.

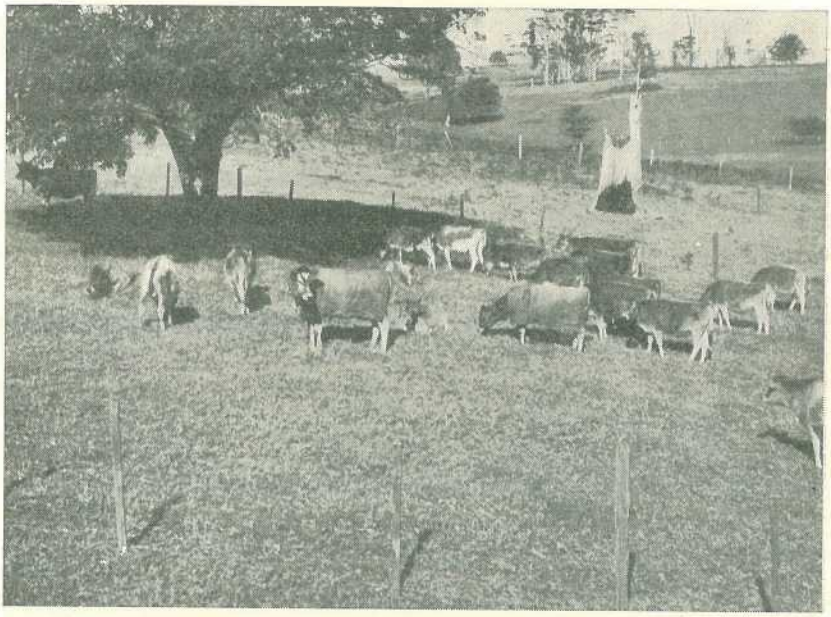


Plate 4.
Subdivision and Rotational Grazing Help to Control Worm Infestation in Calves.

The annoying task of having to unwind chains which have become wrapped around the anchor stakes can be avoided by inserting porcelain electrical insulators or other suitable "keepers" or "blocks," over which the hook of the collar and chain cannot pass, at appropriate intervals in the "trail" wire.

If direct tethering to a stake is practised, the same problem of the calf winding itself onto the stake can be eliminated by fixing the stake through the centre of an old wheel and attaching the chain to the rim or a spoke of the wheel.

The main disadvantage in any method involving tethering is the difficulty of providing shade and water facilities for each calf, whilst the advantages are that it can be implemented without much delay on most farms and without much capital outlay. In addition, it allows the provision of clean unfouled ground for each calf at regular periods, together with an effective system of isolation and reduction of the dangers of cross-infection.

IMPORTANCE OF CORRECT FEEDING METHODS.

The feeding of the correct quantity of wholemilk to young calves is particularly important. In general it should not exceed 10% of the bodyweight of the calf. This is the standard American recommendation and applies equally well under Queensland conditions.

For example, Jersey calves at birth weigh on the average 50 lb. liveweight, with the calves of heifers weighing nearer to 40 lb. bodyweight, so that, generally, Jersey calves in their first week should not receive more than half a gallon of wholemilk per day. Likewise, A.I.S. calves at birth vary usually between 75 lb. and 90 lb. liveweight, and their wholemilk intake, especially during the first week of life, should not exceed 8 lb. (6 pints) of wholemilk daily.

Table 2 is a guide to the average birthweights of the common breeds and the relative quantities of wholemilk to be fed in each case during the first week.

TABLE 2.

Feeding Wholemilk to Calves.

Breed.	Average Birthweight. (Lb.).	Milk Fed Daily in First Week.	
		Pounds.	Pints.
Jersey	45–55	5	4
Guernsey	55–65	6	5
Ayrshire	65–75	7	6
Illawarra	75–90	8	6

Calves fed excessive quantities of milk are likely to develop digestive disorders and consequently to be predisposed to infection by the numerous organisms carrying disease.

If the calf is well and there are no signs of scours, the quantity of wholemilk fed should be increased by 1-2 lb. above these rates during the second week and by a further 1-2 lb. during the third week. An increase in liveweight of 1-2 lb. is all that can be expected during the first week. This rate of liveweight increase should gradually increase until by the end of three months the calves are gaining weight at the rate of about 1 lb. per day. This increase will not be achieved unless the calf has received no setbacks from digestive disorders or other disease conditions.

In many instances, dairymen, in their efforts to rear their calves as well as possible, make available to the calf more milk than the animal's digestive apparatus can safely handle at one feed and as a consequence do considerable harm to the calf and subject it to much digestive disorder.

If the appetites of calves can be kept sharp, without the animals being starved, then thriftier and healthier calves will invariably result.

TICKS ON YOUNG DAIRY STOCK.

Although ticks can now be effectively controlled with a minimum of interruption to shed routine and milk yield by means of portable plants capable of use either in the bails or adjacent to the shed, there are still many instances where the young stock are neglected in this connection. This especially applies to young animals between weaning and first "freshening," when they are often relegated to a more or less remote "dry" paddock and seen only at irregular intervals.

Then, again, young calves still being fed milk in one form or another are often allowed to become heavily infested with ticks while the producing units of the herd, the milking cows, are kept reasonably clean.

Economic losses are caused in young dairy cattle through the worry and discomfort occasioned by the presence of ticks, and in the aggregate these losses are considerable. In cases of severe infestation there may be complete cessation of growth. In any case, considerable interruption to the feeding routine of the young animal occurs from the presence of even a relatively small number of ticks.

The reduced growth rates, inefficient utilization of feeds and resulting economic losses from tick worry on young animals are difficult to estimate with accuracy but are obviously of considerable magnitude on some farms.

In addition to the losses brought about by tick worry, a considerable leakage of nutrients occurs when the engorged female ticks drop off the beast. Each female adult tick removes about 1 cubic centimetre (10-12 drops) of whole blood, while 1,000 such engorged females remove about a quart of whole blood and take in blood proteins the equivalent of the protein in 2 lb. of cereal grains or about ⅓ lb. of meatmeal. In addition, phosphate, calcium and other essential bone and body building minerals are removed; phosphorus is deficient to some extent in many Queensland dairying areas.

Degree of Infestation.	Estimated Number of Engorged Females Dropping per Week.
Light	500
Moderate	1,000
Heavy	5,000
Very Heavy	10,000

The control of ticks on the young growing dairy stock is essential if efficient utilization is to be made of the feeds and pastures available and if high growth rates are to be maintained.

DRINKING WATER FOR CALVES.

Many dairymen neglect to provide an adequate supply of drinking water for young calves, apparently assuming that while they are being fed milk their liquid requirements will be adequately met from this source.

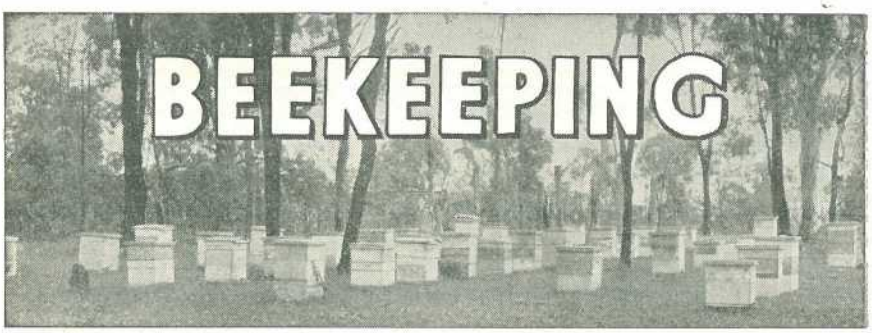
When young calves have their feeding periods restricted to two a day they will develop a considerable thirst between feeds, more particularly in hot weather, with the result that milk fed from the bucket is consumed at an even faster rate than normally and the risks of digestive disorders are greatly increased.

Speaking generally, calves fed milk should drink the milk to satisfy a hunger rather than to satisfy a thirst. Their thirst should be satisfied by periodic drinks of water between feeds.

Calves after one or two weeks will begin to drink water between their milk feeds, and by the age of six weeks may drink a gallon or more each day. The actual quantity depends to a considerable extent on the day temperature and the availability of suitable shade.

Calves given access to dry meals or hay will usually eat very small quantities of the concentrates before going to the water supply, and generally repeat the process several times before consuming their quota of grain or meal. For this reason, the grain or concentrate box is best located in a shady spot adjacent to the water supply.

Water is particularly important should the milk intake be temporarily reduced or even suspended during a bout of scouring. In fact, many early cases of scours, chiefly dietetic scours, can be alleviated by the complete withdrawal of the milk ration for a period of 24 hours and the substitution of water. The calf can then be brought back onto its milk ration gradually, increasing the quantity each meal until the full ration is restored after two or three days. Calves while scouring suffer considerably from excessive loss of water from the body.



The Honey Flora of South-Eastern Queensland.

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

(*Continued from page 163 of the September issue.*)

Blue Gum.

Botanical Name.—*Eucalyptus tereticornis* Sm. This species has sometimes been called *Eucalyptus umbellata* (Gaertn.) Domin.

Other Common Names.—Forest red gum, red gum, red iron gum and Queensland blue gum.

Distinguishing Features.—This is a tree (Plates 45-47) with smooth light-grey bark with darker grey patches, narrow drooping leaves, buds with a long tapering, somewhat curved lid, and a rounded seed-capsule with prominent incurved valves.

Description.—A tree, sometimes as high as 100 ft., with smooth light-grey bark with darker grey patches, often grey and flaky towards the base. The leaves droop from the twigs and are long, narrow, and mostly curved, mostly more than 3 in. long and several times longer than wide. The flowers are produced in stalked bunches amongst the leaves and are about ¾ in. wide when fully out, each on its own stalk. The buds have a short, cup-shaped base and a long, tapering, curved lid. The seed-capsules are rounded, about ¼ in. or a little less in diameter, the upper part being composed of four or five triangular valves curved inwards so that their sides and tip are nearly touching.

Distribution.—Forest country and alluvial flats, but comparatively uncommon in the Darling Downs District. It often grows with apple (*Angophora subvelutina* F. Muell.) on alluvial flats. It is widely distributed in eastern Australia, chiefly in coastal and subcoastal districts.

Usual Flowering Time.—July-November.

Importance as Source of Honey.—Minor, occasionally medium.

Importance as Source of Pollen.—Major.

General Remarks.—The well-known and widely distributed blue gum is a most important species, and those areas in which it is plentiful are favoured as districts in which to place apiaries. Valuable

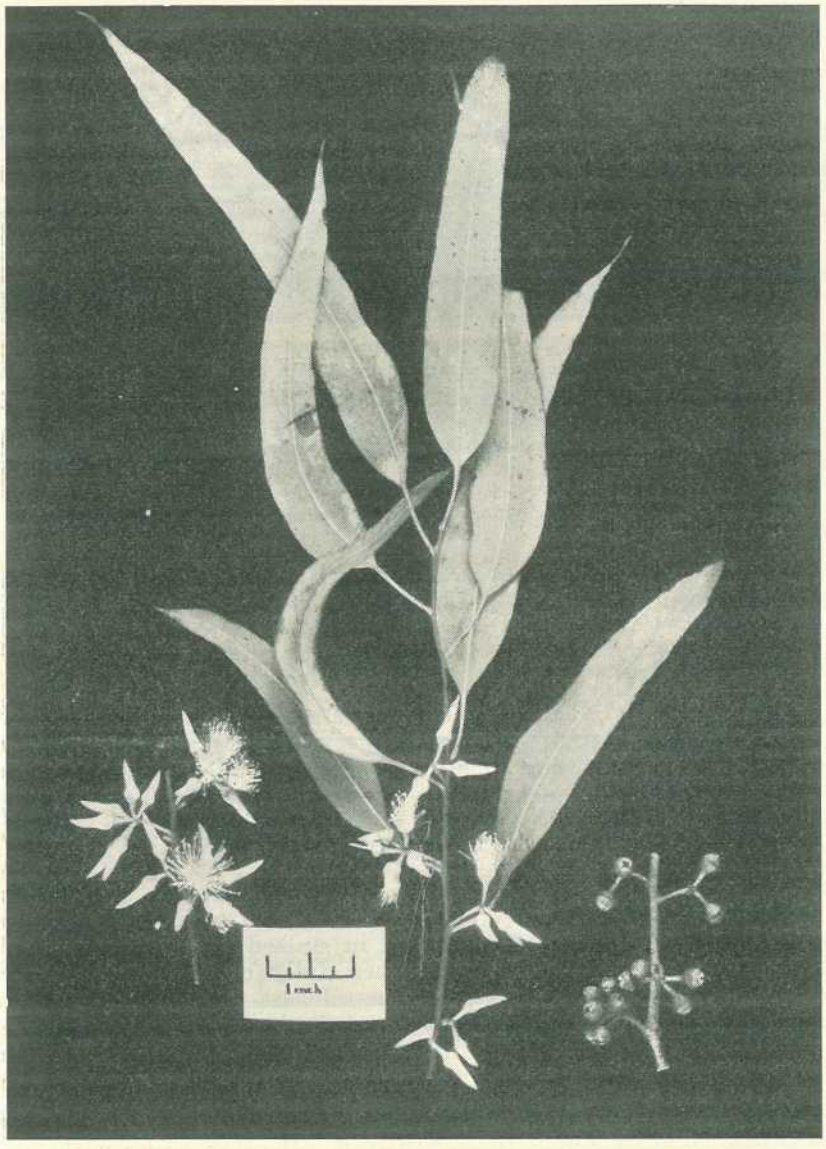


Plate 45.

Blue Gum (Eucalyptus tereticornis). Leaves, buds, flowers and seed-capsules.

pollen and nectar supplies are obtained regularly from it during late winter and early spring. This stimulates colonies to breed freely and build up in strength quickly, thus ensuring that the following major spring and summer nectar flows are worked fully. In addition, some beekeepers report that during a good season a colony may yield up to 40 lb. of predominantly blue gum honey.

Trees of this species bloom more or less each year, although about every three or four years a heavy flowering occurs. On such occasions many spring and summer honeys marketed from coastal districts contain noticeable amounts of blue gum honey.

The reasonably dense honey has a pleasant but characteristic flavour somewhat resembling that of caramel or toffee. Its granulating qualities are unknown, as pure samples are not often encountered.

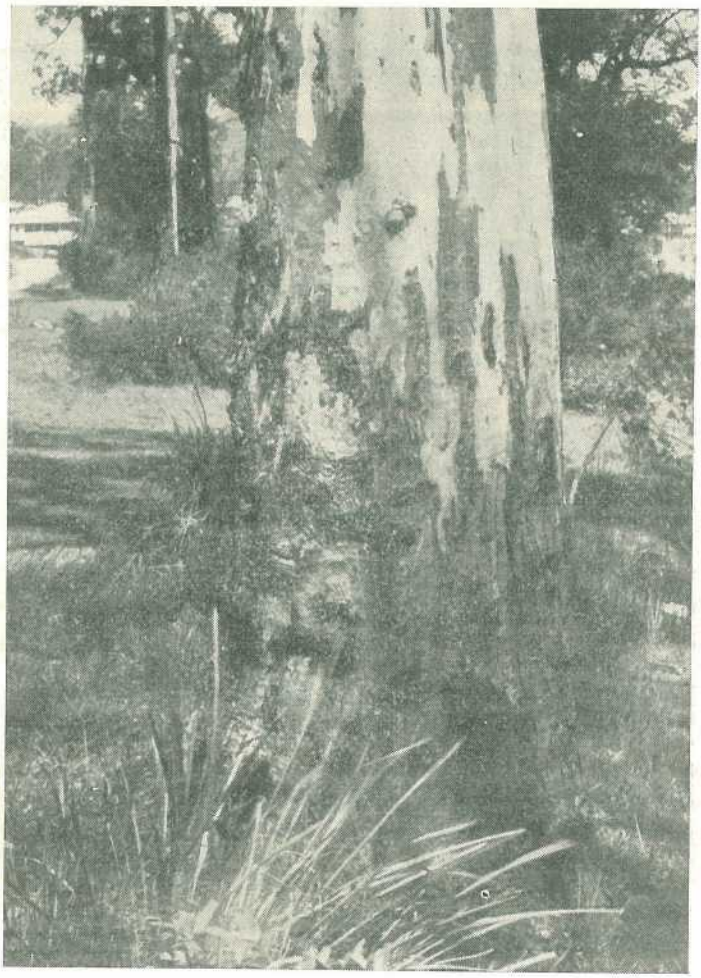


Plate 46.

Blue Gum (Eucalyptus tereticornis). Portion of trunk.

River Red Gum.

Botanical Name.—Eucalyptus camaldulensis Dehn. This species was widely known in the past as *Eucalyptus rostrata* Schlecht., but this name had previously been used for a very different tree.

Other Common Name.—River Gum.

Plate 47.

Blue Gum (Eucalyptus tereticornis). Mandalay, near Brisbane.

Distinguishing Features.—This is a tree (Plates 48-49) with smooth white bark (except near the butt), narrow drooping leaves, rounded buds with a distinct, sometimes rather long point, and seed-capsules with gaping, claw-like valves.

Description.—This is often a crooked tree, often with a stout trunk, with smooth white or nearly white bark sometimes with grey patches and usually with some grey flaky bark towards the ground. The leaves droop from the fine, drooping twigs; they are long, narrow and mostly curved, mostly at least 3 in. long and at least 8 times longer than

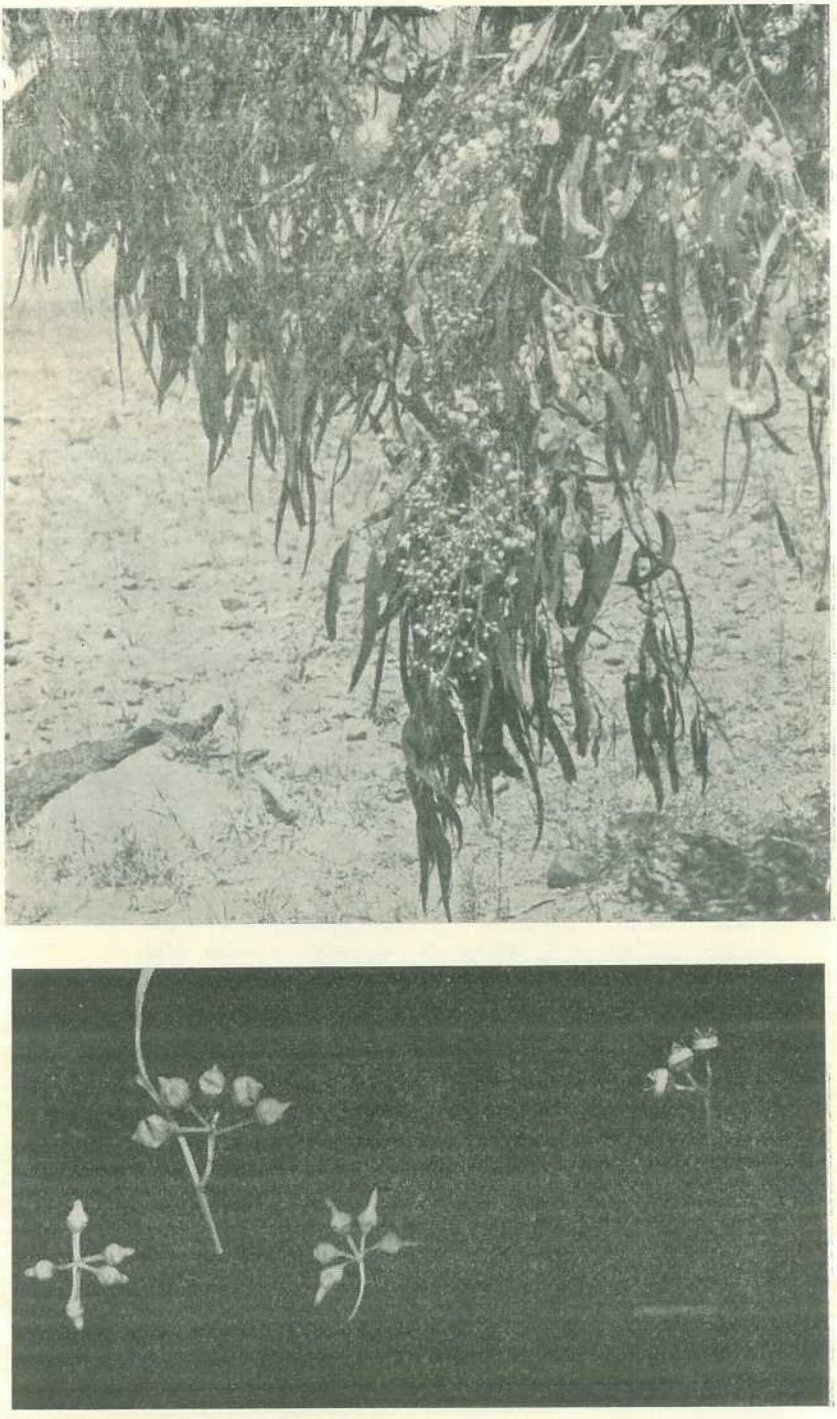


Plate 48.

River Red Gum (Eucalyptus camaldulensis). Branch, leaves, buds, flowers and seed-capsules.

wide. The flowers are produced in stalked bunches amongst the leaves and are ½ in. wide when fully out, each on its own slender stalk. The buds are rounded with a distinct point that is often quite long and the greater part is taken up by the lid. The seed-capsule is roughly rounded in outline, about ¼ in. long and wide, composed of three parts—a shallowly cup-shaped basal part, a middle part sloping inwards, and usually four stout, somewhat triangular, incurving valves.

Distribution.—Along the banks of the Condamine and Macintyre Rivers and some of their tributaries. One of the most widely distributed of all eucalypts, but chiefly an inland species except in Victoria and South Australia.

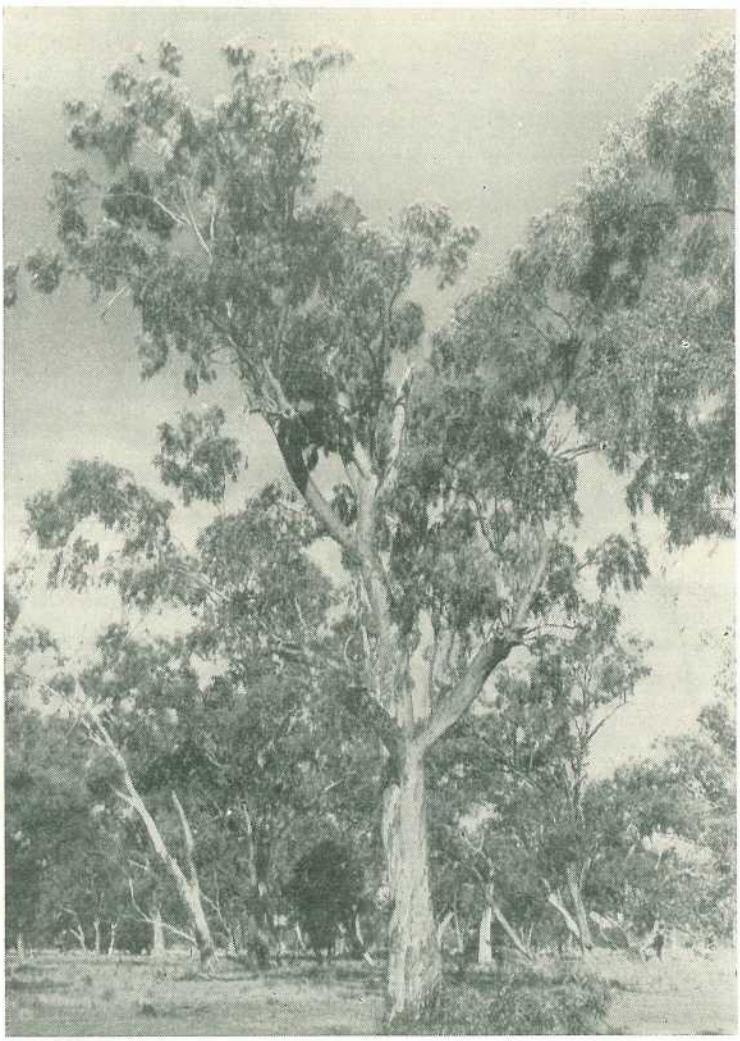


Plate 49.

River Red Gum (Eucalyptus camaldulensis). Texas.

Note. Blue gum and river red gum are not always easy to distinguish. They can usually be differentiated by the shape of the buds and less easily by the shape of the seed-capsules, but there are other species in the Darling Downs District resembling one or the other. *Eucalyptus acuminata* Hook. is one of these, having seed-capsules resembling those of river red gum and buds more like those of blue gum, but the lid tapers gradually to a point and is not curved; trees of this species have been found on creek banks and sandy hillsides.

Usual Flowering Time.—November-January.

Colour of Honey.—Medium amber.

Importance as Source of Honey.—Major.

Importance as Source of Pollen.—Major.

General Remarks.—Every second year this gum usually blossoms heavily for a short period, resulting in a quick intense honey flow. For a few years it may flower annually, when nectar secretion will be poor. In a good season up to 120 lb. of this honey, together with large quantities of pollen, may be obtained by each colony. The pollen not only assists current broodrearing but the excess supply is stored by the bees for use in a time of scarcity, which often occurs in the early months of the year. During the flowering period of the river red gum ideal conditions prevail for queen-rearing, and at this time commercial beekeepers requeen as many colonies as practicable.

The tree flowers often in association with poplar box and the addition of the lighter coloured honey results in a blend which is classified as first grade.

River red gum honey is dense, with a pleasant mild woody flavour, and it granulates fairly slowly with a large brown-coloured grain. At times, it has a tendency to froth when being extracted.

The honey and pollen producing characteristics of the closely related gum, *Eucalyptus acuminata,* are practically identical with those of *Eucalyptus camaldulensis.* In districts where the two species are present, a variable proportion of what is known as river red gum honey and pollen is derived from the former tree, the amount depending on the relative distribution of the two species.

Fuzzy Box.

Botanical Names.—*Eucalyptus conica* Deane & Maiden, also known as *Eucalyptus baueriana* Schau. var. *conica* (Deane & Maiden) Maiden.

Other Common Names.—Apple box, grey box, blue box.

Distinguishing Features.—This is a narrow-leaved box (Plates 50-51) with the smaller branches smooth and small conical seed-capsules.

Description.—A tree mostly 30-50 ft. high with grey "box" bark on the trunk and large branches, and smooth whitish bark on the smaller branches. The twigs are reddish and commonly droop. The leaves are green with long stalks, narrow (4 or more times as long as wide), 2½-4½ in. long, tapering and often slightly curved. The flowers are produced in bunches at and near the ends of the twigs and are about ¼ in. wide

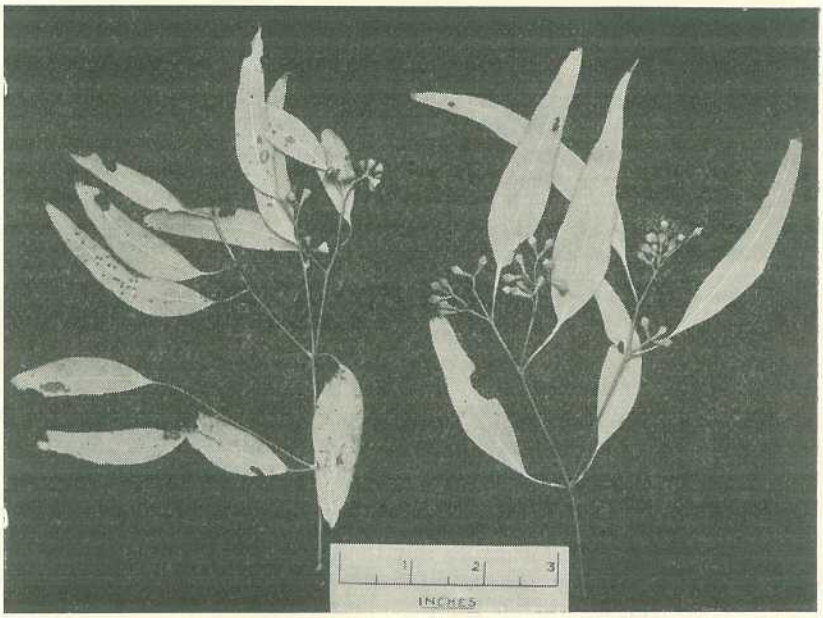


Plate 50.

Fuzzy Box (Eucalyptus conica). Leaves, seed-capsules and flower-buds.

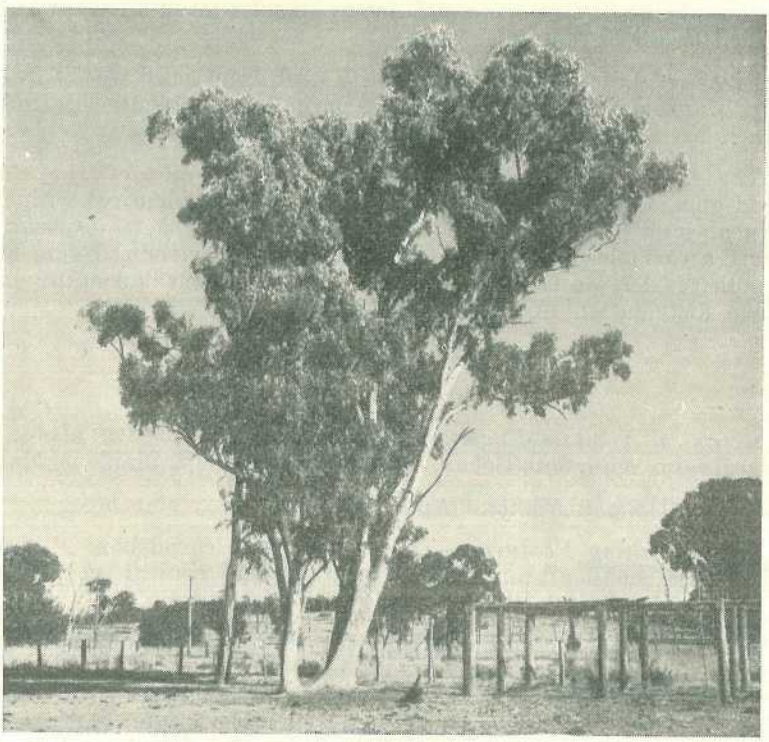


Plate 51.

Fuzzy Box (Eucalyptus conica). Graysholm.

when fully out. The buds are nearly diamond-shaped, tapering to their stalks, and with a conical or shortly pointed lid shorter and narrower than the rest of the bud. The seed-capsules are almost conical in shape, with the wide end at the top, about $\frac{1}{5}$ in. long and slightly narrower.

Distribution.—Forest country in the southern and eastern part of the Darling Downs District, southern part of the Burnett District and the north-western part of the Moreton District. Also in northern New South Wales.

Usual Flowering Time.—August-October.

Colour of Honey.—Light amber with noticeable bright appearance.

Importance as Source of Honey.—Medium.

Importance as Source of Pollen.—Minor.

General Remarks.—About every second year fuzzy box flowers profusely in the early summer, when up to 60 lb. of honey may be harvested by each colony. It is often obtained as a natural blend with yellow box.

In the Texas and Stanthorpe areas, colonies build up on this species, although generally it is considered to be only a minor pollen plant.

The choice honey from this tree has a mild sweet flavour and good density. It is similar to other summer-produced "box" honeys in that it does not granulate readily.

[TO BE CONTINUED.]

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.

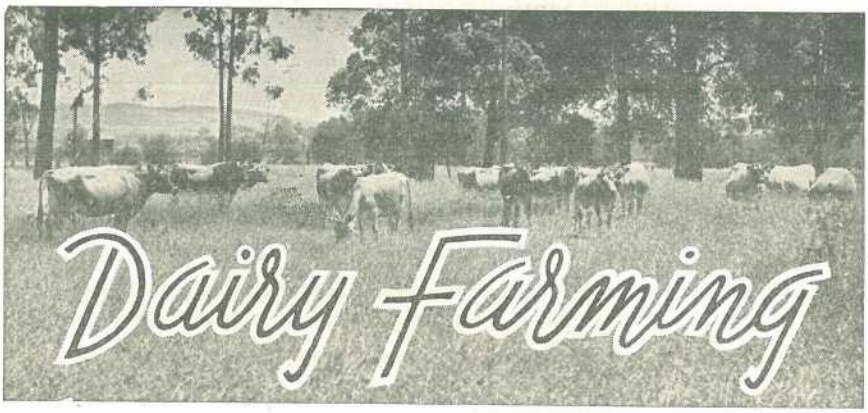
TESTED HERDS.

(AS AT 15th SEPTEMBER, 1953.)

Breed.	Owner's Name and Address.
Berkshire	J. J. Bailey, " Lucydale " Stud, East Greenmount
	S. Cochrane, " Stanroy " Stud, Felton
	G. Handley, " Handleigh " Stud, Murphy's Creek
	J. L. Handley, " Meadow Vale " Stud, Lockyer
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	O'Brien and Hickey, " Kildurham " Stud, Jandowae East
	E. Pukallus, " Plainby " Stud, Crow's Nest
	G. C. Traves, " Wynwood " Stud, Oakey
	E. Tumbridge, " Bidwell " Stud, Oakey
	Westbrook Farm Home for Boys, Westbrook
	H.M. State Farm, " Palen " Stud, Palen Creek
	A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
	H. H. Sellars, " Tabooba " Stud, Beaudesert
	F. Thomas, " Rosevale " Stud, M.S. 373, Beaudesert
	D. T. Law, " Rossvill " Stud, Trout road, Aspley
	R. H. Crawley, " Rockthorpe " Stud, *via* Pittsworth
	F. R. J. Cook, " Alstonvilla," Woolvi, *via* Gympie
	Mrs. I. M. James, " Kenmore " Stud, Cambooya
	H. L. Stark, " Florida," Kalbar
	J. H. N. Stoodley, " Stoodville," Ormiston
	H.M. State Farm, Numinbah
	V. G. M. and A. G. Brown, " Bardell," Goovigen
	R. E. Paulsen, " Crest " Stud, Binjour Plateau, M.S. 670, Gayndah
	M. G. and R. H. Atkins, " Diamond Valley " Stud, Mooloolah
	L. Puschmann, " Tayfeld " Stud, Taylor
	Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
	W. F. Ruhle, " Felbar " Stud, Kalbar
	C. E. Edwards, " Spring Valley " Stud, Kingaroy
	G. J. McLennan, " Murcott " Stud, Willowvale
	H. M. Wyatte, " Cumberland " Stud, Rocky Creek, Yarraman
	C. F. W. and B. A. Shellback, " Redvilla " Stud, Kingaroy
Large White	H. J. Franke and Sons, " Delvue " Stud, Cawdor
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	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

TESTED HERDS—continued.

Breed.	Owner's Name and Address.
Large White	L. C. Lobegeiger, " Bremer Valley " Stud, Moorang, *via* Rosewood H. R. Gibson, " Thistleton " Stud, Maleny H.M. State Farm, Numinbah K. A. Hancock, " Laurestonvale " Stud, Murgon V. P. McGoldrick, " Fairymeadow " Stud, Cooroy R. S. Powell, " Kybong " Stud, Kybong, *via* Gympie E. B. Horne, " Kalringal," Wooroolin S. T. Fowler, " Kenstan " Stud, Pittsworth H. L. Larsen, " Oakway," Kingaroy C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek E. G. Evans, " Lauraven " Stud, Box 22, Maleny Mrs. I. G. Utting, "White Lodge," Mountain Road, Cooroy N. E. Meyers, Halpine Plantation, Kallangur Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes G. I. Skyring, " Bellwood " Stud, *via* Pomona O. H. Horton, " Manneum Brae " Stud, Manneum, Kingaroy M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
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, " Canaan " Stud, Riverview F. Thomas, " Rosevale " Stud, M.S. 373, Beaudesert A. J. Surman, " Namrus " Stud, Noble road, Goodna Department of Agriculture and Stock, Regional Experiment Station, Kairi E. C. Phillips, " Sunny View," M.S. 90, Kingaroy T. A. Stephen, " Withcott," Helidon W. F. Kajewski, " Glenroy " Stud, Glencoe A. A. Herbst, Bahr Scrub, *via* Beenleigh R. G. Koplick, " Melan Terez " Stud, Rochedale H.M. State Farm, Numinbah D. B. Alexander, " Debreczen " Stud, Kinleymore, *via* Murgon Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
Wessex Saddleback ..	W. S. Douglas, " Greylight " Stud, Goombungee D. Kay and P. Hunting, " Kazan " Stud, Goodna E. Sirett, " 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, " Rossvill " Stud, Trout road, Aspley J. B. Dunlop, " Kurrawyn " Stud, Acacia road, Kuraby A. Curd, " Kilrock " Stud, Box 35, Jandowae C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek R. A. Collings, " Rutholme " Stud, Waterford M. Nielsen, " Cressbrook " Stud, Goomburra G. J. Cooper, " Cedar Glen " Stud, Yarraman M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley A. H. Groves, " Kinvara " Stud, Ingleside, West Burleigh



A Survey of Dairy Herd Wastage in Queensland for 1951-52.

C. H. CLARK and R. A. PAUL, Division of Dairying.

IN previous surveys of dairy herd wastage in Queensland that have been published in this journal, it was the practice to give wastage information for all animals in the herd, including bulls, heifers and calves.

Organisations in some other countries have presented wastage figures in that form, while in some other cases, including some of the Australian Departments, details of wastage of cows only have been published.

There is an increased interest in the wastage of milking and dry cows in Queensland, and this article has been designed to provide this information as well as information on calf wastage.

In this survey for 1951-52, the average figures for 1948-51 have been included for comparison. Drought conditions prevailed in many districts from May 1951 until February 1952, while the seasons 1948-51 were fairly uniform. Rainfall in all areas covered by the 1948-51 survey was above normal for most months of the three years, except in the latter part of 1948 and May and June 1591. The survey for 1951-52 indicates the degree of wastage during a drought, while the 1948-51 figures

TABLE 1.

Approximate Average Rainfall for the Years 1948–1952 in Districts included in the Survey.

Year.	North Coast (Barron).	South Coast (Port Curtis).	South Coast (Moreton).	Darling Downs (East).	Darling Downs (West).
	In.	In.	In.	In.	In.
1948	53	31	45	27	21
1949	76	43	51	31	20
1950	93	55	70	41	34
1951	38	24	37	26	15
1952	53	40	39	30	23
Average Annual Rainfall	66	37	46	26	21

indicate the degree of wastage during fairly uniform seasons. Figures supplied by the Meteorological Bureau, Brisbane (Table 1) show that rainfall in all areas covered by the survey (except Eastern Downs) was below normal for 1951.

Sources of Data.

The information used in compiling this survey was furnished by farmers in various parts of the State who were members of herd recording groups.

For 1951-52 (July 1, 1951–June 30, 1952) complete returns were received for 82 herds. During the year many herds were withdrawn from recording for short periods as a result of drought conditions, and a great deal of incomplete information was discarded.

Wastage of Cows.

The chief reasons for disposals of cows in Queensland, in order of importance, are:—

(1) Low production.

(2) Old age.

(3) Sales of surplus stock for dairy purposes.

(4) Failure to breed (that is, sterility due to various causes).

(5) Udder troubles (chiefly mastitis).

(6) Calving troubles.

The total wastage of cows included in this survey is set out in Table 2. Cows sold for dairy purposes constitute a large percentage of disposals, but as they are not lost to the industry they cannot be included in determining true wastage. Excluding cows sold for dairy purposes, the true wastage for the State for 1951-52 was 21·8 per cent. This means that the average cow has a productive life of approximately five years; or the average dairy cow completes barely five lactation periods if she calves regularly each year.

TABLE 2.

Cow Wastage in Herds according to District.

—	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-Eastern Queensland.	Downs.
Wastage including cows sold for dairy purposes	23·7 (22·1)	23·2 (27·5)	29·9 (41·4)	20·4 (18·0)	25·5 (19·8)	12·1 (22·7)
Wastage excluding cows sold for dairy purposes	21·8 (17·3)	19·7 (15·9)	21·5 (24·1)	20·4 (15·9)	23·6 (17·0)	12·1 (18·7)

The figures in brackets are for the 1948–51 survey.

Serious economic losses must result if cows have to be culled before reaching full production, as the economic cow is one which will produce large quantities of milk and butterfat annually and for a number of years. In information collected for this survey, the ages of animals were omitted in many cases, and therefore it was impossible to assess the average age of disposal or to analyse wastage according to age.

TABLE 3.

CAUSES OF COW WASTAGE SHOWN AS PERCENTAGES OF ALL COWS, 1951–52.

Cause.	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-Eastern Queensland.	Downs.
Low Production	7·6	9·4	2·8	7·4	8·2	4·9
Aged	3·4	5·2	6·9	3·7	3·2	1·6
Udder Troubles	0·8	1·3	0·7	1·9	0·7	0·5
Brucellosis	0·3	..	..	..	0·3	0·5
Sterility	1·2	1·3	..	0·7	1·5	..
Calving Troubles	0·7	..	0·7	1·1	0·7	0·9
Tuberculosis	0·6	..	..	..	0·8	..
Poisoning	0·4	0·4	0·7	0·7	0·3	0·5
Bloat	0·02	..	..	..	0·03	..
Tick Fever	0·05	..	1·4	..	..	..
Milk Fever	0·03	0·4	..	..	..	..
Accidents	1·2	0·4	0·7	0·4	1·4	0·5
Drought	2·4	..	0·7	3·3	2·9	..
Other Known Causes	0·7	..	..	0·4	1·0	0·2
Unknown Causes	2·5	1·3	6·9	0·7	2·6	2·6
Total Wastage	21·8	19·7	21·5	20·4	23·6	12·1

TABLE 4.

CAUSES OF WASTAGE OF COWS ONLY SHOWN AS PERCENTAGES OF TOTAL COW WASTAGE, EXCLUDING COWS SOLD FOR DAIRY PURPOSES, 1951–52.

Cause.	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-Eastern Queensland.	Downs.
Low Production	34·9	47·8	12·9	36·4	34·6	40·4
	(38·4)	(34·7)	(16·7)	(42·1)	(41·2)	(30·4)
Aged	15·3	26·1	32·3	18·2	13·8	13·5
	(21·1)	(20·1)	(53·5)	(17·8)	(17·2)	(23·0)
Udder Troubles	3·6	6·5	3·2	9·1	2·9	3·8
	(9·9)	(6·7)	(4·4)	(11·3)	(11·0)	(16·9)
Brucellosis	1·3	—	—	—	1·3	3·8
	(0·9)	(—)	(2·6)	(2·0)	(0·5)	(—)
Sterility	5·5	6·5	—	3·6	6·3	—
	(5·5)	(10·5)	(1·8)	(4·6)	(5·3)	(4·7)
Calving Troubles	3·2	—	3·2	5·5	2·9	7·7
	(3·6)	(2·9)	(1·8)	(6·3)	(2·0)	(6·1)
Tuberculosis	2·5	—	—	—	3·2	—
	(1·2)	(1·7)	(—)	(0·4)	(—)	(—)
Poisoning	1·8	2·2	3·2	3·6	1·5	3·8
	(1·7)	(2·9)	(0·2)	(1·1)	(2·3)	(0·7)
Bloat	0·1	—	—	—	0·2	—
	(0·8)	(—)	(0·2)	(0·4)	(0·3)	(2·7)
Tick Fever	0·2	—	6·5	—	—	—
	(—)	(—)	(—)	(—)	(—)	(—)
Milk Fever	0·1	2·2	—	—	—	—
	(0·2)	(—)	(0·2)	(0·2)	(—)	(1·4)
Accidents	5·3	2·2	3·2	1·8	6·0	3·8
	(5·8)	(5·4)	(2·6)	(4·6)	(8·2)	(4·1)
Drought	11·0	—	3·2	16·4	12·4	—
Other Known Causes	3·3	—	—	1·8	4·0	1·9
	(2·4)	(5·4)	(3·5)	(1·3)	(2·2)	(2·0)
Unknown Causes	11·6	6·5	32·3	3·6	11·0	21·2
	(8·3)	(8·4)	(10·5)	(8·0)	(9·8)	(7·4)

The figures in brackets are for the 1948–51 survey.

Tables 3 and 4 show the various causes of wastage. Table 3 shows the various causes of wastage as percentages of all cows, while Table 4 gives a clearer picture of the order of importance of the various causes of wastage and reveals that low production is the chief reason for culling. Herds surveyed have been recorded for production for various periods, and it is probable that herd recording is responsible for a heavier culling rate for low production than is evident in the majority of non-recording herds.

Udder troubles have shown a further decrease in some areas. The figures indicate that there has been lowered incidence in South-eastern Queensland and the Downs areas. Many farmers in these districts are supplying milk to cheese factories and for market milk purposes. During recent years, the frequent laboratory testing of samples of milk in connection with the Milk Quality Control Scheme has led to an intensive check of herds on milk-supply farms for the purpose of locating cows affected with mastitis. It appears that the lowered incidence of mastitis may be attributed to its early detection and the extensive use of antibiotics in treating the disease.

There has been an overall increase in sterility and brucellosis in 1951-52 compared with the average for 1948-51.

Drought was the direct cause of 11.0% of total wastage in 1951-52. In previous surveys (carried out from 1947 to 1951) losses due to drought were insignificant and were included in "Other Known Causes". It is possible that the economic loss due to drought could be considerable when calculated over a number of years.

Reference to Table 5 indicates that the average herd included in the survey is composed of 60% cows, 2% bulls, 21% heifers (weaning to calving) and 17% calves (1 month to weaning). These figures show that the percentage of animals available for replacement is greater than the percentage of wastage in Table 2.

TABLE 5.

Composition of Herds.

—	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-eastern Queensland.	Downs.
Cows (Milking and Dry) ..	59·3 (61·1)	61·2 (60·8)	57·1 (53·1)	65·3 (65·6)	60·2 (61·9)	59·9 (51·6)
Bulls	2·2 (2·4)	2·3 (2·8)	2·1 (2·9)	2·8 (2·4)	2·2 (2·3)	1·8 (2·0)
Heifers (Weaning to Calving)	20·9 (20·6)	17·5 (21·1)	23·4 (24·1)	22·0 (20·0)	21·0 (19·8)	20·6 (23·6)
Calves (1 Month to Weaning)	17·7 (15·9)	19·0 (15·4)	17·3 (20·0)	9·9 (12·1)	16·6 (16·0)	26·7 (22·8)

The figures in brackets are for the 1948–51 survey.

Calf Wastage.

Tables 6 and 7 show the percentages of male and female calves born and the percentage of calves reared. The information given in the tables was prepared from particulars of calves born and disposal of calves not older than one month. Perusal of the tables indicates that there is a considerable variation in the number of calves reared in the various districts of the State.

TABLE 6.

Sex of Calves and Percentages of Calves Reared, 1951–52.

—	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-Eastern Queensland.	Downs.
Heifers Born	45·4	37·2	41·8	51·3	45·2	48·4
	(45·6)	(45·1)	(47·3)	(46·4)	(44·7)	(45·2)
Bulls Born	54·6	62·8	58·2	48·7	54·8	51·6
	(54·4)	(54·9)	(52·7)	(53·6)	(55·3)	(54·8)
Heifers Reared	67·5	55·0	88·2	38·1	67·1	87·2
	(63·3)	(64·1)	(91·5)	(48·2)	(63·4)	(90·1)
Bulls Reared	10·9	1·5	6·6	7·1	5·2	55·0
	(11·4)	(7·1)	(21·8)	(5·1)	(7·7)	(52·2)

The figures in brackets are for the 1948–51 survey.

TABLE 7.

Disposal of Calves not Reared shown as Percentages of all Calves Born.

—	All Queensland.	North Queensland.	Upper and Central Burnett.	South Burnett.	South-Eastern Queensland.	Downs.
Sold	23·0	24·2	9·8	72·6	19·9	17·0
	(31·6)	(33·5)	(28·0)	(61·1)	(13·5)	(10·6)
Slaughtered	38·4	50·7	45·1	1·1	45·3	9·4
	(30·6)	(31·2)	(16·3)	(10·2)	(52·2)	(14·9)
Died	1·5	3·6	0·8	3·0	1·1	3·0
	(2·2)	(2·1)	(1·0)	(2·6)	(1·4)	(4·6)
Stillborn	0·5	0·9	0·8	—	0·5	—
	(0·5)	(0·4)	(—)	(0·9)	(0·3)	(0·6)
Killed by Dingoes	0·03	—	—	0·4	—	—
	(0·07)	(—)	(—)	(0·07)	(0·03)	(—)

The figures in brackets are for the 1948–51 survey.

The average percentage of heifer calves reared for the State is 67.5, so ample calves are being reared for normal herd replacements.

Discussion.

Herd wastage surveys carried out since 1947-48 indicate the general order of importance of some of the main dairy cattle losses. The extent and nature of some causes of wastage in individual herds may be concealed when converting these into an average for various districts and for the State. A summarised account will tend to put less emphasis on extreme cases—on the one hand, herds in which mastitis accounts for a large percentage of wastage or where large percentages are found to be reactors to the tuberculin test; on the other hand, herds which are almost completely free of disease and show a small amount of wastage. It is desired to present a picture of average conditions.

The general position indicates that low production is still the chief item in the average farmer's culling programme. Disease accounts for a large percentage of wastage and every effort must be made to diagnose, treat or apply preventive measures to decrease the incidence as much as possible.

PUREBRED PRODUCTION RECORDING.

Murcott Clara 3rd had a butterfat production of 365 lb. and a test of 4·5% for 1951-52. The figures were given incorrectly as 199 and 4·0 on page 108 of the February issue of the Journal.

How Buyers of Agricultural Requirements may Submit Samples.

F. B. COLEMAN, Standards Officer, Standards Branch.

THE Agricultural Standards Act requires that seeds, fertilizers, lime, stock foods, veterinary medicines, growth regulating substances, marking preparations, testing reagents, and any other materials which may be included within the ambit of the Act, comply with the guarantee on the label and with any standards that may be prescribed.

A person shall not be bound to accept delivery on the sale of any agricultural requirement unless all of the provisions of the Act relating to such agricultural requirement and the sale thereof have been complied with in full.

In order that a check may be kept on quality, provision is made for inspectors to take official samples on the premises of the seller. When the goods have been delivered to the buyer, section 75 of the Act makes provision for the purchaser to obtain a sample and forward same to the Standards Officer for purposes of examination and report thereon. Such section reads as follows:—

(1) Any buyer of any agricultural requirement shall, subject to this section, be entitled to submit a sample of that agricultural requirement to the standards officer for analysis and to receive a report of the result of the analysis.

(2) Each and every buyer intending to submit a sample for analysis under this section shall, at any time within fourteen days after the delivery of such agricultural requirement to him or within fourteen days after receipt by him of the invoice therefor (whichever is the later period), give notice in writing either personally or by registered post to the seller or the seller's agent of his intention, and of the day (not being earlier than fourteen days from the date of the giving or posting of such notice) and time and place when and where such sample will be taken.

If the seller does not within fourteen days after the giving or posting of the notice, attend personally or by agent at the time and place appointed by the buyer for the purpose, the buyer may, at that time and place or at any later time and at any place, but not later than twenty-one days after the giving or posting of the notice, take, or obtain the services of an inspector to take a sample of such agricultural requirement in the presence of a witness.

(3) (*a*) The sample shall be a fair average sample of the agricultural requirement concerned and, if prescribed, of the quantity or weight and taken as prescribed.

(*b*) The buyer shall divide or have divided the sample so obtained into three approximately equal parts, and shall mark and seal or fasten up each such part in such a manner as its nature permits.

(*c*) The buyer shall write or print or have written or printed upon each package or on a label affixed to each package particulars as follows:—

(i) Name of the agricultural requirement;

(ii) Number of packages from which sample was taken;

(iii) Number of packages received;

(iv) Markings, if any, on packages;

(v) Name and address of seller from whom the agricultural requirement was purchased;

(vi) Date agricultural requirement was received by the buyer;

(vii) Name and address of the buyer;

(viii) Date upon which the sample was taken.

Such particulars shall be signed by the buyer and the seller or agent (where the seller or agent is present) and witness.

(*d*) The buyer shall deliver or cause to be delivered one of such parts to the seller or his agent and shall deliver or cause to be delivered to the standards officer one of such parts accompanied by—

(i) The label or labels attached to the agricultural requirement at the time of delivery if same is or are procurable;

(ii) The invoice covering the sale of the agricultural requirement in question received from the seller if same was received or is available;

(iii) A request in writing, signed by the buyer, for a report of the result of the analysis;

(iv) The prescribed fee, if any:

Provided that if a buyer who in good faith has submitted any such sample for analysis satisfies the standards officer that he has substantial ground for his action in so submitting such sample based upon his own experience of the agricultural requirement concerned, no charge shall be made for analysis.

(4) The costs of and incidental to the obtaining of any analysis under this section shall, subject to the provisions of paragraph (*d*) above, be paid in the first instance by the person requesting the analysis, but shall subsequently be dependent upon the results of the analysis, and if the agricultural requirement does not comply with the requirements of this Act, shall be recoverable from the seller of such agricultural requirement by such person as a simple contract debt or, in the case of a conviction, for an offence, shall be added to the penalty and be recoverable in the same manner as the penalty, and, upon recovery, be paid to such person.

However Section 75 (5) of the Act provides that, in the case of seeds for sowing purchased for a buyer's own use, a free testing service shall be available upon complying with the following:—

(5) Nothwithstanding anything contained in subsections two, three and four above, a buyer of seeds or any other prescribed agricultural requirement for his own use may submit free of charge to the standards officer a fair average sample of that agricultural requirement by complying only with the provisions of paragraphs (*a*) and (*c*) and subparagraph (iii) of paragraph (*d*) of subsection three set out above:

Provided that any sample submitted under this subsection and the result of the analysis of that sample shall not be the basis of a complaint for an offence against this Act.