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C. W. WINDERS, B.Sc.Agr.

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Contents

THE MINISTER'S NEW YEAR MESSAGE

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The year which is drawing to a close has provided primary producers with a somewhat mixed grill.

As this message is being written, the last of a record volume of wheat is pouring into the dumps, sugar mills are just finishing crushing a bountiful harvest, and the year's wool sales are ending on a very high tone.

Hon. H. H. Collins

On the other side are the regrettable losses which have occurred in the drought-stricken north-west, the lowered spring and early summer dairy production due to dry conditions, and frost and dry-weather injury to fruit crops.

These varied conditions serve to emphasize the vicissitudes of Queensland agriculture, ups and downs which demand of the farmer and grazier a good deal of skill, fortitude, and perseverance in adversity and balance and foresight in prosperity.

I sincerely hope that by the time this message is read in country homes throughout the State pastures will be green again and field and orchard crops in a flourishing condition.

It is a pleasure to again record my appreciation of the assistance given by primary producers to officers of my Department in their endeavours to advance the science and practice of agriculture in this State. With the continued goodwill and co-operation of producers, further achievement is certain in the coming year.

Not merely increased output, but more efficient and economical production must be the keynote for the future. It is to be hoped that the spirit of the efficiency drive which is about to be undertaken in connection with the Australian dairying industry will permeate other industries possessing inefficiency problems and lead to a reduction in the amount of sub-standard farming.

I take this opportunity of wishing all primary producers the greatest success in their efforts during 1949 and the happiness that comes to the farmer and his family from a job well done.

H. H. Collins

Secretary for Agriculture and Stock.

Sunflowers for Seed on the Darling Downs.

C. S. CLYDESDALE, Senior Adviser in Agriculture, and
J. HART, Adviser in Agriculture.

THE sunflower is a native of northern America, where it was one of the food plants of the Indians. Its culture has now spread to many tropical and sub-tropical countries, but the crop assumes its greatest importance in Russia and the Danubian countries, where the oil extracted from the seed has many domestic and industrial uses and the oil-cake residue, which has a stock food value comparable with that of linseed meal and cottonseed cake, forms an important cattle fodder concentrate.

In America, the sunflower is used largely as a cattle fodder in the form of ensilage in those regions too cold for normal maize production. As a feed, sunflower silage contains less total digestible nutrients than, and is very inferior to, well-matured maize silage. Sunflower silage is also relatively low in palatability. However, it is seldom used as a fodder in Queensland.

Until recent years there has been only a limited local market demand of about 500 to 800 tons of sunflower seed per annum, most of which was absorbed by the bird seed trade. The present shortage of vegetable oils has stimulated interest in the crop and a survey made by the Council for Scientific and Industrial Research indicates that there is a large potential demand for sunflower seed for the production of oil to be used for the following purposes:—

(*a*) As an extender or partial substitute for linseed oil in the manufacture of paints and varnishes, for which purpose approximately 22,000 tons of sunflower seed could be absorbed annually.

(*b*) As an edible oil for use in food processing and preparations. There is a deficiency of approximately 1,500 tons of oil between Australian annual requirements and local production. This deficiency could be made up with 7,500 tons of sunflower seed.

(*c*) Miscellaneous uses, such as in the manufacture of plasticising materials for the rubber trade; cosmetic and soap manufacture could also use greater quantities of this oil.

However, this potential demand of about 30,000 tons of seed is entirely dependent on availability of recognised drying oils such as linseed oil and on its price relative to those of other edible oils. Thus the demand in future years cannot be forecast.

The fixed ceiling price of £32 per ton for graded seed was waived during the 1947-48 season and market values rose sharply to as high as £46 per ton. At these prices the crop is a remunerative one, and while they remain at or near the present level increased acreages can be expected in Queensland.

SOIL AND CLIMATE.

Soil and climatic requirements of the sunflower are somewhat similar to those of maize, but the sunflower will grow successfully on a wider range of soil types and is more tolerant of cool conditions. The sunflower also is generally of quicker maturity. It is this adaptability to poorer soils and colder climates, coupled with earlier maturity, that has given the crop such significant value in the more temperate regions of Russia and America. In America, the sunflower is grown extensively beyond the Corn Belt as a substitute for maize.

The sunflower plant, under normal conditions, is a gross feeder and best results are obtained on deep, rich, friable loams. Sandy soils, when the organic matter is in reasonable supply, also provide favourable conditions. Shallow, stiff, and wet soils are least productive.

SEED-BED PREPARATION AND CROP CULTIVATION.

As well as abundant plant foods, the sunflower plant requires large quantities of water—about 7 gallons for every 1 lb. of dry matter produced—to make its maximum development; preparatory cultivation must, therefore, be early, deep, and thorough. However, sunflowers withstand dry conditions extremely well, being much superior to maize in this regard and thus a surer crop. On a well-prepared long fallow a yield of 1,000 lb. per acre was obtained during the 1946-47 season from a crop on the Darling Downs which received no rain after time of planting. This result instances the value of correct soil preparation and fallowing and the sunflower plant's adaptability to adverse seasonal conditions.

The initial ploughing should be as early as possible and as deep as practicable without inverting the subsoil. The field, particularly if the soil is of a heavy nature, should then be left in the rough, thus allowing rains to penetrate to the subsoil, while surface clods are mellowed down to a friable structure by climatic influences.

Subsequent seed-bed cultivation will be dictated by soil type, climatic conditions, proximity to date of sowing, and the range of implements available. The ultimate objective should be a fairly firm and fairly fine-surfaced seed-bed, similar to that prepared for maize. It is essential that preparation be designed to trap as much moisture as possible. To achieve this, the surface should not be reduced to a fine tilth until immediately before sowing. Weed growth should be kept in check in the earlier stages with stirring types of implements, which will assist in keeping the soil open and pervious to rain, rather than discs, which should be used only if weeds threaten to get beyond control or if a rough surface cannot be broken down sufficiently quickly.

During growth, inter-row cultivation may be necessary to keep down weed growth up to the time the rapidly growing sunflower plants

cover the ground sufficiently to check such competition. Care should be taken during the inter-row cultivations, especially the second, which is normally also the last, to ensure that damage is not inflicted on the root system, which spreads rapidly across the inter-row spaces.

PLANTING.

Sowing may commence as soon as fear of frost is over and may be continued into January of the following year. However, December and January plantings are often subject to rust attack and, therefore, the early planting is recommended. One disadvantage with early planting is that the crop tends to ripen during the wet, stormy season and thus harvesting operations may be interrupted or delayed.

The rate of sowing and the spacings to be used are dependent on the intended method of harvest—that is, whether by hand or by mechanical means. If the latter method is to be used, sowing at the rate of 4 to 5 lb. of seed per acre, in rows 35 inches apart, is recommended. This rate allows good plant development and yet tends to keep the number of coarse-growing plants down. The 35-inch spacing, besides favouring crop growth, is a convenient planting and harvesting spacing and is the minimum practical planting distance which allows combine-drill* inter-row cultivation.

If the crop is to be harvested by hand, a planting rate of 2 to 3 lb. per acre in rows 4 feet to 4½ feet apart is suggested. This lower seeding rate, by reducing the plant population of the field, allows vigorous plant development with the production of large, heavy seedheads. Thinner stands of this type are most suitable where hand harvesting is practised.

The crop can be planted either with a combine-drill or a maize planter. Plants usually average 12–18 inches apart within the drills. Planting at 15 inches apart in drills 4 feet wide would require 2 lb. of seed per acre. When the crop is to be harvested by mechanical means, planting round and round the paddock is recommended as it is then a simple matter to follow the rows with the header-harvester.

VARIETIES.

The giant sunflower has been grown in Queensland for many years but increased attention is now being given to dwarf varieties, which are more suitable for mechanical harvesting and can be handled entirely by normal wheat farm machinery.

The table below gives bushel weights and seed-oil contents of samples taken from a Departmental varietal trial conducted on the Darling Downs during the 1947-48 season—

Variety.	Bushel Weight.	Oil Content.
	Lb.	Per cent.
Giant Russian	32¼	27·1
Mennonite	22	23·5
Sunrise	29½	28·8

* Combination seed drill and tyne cultivator used principally in the wheat-growing areas for sowing of all types of seed.

Giant or Mammoth Russian.

This was the principal variety introduced into Queensland, but the indiscriminate selection of seed has given rise to a mixed type with few uniform characteristics. Certain growers have made selection for size of head and appear to have included such characteristics as height of plant and colour of seed, so that to-day a number of strains occur throughout the State. Giant Russian has a medium-sized, grey-striped seed (Plate 106), with some strains producing pure black seed.

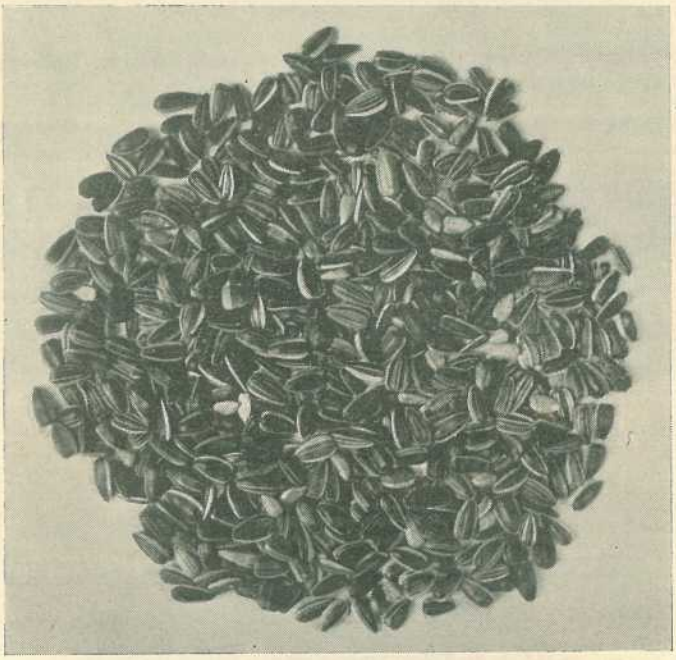

Plate 106.

SEED OF GIANT RUSSIAN SUNFLOWER.—The average seed dimensions are $\frac{7}{16}$" to $\frac{1}{2}$" long by $\frac{1}{4}$" broad.

It is a very vigorous variety, often exceeding 10 feet in height and developing heads up to 1 foot in diameter. It is a high yielder, averaging in the vicinity of 1,000 lb. per acre, but yields of 1 ton per acre are not uncommon. Because of its robust habit of growth (Plate 107), this variety gives best results when planted at the wider spacing and at the lighter seeding rate, thus allowing full development of individual plants. In the Warwick-Killarney district, where hand harvesting is still practised, this is the principal variety grown.

Giant Russian can be satisfactorily handled by the header-harvester, but if the stand is unusually heavy it may be advisable to take only two rows, or even one row, at a time with the harvesting machine.

Mennonite.

Although a dwarf variety, Mennonite under ideal conditions may grow as high as six feet. The heads are markedly pendulous and this characteristic seems to be responsible for the tendency of Mennonite to

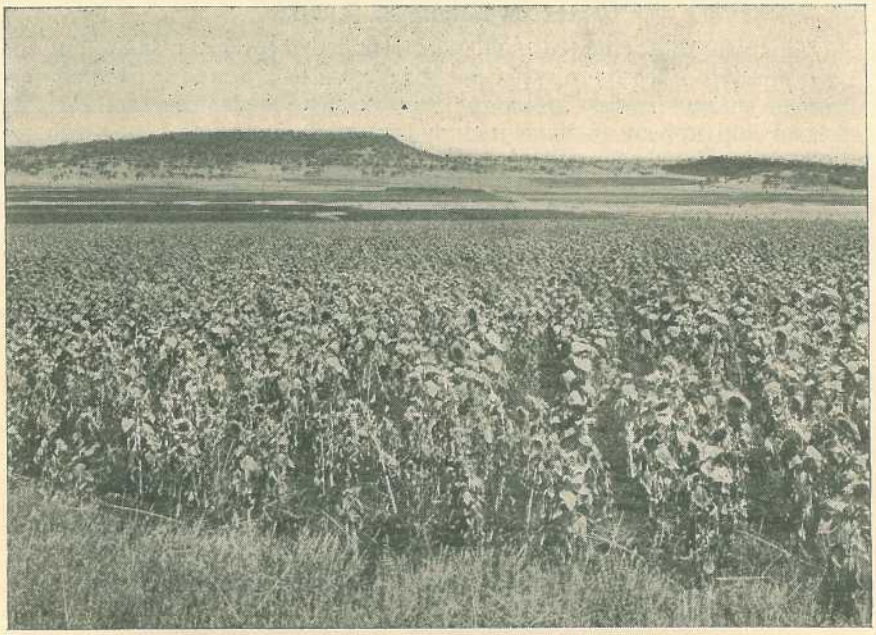

Plate 107.

A CROP OF GIANT RUSSIAN SUNFLOWER IN THE CAMBOOYA DISTRICT.

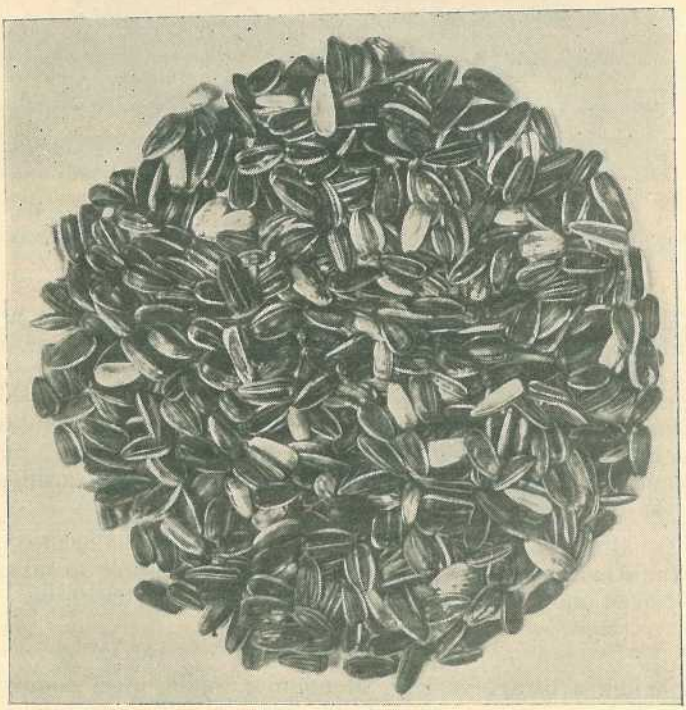

Plate 108.

SEED OF MENNONITE SUNFLOWER.—The average seed dimensions are $\frac{9}{16}$" long by $\frac{5}{16}$" broad.

"go down" if heavy rains fall during the ripening stage. Lodging occurs in all varieties but appears to be more common in Mennonite. As maturity approaches, the head in most strains of sunflowers becomes lighter and the bent stalk gradually straightens itself to near its former upright position. In Mennonite, however, this upright position is often not regained, due to the partial fracture of the stalk during the period when the head is at its heaviest and causing pronounced bending of the stalk. This characteristic suggests a weakness of stalk in the variety which is not desirable from the point of view of mechanical harvesting, as the comb would have to be lowered below normal cutting height to gather most of the hanging heads. However, this variety, because of its partial dwarf habit, is now becoming popular on the Darling Downs, where yields to date have averaged 750–1,000 lb. per acre. The heads are medium-large in size and bear large, elongated grey-striped seeds (Plate 108).

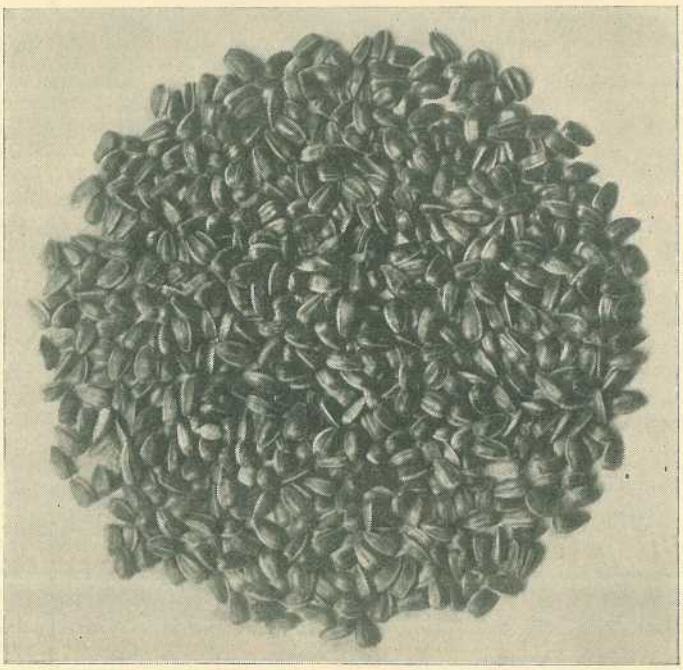

Plate 109.

SEED OF SUNRISE SUNFLOWER.—The average seed dimensions are ⅜" long by ¼" broad.

Sunrise.

Although not yet grown commercially to any extent in Queensland, this variety is promising. In appearance, it seems more leafy than other varieties, but this is probably because of its dwarf habit; it is only 3½ to 4 feet in height. It carries well-formed heads with a diameter of six to eight inches and bearing small, plump, dark-grey-striped seeds (Plate 109). The head of Sunrise is quite distinct from other varieties, for when mature the bracts at the base of the head remain fairly straight and regular while in Giant Russian and Mennonite the bracts become

curled and irregular in appearance. Furthermore, the mature head retains its seed reasonably well, while in the other two varieties the seed shatters if the plant receives a slight jar or if the head is handled.

The height of this variety renders it particularly suitable for mechanical harvesting. Moreover, it could probably be effectively handled by the lighter type of header-harvester which is unsuitable for handling tall varieties.

Advance.

Advance is a hybrid introduction from Canada, where it has become most popular, and is reported as possessing a high oil content. It is similar in appearance to the Sunrise variety, growing to approximately the same height and having a seedhead of similar size. The parent seed itself, however, is of medium size and more grey-striped than Sunrise (Plate 110).

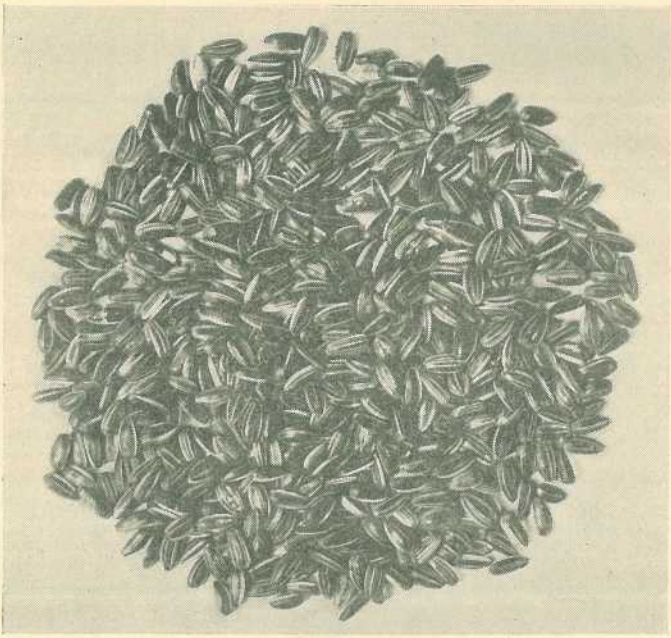

Plate 110.

SEED OF THE FEMALE PARENT OF ADVANCE, A HYBRID SUNFLOWER.—The average seed dimensions are $\frac{7}{16}$" long by $\frac{7}{32}$" broad.

HAND HARVESTING.

The heads should be thoroughly dry before harvesting commences. Where hand harvesting is followed, the heads are usually cut with pruning shears and then thrown into a wagon, dray or other vehicle which has been lined with sheets of bagging or other suitable material to retain any loose seed which may be shed. The heads are then carted direct to the thresher.

The seed is easily removed, the grain header used as a stationary thresher being the most convenient machine for threshing sunflower

heads. Any type or make of header will thresh the seed, but different modifications are required according to the type of drum in the header to be used. With a peg drum, adjustments on the principles outlined in (*d*) and (*e*) of the section devoted to mechanical harvesting should suffice, whilst with the bar drum the concave should have all bars removed and should be opened to its fullest extent. The drum should be slowed down, and the fan draft increased. The rate of threshing will be controlled by the capacity of the riddle to handle the refuse, most of which escapes the straw-walkers.

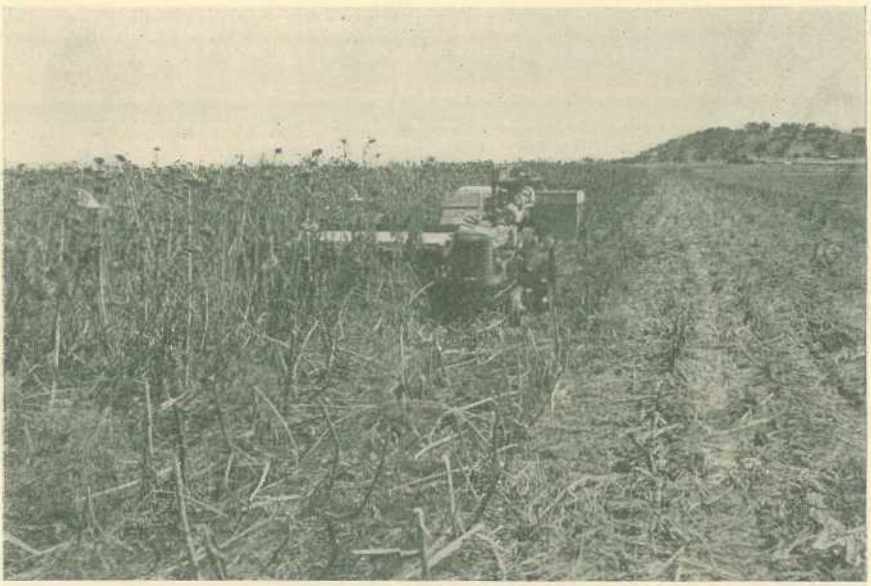

Plate 111.
A Modified Header Taking Off a 22-Bag Crop.

MECHANICAL HARVESTING.

Sunflowers have been successfully harvested by header-harvesters on the Darling Downs for a number of years (Plate 111). Header modifications and adjustments vary for individual crops, for the various makes of machines and according to the ideas of individual growers, but basically all machines are modified similarly.

Although ground driven machines can be used, the power driven are by far the most satisfactory, for, in addition to being much easier to pull, they allow the machine to work at a much slower speed. A slow-moving header is much less likely to jar and knock the ripe plants, causing seed loss, than is a header moving at three miles per hour, which would be the minimum speed to give the necessary power in a ground driven machine.

As an illustration of alterations to a header-harvester which have given very satisfactory results in harvesting sunflowers, the following details are quoted by courtesy of Mr. D. Binney, Cambooya, who operates a 1939 model 12-foot Horwood Bagshaw header-harvester drawn by a W6 McCormick-Deering tractor (H.P. 24·7).

Modifications and adjustments can be divided into five groups as hereunder:—

(*a*) Addition of trays and finger covers;
(*b*) Comb;
(*c*) Reel;
(*d*) Threshing drum;
(*e*) Minor adjustments.

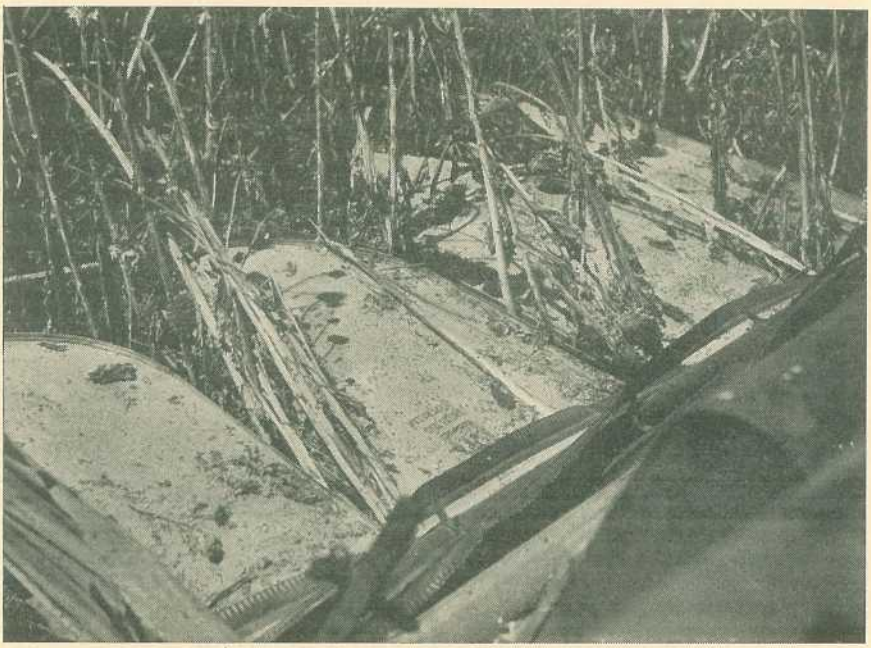

Plate 112.
VIEW OF TRAYS ATTACHED IN FRONT OF COMB.

(*a*) *Addition of trays and finger covers.*

Trays are simply large fingers which protrude with a slight upward tilt to 7 ft. 6 in. in front of the comb and have the double function of catching falling seed and seedheads and of guiding and assisting the stalk and head on to the comb (Plates 112 and 113). The end of each tray is shaped into a point so that bent stalks and heads hanging in the middle of the row can be gathered in, and in addition this shape allows for any slight discrepancy in row spacing which may occur when the crop is planted.

The trays are made of 20-gauge galvanised iron with an upturned lip of 1 inch on all sides except the base, which is attached to the comb. This lip not only retains any seed that may fall on to the tray but also helps to strengthen the tray. These galvanised trays can be further strengthened by the use of 1-inch flat iron or angle iron to enclose the whole of the lipped edge. Because of extra firmness, angle iron is preferred and in this case a lighter gauge galvanised iron can be used

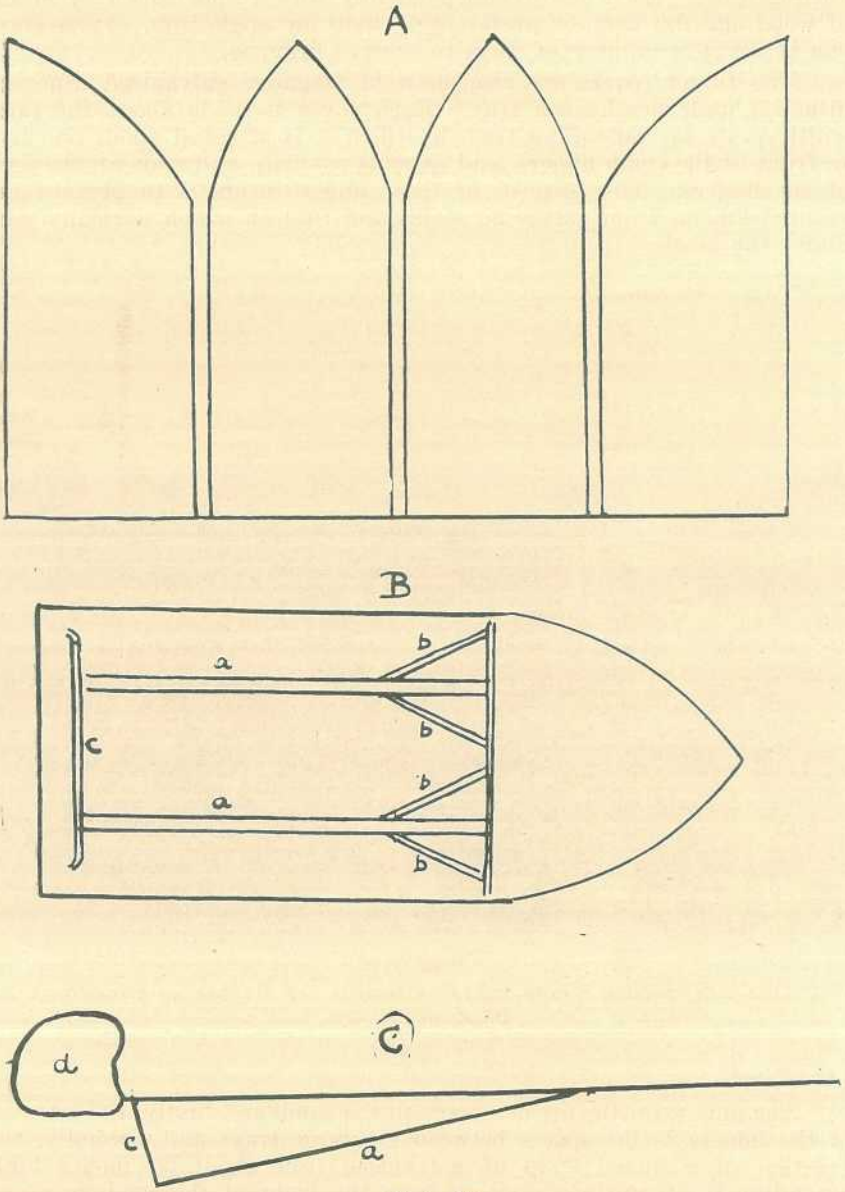

Plate 113.

Diagrams (not to scale) Showing Trays and their Attachment.—A: Four trays approximately 3 feet wide on a 12-feet header. B and C: Showing how the tray is stayed and attached. *a*, 3-inch hardwood stays; *b*, 1-inch flat-iron stays; *c*, iron U; *d*, end of comb.

for the trays, thus reducing the strain on the comb. Steadiness of the trays is a very important factor if seed loss is to be minimised during their passage through the crop.

The base of each tray is placed on top of the fingers and attached thereto by small bolts so that the basal edge of the tray just covers the

cutting knife. Each tray is independently stayed underneath by means of wood and flat iron, or preferably, wholly by angle iron. These stays can be set in a number of ways to achieve firmness.

The finger covers are also made of 20-gauge galvanized iron and attached underneath each tray. Each cover is made about the same width as its corresponding tray, to which it is attached about one foot in front of the comb fingers, and extends towards, and ends at, the base of the fingers. The purpose of these finger covers is to prevent the pointed fingers from gathering stalks and rubbish which normally pass under the comb.

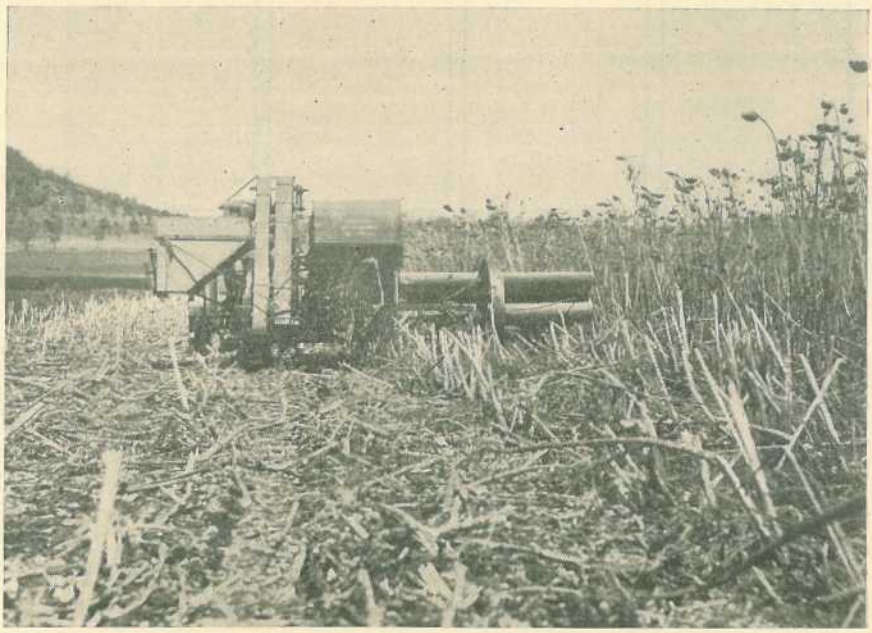

Plate 114.

THIS ILLUSTRATION SHOWS THAT THE HEADER CAN HANDLE AN ENORMOUS BULK OF WASTE.

(*b*) *Comb.*

The only adjustments necessary to the comb are, firstly, the removal of the fingers in the spaces between the large trays and, secondly, the erection of a guard strip of galvanised iron about 30 inches high extending in an upright position from the front of the comb to about 48 inches along the outer edge of the tray nearest to the elevator.

This vertical guard helps to keep the stalks on the trays and prevents them from falling on the machine itself.

(*c*) *Reel.*

The reel is raised approximately one inch above its normal setting. This increased clearance not only allows for the greater width of the sunflower stalks but is necessitated by the upturned lip on the edges of the trays. This lip is one inch high, and it is essential that the reel has

normal clearance above it. To obtain such clearance, fresh holes need to be drilled in both ends of the reel support in which the axle of the reel revolves.

(*d*) *Threshing drum.*

Best results are obtained by removing the concave pegs from the concave floor; or, if the crop is light, by setting back the concave pegs to their full extent. This modification prevents seed damage.

A desirable but not altogether necessary adjustment is the removal of the six drum thresher bars and the substitution of three plain bars with only three raised pegs on each bar. This modification prevents excessive breaking of the seedhead and permits a greater proportion of the refuse to pass over the straw-walkers, thus reducing the congestion of refuse and the strain on the riddles.

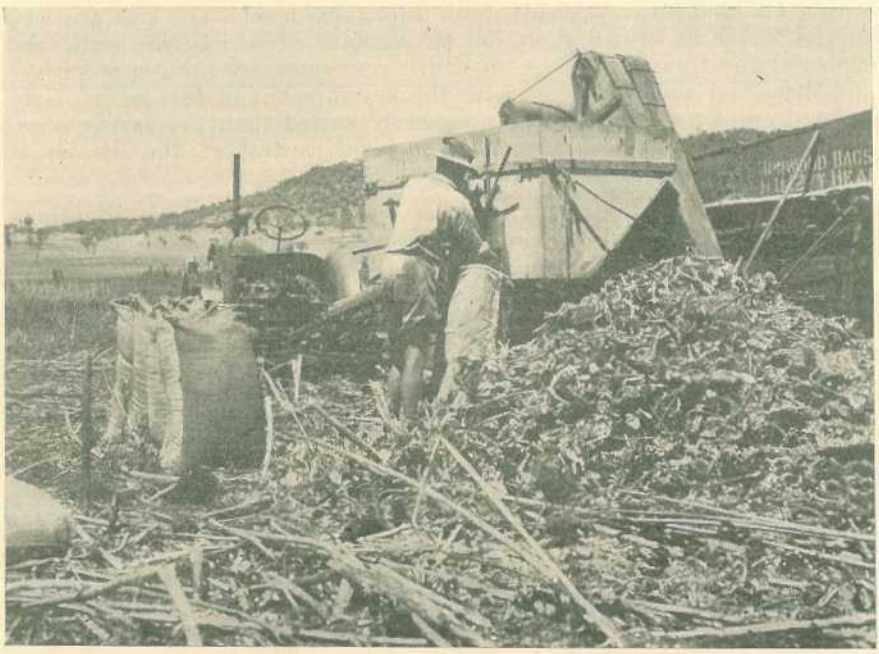

Plate 115.
The Thresher at Work.

(*e*) *Minor adjustments.*

As required for all other crops, minor adjustments of the header-harvester are also necessary for the harvesting of sunflowers to correct for height of plants at maturity, thickness and peculiarities of individual crops and so on. For example, the blast can be reduced to a minimum or may need to be completely shut off. Again, in some instances it may be necessary to give additional clearance to the comb spiral, whilst again the selection of certain riddles may be required for different varieties and for different crops. The length of shake on the riddles may also need adjusting, but, in general, the shorter the shake the more satisfactory is the result.

Under normal conditions, taking a three-row cut and with the tractor in low gear, seven or eight acres a day can be handled.

With correct adjustments and with a fully ripe crop, there should be no need to grade the seed. Some difficulty may be experienced, however, in securing a good clean seed sample if the crop is not at the right stage of maturity.

To avoid waste and to facilitate machine harvesting, it is preferable to hand-cut the four corners through to the centre of the paddock before the main harvest commences. These heads can be fed direct into the header from heaps in the field. Plate 115 shows the residue where one of these heaps has been threshed in the field.

DISEASES AND PESTS.*

Sunflowers grown in Queensland generally show the presence of a rust. This disease, which is caused by a fungus† can become quite serious and reduce crop yields to an unpayable level. The rust appears on the leaves as brown spots, on the surface of which are borne the spores of the fungus. Leaves on which rust spots are numerous shrivel and drop and this interferes with the development of the seeds. Late planted crops are generally more severely rusted than the earlier ones. As the early crops escape serious injury, control of the disease is obtained by planting before December.

A white rust frequently appears on sunflowers. This is due to another fungus‡ and is of more interest than importance as it has not been known to cause serious crop losses. The name is descriptive of the disease, in which clusters of white spores form white spots on the leaves. Wilt, due to a soil inhabiting fungus,§ is more serious. The fungus invades the plant at about soil level, setting up rot of the base of the stalk and adjacent roots. Affected plants are a total loss. To avoid trouble from this disease, sunflowers should not be planted in poorly drained land nor planted frequently in the same paddock.

Although insects are not usually a limiting factor in the cultivation of sunflowers, certain pests that are notorious for their damage to a wide range of plants may temporarily transfer their attention to this crop.

The establishment of a uniform stand may be governed by the activity of soil insects and notable among these are wireworms. These beetle larvae are found in the soil and may occur in numbers in certain localities, causing damage to seedling roots. The routine application of control measures would not be warranted unless it had previously been established that a particular soil type was prone to wireworm infestation. If such should be the case, BHC 10 per cent. dust, which has proved very effective for wireworm control, should be applied as a soil dressing before seed sowing.

The green vegetable bug,¶ a notorious pest of leguminous crops and tomatoes, will also attack sunflowers. Large numbers of adult bugs per

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* Notes supplied by R. B. Morwood, Senior Pathologist, and A. W. S. May, Entomologist.

† *Puccinia helianthi* Schwein.

‡ *Cystopus* sp.

§ *Sclerotinia sclerotiorum* (Lib.) de Bary.

¶ *Nezara viridula* L.

head may cause malformation of the flowers and faulty setting of seeds. Control measures are rarely warranted against this pest, but where populations are high and damage likely to occur the application of DDT, either as a 0·1 per cent. spray or a 2 per cent. dust, will control the infestation.

The Rutherglen bug* is normally of little importance in this crop. Occasionally, however, it breeds rapidly on certain weeds and the adults migrate to various cultivated plants. They readily attack sunflowers, causing yellowing, scorching, and eventual death of plant parts. The destruction of their normal weed hosts suggests itself as an obvious method of control, but during epidemic years reinfestation of the area soon occurs and some form of insecticidal control is required in addition to general cultural control measures. Like the green vegetable bug, this pest is controlled by applications of DDT in either spray or dust form.

Aphids are commonly associated with sunflowers but rarely attain serious proportions. Parasites and predators play a big part in controlling outbreaks of the pest and it is doubtful whether specific control measures would be warranted in this crop.

Although the various pests mentioned above may occur quite frequently in sunflower crops, they only occasionally attain importance as a limiting factor in crop production. The advisability of applying insecticidal control measures must be weighed from a number of angles and the cost of materials, labour and equipment required taken into consideration. The availability of efficient and easily handled equipment will be a big factor governing the feasibility of applying insecticides to this crop.

* *Nysius vinitor* Berg.

New Weed Thistle.*

A thistle with a bad reputation in the south has recently appeared in the Fassifern district. Farmers in southern Queensland should watch for the occurrence of this thistle and grub it out before it seeds.

The plant is two to three feet high and extensively branched. Its leaves are dull green, about two inches long and deeply lobed. The flowers are lilac or pale purple and surrounded by a mass of spiny bracts. Seed usually ripens about January.

The name star thistle given to this plant is applied also to two yellow-flowered thistles, but these are annuals, whereas the purple-flowered thistle lives for two years or longer.

* *Centaurea calcitrapa.*

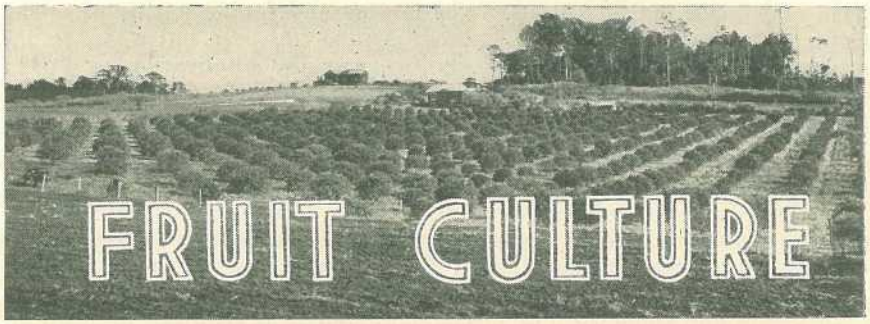


Fig Growing in Queensland.

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

COMMERCIAL fig growing in Queensland has, principally due to economic factors, been confined to the neighbourhood of Brisbane, but figs are grown in the home garden in many parts of the State. The main outlet for the commercial grower is for jam making, but small quantities are marketed as fresh fruit.

CLIMATIC CONSIDERATIONS.

When grown under humid conditions such as are experienced in the coastal areas, figs are very perishable and are liable to sour and ferment within a short time after picking. Therefore, the prompt utilisation of the fruit as it ripens is necessary, thus confining its usefulness to marketing as fresh fruit close to the centre of production, and for preserving or canning.

Conditions required for the dried fig industry are long, sunny days, high temperatures, and relatively low humidity. Though some of these conditions exist in parts of our semi-arid regions, adequate irrigation facilities are essential before a dried fig industry can be established, consequently no development of fig growing has taken place in such areas. In addition, frost hazards would require careful consideration, for though the fig tree is deciduous, young trees are susceptible to frost injury.

SOILS.

In Queensland, figs are found to be thriving on a comparatively wide range of soils, such as sands, sandy loams, and loams, all of which are regarded as suitable, provided they are well drained.

Generally, light sandy soils lack fertility. Their humus content is low and their moisture-holding capacity poor, and as a consequence they can be expected to become very hot and dry during the summer months. Under such conditions, irrigation and ground coverage with a suitable green crop are necessary soil management practices.

Sandy loams are usually more fertile than sandy soils, with a higher humus content and a much better moisture-holding capacity.

Loams, though not always well drained, possess some desirable qualities. Usually they are fairly fertile and well supplied with humus, though not necessarily so; hence they are not so seriously subject to the effects of drought or high soil temperatures.

NOTES ON BOTANICAL CHARACTERS.

Botanically, the common fig belongs to the genus *Ficus*, and is a member of the mulberry family. The home of the cultivated species is the semi-desert regions of Asia.

The fruit is a fleshy, hollow receptacle bearing flowers on the interior surface. At its apex is an opening which is more or less closed by scales. Within some of the receptacles of most species of *Ficus* are to be found various species of insects whose larvae develop from egg to adult inside individual flowers. A fig flower, the ovary of which contains the egg or larvae of a fig wasp, is termed a gall flower. When the fig wasp emerges from the flower and leaves the fruit, it may be dusted with pollen if the staminate flowers near the opening or mouth are mature. Such pollen is deposited in other figs which the insect enters for the purpose of egg-laying, and so pollination is effected.

CLASSIFICATION.

For horticultural purposes the fig may be divided into four general types—namely, Caprifig, Smyrna, White San Pedro, and the Common fig.

Caprifig.

This is a primitive type of the cultivated fig. Its useful purpose horticulturally is the part played by it as the host plant for the Blastophaga or fig wasp.

Smyrna.

This type of fig includes those which require to be pollinated by an outside agency. This may be readily brought about by placing mature figs of the Caprifig in the trees of the Smyrna type. From the former the pollen-dusted fig wasps emerge and then enter the Smyrna figs, thus effecting pollination. This operation is called caprification.

White San Pedro.

This type combines the characteristics of both the Smyrna and the Common type on the one tree. The first crop figs are of the Common type and develop without pollination of the flowers; the second crop figs are of the Smyrna type and must be caprified if they are to reach maturity.

Common.

The Common type does not require to be caprified. All the varieties grown in Queensland, of which Brown Turkey, Brunswick, Cape White, and White Adriatic are the best known, belong to this group. Hence growers in this State do not have to concern themselves with the problem of caprification.

VARIETIES.

Adriatic (White Adriatic).

This is one of the principal drying figs, though the dried product is not considered to be of the highest quality. In Queensland, where it is grown as a fresh fruit, plantings have been mainly confined to the home garden. The trees are vigorous and very productive. The main crop figs are medium to large in size and variable but generally spherical in shape; they are usually green in colour, but when grown

in coastal areas green with a purplish tinge. The pulp may be light to deep strawberry in colour, and the flavour is considered to be excellent. The crop matures in February and March.

Brown Turkey.

This is the principal variety grown in Queensland, and is particularly favoured for coastal areas. The tree is large and vigorous, and under favourable conditions crops well. The fruit is medium to large in size and obliquely pear-shaped; the ribs are fairly prominent and usually more deeply coloured than the rest of the fruit, and the eye is large and open. The fruit is purplish-brown in colour, with lighter shades towards the neck and base. The flesh is pinkish-brown, with a hollow centre and numerous seeds of medium size. Tree-ripened fruit is of excellent quality and flavour and is favoured on the fresh fruit market. The season is February to April.

Brunswick.

This variety is mainly confined to the home garden in Queensland. The tree is considered to be less vigorous than Brown Turkey, and the fruit has a tendency to crack. The main crop fruits are of medium size, spherical to top-shaped, with well-defined ribs. The mature fruits are reddish-brown in colour, with the pulp amber coloured and seedless. The flavour is sweet. Fruit ripens in Queensland in February and March. Caprified Brunswick figs are above medium in size, purplish-brown in colour, with deep strawberry flesh and large fertile seeds.

Cape White.

This is a recent importation from South Australia, where it is greatly favoured by the trade for jam purposes, mainly because of the attractive golden colour of the manufactured product. The trees are small, compact, and vigorous, and are heavy croppers. The fruit is small, squat pear-shaped, and practically neckless. It is slightly ribbed and has a small open eye. The colour at maturity is yellowish-green, with a darker shading along the ribs. The flesh is creamy-white, with a solid centre, and the numerous seeds are white to brownish in colour. This is an early variety, the fruit maturing in December and January.

Genoas.

These are sometimes listed by nurserymen. They do not require to be caprified.

Black Genoa is a large, purplish-black fig with a reddish flesh. It matures somewhat earlier than the Brown Turkey but is not so prolific.

White Genoa is a large, pear-shaped variety with a waxen yellow skin. The flesh is amber and sweet. This variety crops well in coastal districts.

PROPAGATION.

In this State fig trees are propagated from cuttings. The cuttings are made during the dormant period from well-matured wood of the previous season's growth. The long slender sappy growths which sometimes sprout from the ground should not be used.

The centre of the wood used for cuttings is pithy, except at the nodes, that is, the points where the leaf stems are attached. Here the wood is solid, and it is from these points that roots are put forth.

In making cuttings the lower ends should be severed below the bottom node, and the top just above the top node. The length of the cutting is governed mainly by the vigour of the growth and the distance between nodes, and is ordinarily about 8 to 10 inches.

When cuttings are made in the late autumn they are heeled in moist sand in a cool, shady place, where they remain dormant until they are required for planting in late winter or early spring. Cuttings made during late winter or early spring are planted straight to the nursery row.

In planting to the nursery row, furrows are opened and cuttings spaced at from 9 to 12 inches apart in an upright position. One bud or node should remain above ground level, so that the depth at which the cutting is planted is largely governed by its length. The soil should be carefully firmed around each cutting. Under favourable conditions cuttings should develop into suitable trees in one season.

PLANTING.

In districts with comparatively mild winters, figs may be planted from autumn through to spring, providing the trees are completely dormant at the time of planting.

The number of fig trees to the acre depends on the variety, the fertility and moisture-holding capacity of the soil, and the amount of water available from either irrigation or rainfall. In coastal Queensland, planting on the square (Plate 116) at from 25 to 30 feet apart has generally been adopted.

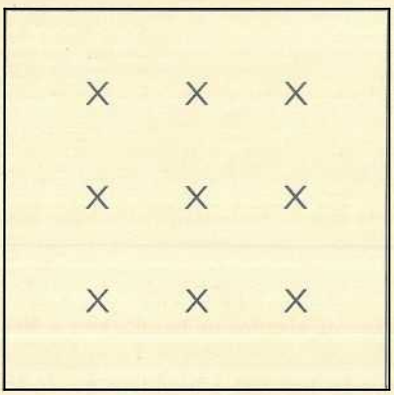


Plate 116.
Diagram of Square System Planting.

The following table gives the approximate number of trees to the acre when planted on the square.

Distance Apart in Feet.	No. of Trees per Acre.
25	70
26	64
27	60
28	55
29	51
30	48

In order to calculate the number of trees required per acre when planting on the square system, multiply together the distance apart in feet and divide the result into 43,560, the number of square feet in an acre.

The first essential in planting an orchard is to plough thoroughly and subsoil, always, however, avoiding bringing the subsoil to the surface. This can be done by ploughing the furrow in the usual way and following by a subsoiler to loosen up the bottom of the furrow before the next sod is turned. Ploughing should be followed by harrowing, working down, and grading.

Having decided on the distance at which the trees are to be planted, the next step is to measure the longest side of the proposed orchard and use it as a base line. This should be measured from at least 30 feet inside each boundary in order to leave ample headlands for turning purposes.

The base line is marked out by the use of a length of fencing wire fitted with rings at each end, and with small buttons of solder fixed at distances along its length corresponding with the distance apart the trees are to be planted. When the base line is struck and the wire drawn taut, pegs should be driven into the ground at the buttons on the wire.

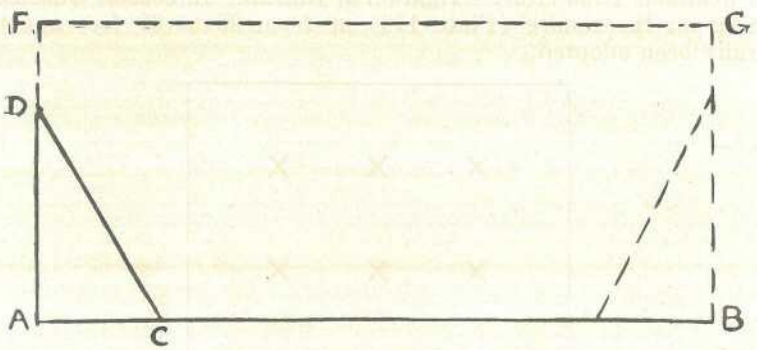


Plate 117.

DIAGRAM ILLUSTRATING THE METHOD OF LAYING OUT A RECTANGULAR ORCHARD.

The simplest way to lay out a right angle is by the 3–4–5 method. For accuracy, it is better to work with multiples of these figures, and the following procedure is recommended (refer to Plate 117.)

AB is the base line, and a line is to be laid off at right angles to *AB*, at *A*.

With a box tape, measure 15 feet along the base line *AB* to the point *C* and peg. Secure the ring of the tape at *A*, get a second person to hold the 45-feet mark at point *C*, take the 20-feet mark on the tape, and walk back until the tape tightens equally from both ends. The line joining this point *D* to *A* is exactly at right angles to the base line *AB*, at *A*.

The two side lines *AF* and *BG*, at right angles to the base line *AB*, are run out. Complete and stake the fourth side of the rectangle and

then stretch the planting wire from the second stake on the base line to the second stake on the fourth side *FG*, stake, and then move the planting line to the third peg, and so on until the field is completed. If the right angle was set out correctly and the wire strained equally taut throughout, the rows of stakes will be in line in every direction.

To ensure that the young trees are placed exactly in the position occupied by the pegs, a planting board will be found useful and is easily constructed. A board some 4 or 5 feet in length, 4 or 5 inches in width, and 1 inch thick is used and a "V" notch out in the centre and a similar notch at each end. (Plate 118.)

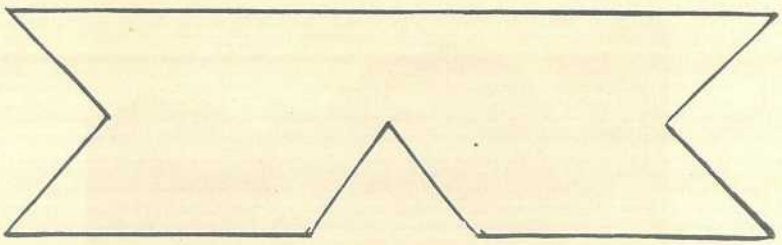


Plate 118.
Method of Notching Planting Board.

In use, the centre notch is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at each end of the board. The board and middle (tree) peg are then removed, leaving the end pegs in place. The hole to receive the tree is then dug. The board is then brought into use again, being fixed as before at ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre notch in the board, taking the position formerly occupied by the middle (tree) peg, and the soil filled in.

The planting board serves another purpose in that it ensures planting the tree at the proper depth. The correct depth at which to plant the tree is the depth it was grown in the nursery; the mark can usually be distinguished on the tree.

In digging the holes for the trees the surface soil should be taken out and kept on one side. The subsoil at the bottom of the hole should be finely broken up. Provided the orchard has been properly prepared, there is no need to dig deep holes; so long as they are large enough to space the roots without cramping, they will serve the purpose. A little topsoil may be returned to form a small mound at the bottom of the hole. The roots, which just prior to planting should be carefully washed and trimmed, should be spaced as evenly as possible, and, with a downward and outward slope of from 40 to 45 degrees. The spaces are then filled in with fine soil which is pressed down firmly. Water is applied and allowed to soak in before the hole is completely refilled with soil.

PRUNING.

The main objects of pruning fig trees are the training of young trees, the removal of undesirable limbs, the modification of form to meet cultural requirements, and the encouragement of the production of vigorous new wood for bearing main-crop figs over a long season.

The fig tree normally bears two crops each year, the first crop appearing on wood of the previous season's growth and the second or main crop on new wood of the current season's growth. As it is this latter crop in which the fresh fruit and jam trade is mainly interested moderate to heavy winter pruning to stimulate new growth is the general practice.

At planting, the trees should be headed back to within 18 inches of the ground. Where branches suitable for forming a framework are present, they should be cut back to a uniform length so as to produce a strong balanced framework for the future tree.

Plate 119.
BROWN TURKEY VARIETY PRUNED AT THE END OF THE FIRST SEASON.

At the end of the first season's growth the secondary arms which will have developed are well shortened back and, where necessary, thinning is practised (see Plate 119). Sucker growth should be entirely removed. Undesirable inside branches arising from the main arms should also be cut out. Long weak limbs that do not show a tendency to branch should be shortened back generally to the limit of the other growths so that the tree will produce a strong, compact, and symmetrical head. The top should not be allowed to become too dense; on the other hand, it should not be kept too open because of the risk of sun scalding of the main limbs and branches. A similar plan of treatment should be adopted for the next two years (see Plate 120).

The subsequent pruning of the trees should then be directed towards the annual production of new and vigorous wood and the prevention of a dense growth of short weak twigs (see Plates 121 and 122).

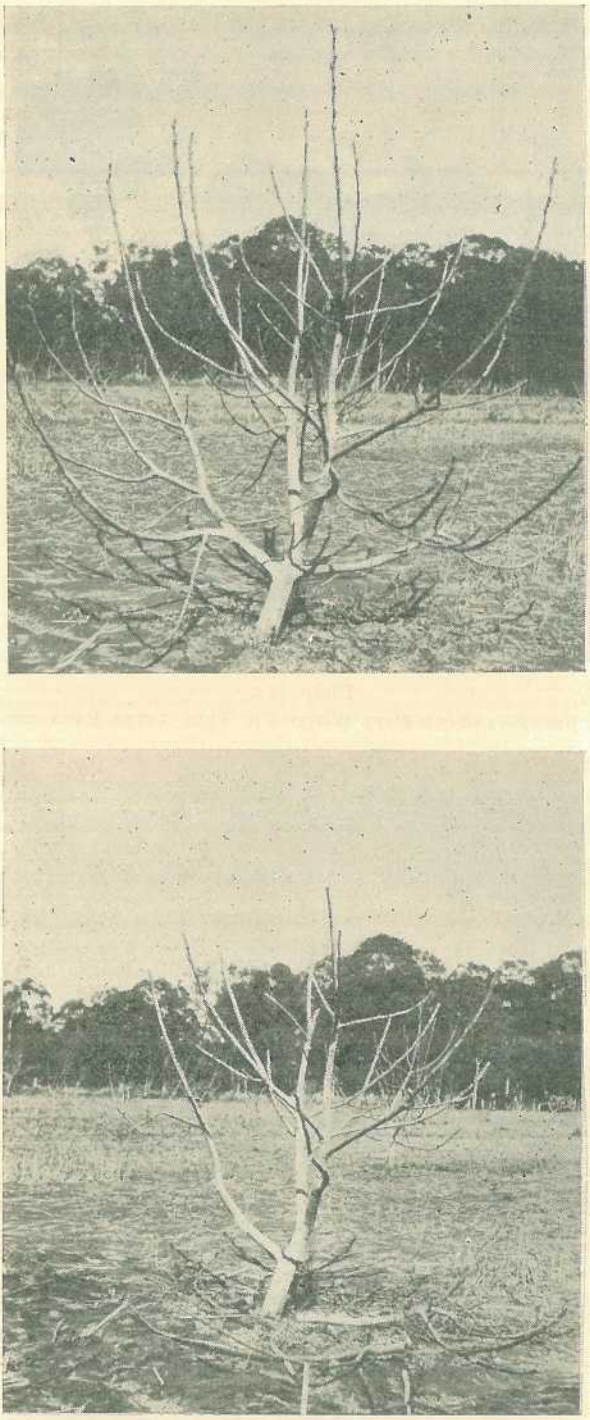


Plate 120.

A Two-year-old Brown Turkey Fig Tree Before and After Pruning.

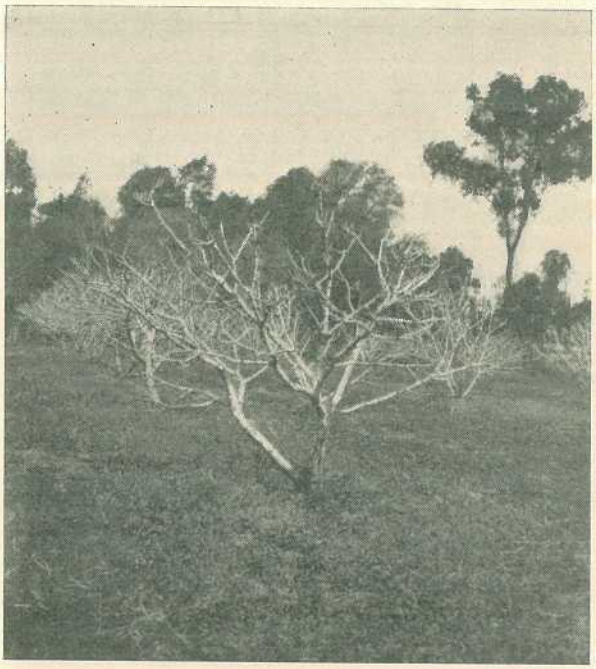


Plate 121.
A SEVEN-YEAR-OLD CAPE WHITE FIG TREE AFTER PRUNING.

Plate 122.
A FIFTEEN-YEAR-OLD BROWN TURKEY FIG TREE AFTER PRUNING.

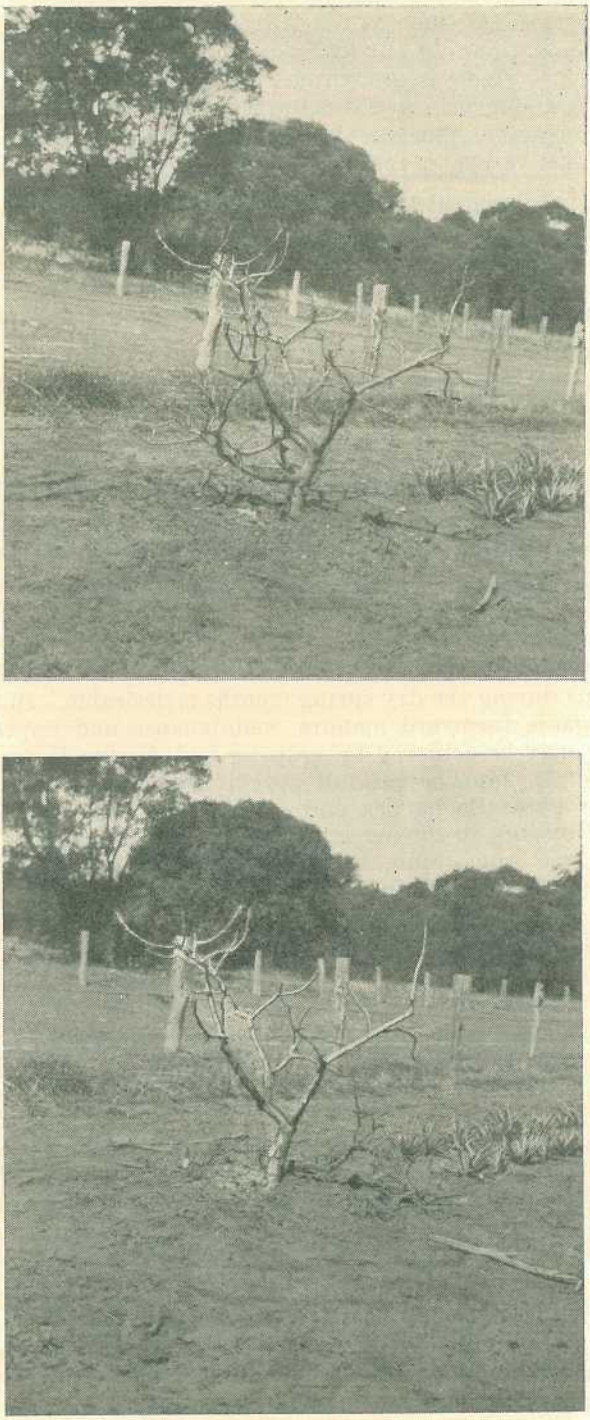


Plate 123.
A POORLY FRAMED BROWN TURKEY FIG TREE BEFORE AND AFTER PRUNING.

In some varieties, such as the Adriatic, this later pruning consists of an occasional thinning out and shortening back of the top in order to stimulate new vigorous growth on the main framework. In the case of Brown Turkey, grown in coastal areas, where the second crop fruits are of paramount importance, a heavy winter pruning should be practised. This variety is remarkably productive under such treatment.

Renovating decadent trees, providing they have a sound framework and a healthy rooting system, may be accomplished by a severe heading back on to secondary arms to within 12 to 18 inches of the primary framework, thus stimulating new growth from which selections for the new top may be made (see Plate 123).

When declining trees are cut back in this manner it should be remembered that the bark is susceptible to sun scald and all exposed limbs must be thickly coated with a suitable whitewash.

CULTIVATION.

The cultivation programme for the fig orchard is similar to that for other deciduous fruit trees. It should be designed to maintain and improve soil fertility and moisture-holding capacity and to suppress weed growth, which would compete with the trees for soil moisture during dry periods.

In the coastal districts light cultivation as often as is necessary to destroy weeds during the dry spring months is desirable. In the absence of bulky organic farmyard manure, maintenance and improvement of soil fertility may be achieved by growing and discing in green manure crops. Here the summer rainfall period may be successfully utilised with such crops as Poona pea and crotalaria planted in December or January for discing in during late March. A winter green crop, such as New Zealand blue lupin, field peas, and skinless barley, mustard, &c., could with advantage follow and be disced or ploughed in during July.

It should be remembered that, though fig trees develop large roots, they also have an extensive fibrous rooting system which is extremely sensitive to injury. These feeding roots do not penetrate the soil very deeply and, therefore, careful shallow cultivation must be aimed at.

FERTILIZING.

In reasonably fertile lands the addition of artificial fertilizer to the soil either before or at the time of planting is unnecessary, but in land that has been previously cropped or which would not be classed as fertile assistance to the growing plants in this way is required. When fertilizer is applied it should be thoroughly incorporated in the soil. It should not be allowed to come into direct contact with the existing roots at the time of planting.

As the trees develop the quantity of fertilizer required for each one will correspondingly increase, and when they are fully grown a regular supply is necessary.

From general observations in the field it would appear that nitrogen is one of the main constituents required to maintain healthy

and vigorous fig trees. Therefore, consideration should be given to fertilizer mixtures high in nitrogen. Mixtures at present available and showing analyses such as 8-12-7·5, 8-12-6, and 8-12-4 would be suitable.

An early spring application of a mixture containing a source of readily available nitrogen should stimulate growth and yields. From 8 to 10 cwt. per acre is a suitable basis for the spring application to mature-bearing trees, to be followed by a second application at the rate of 4 cwt. to the acre when the main crop figs are half grown.

HARVESTING AND MARKETING.

In the coastal areas the harvesting season commences towards the end of December and continues until the end of March. The Cape White is the first one ready to pick and then Genoa, Brown Turkey, Brunswick, and White Adriatic follow on.

The trees are picked over from time to time in order to harvest the fruit in prime condition. It should be picked into shallow containers and placed in suitable boxes for transport to the factory. The boxes at present in use hold approximately a bushel of fruit, weighing about 56 lb.

For the fresh fruit market, figs are packed in a single layer in rectangular cardboard boxes 8 inches long 6 inches wide and 2 inches deep, holding twelve fruits. For transport these are packed in containers holding from twelve to sixteen boxes; a bushel case opened on the side comfortably holds sixteen boxes.

YIELDS.

Figs are usually regarded as coming into profit in their sixth year, though under favourable conditions small crops may be harvested in their fourth season.

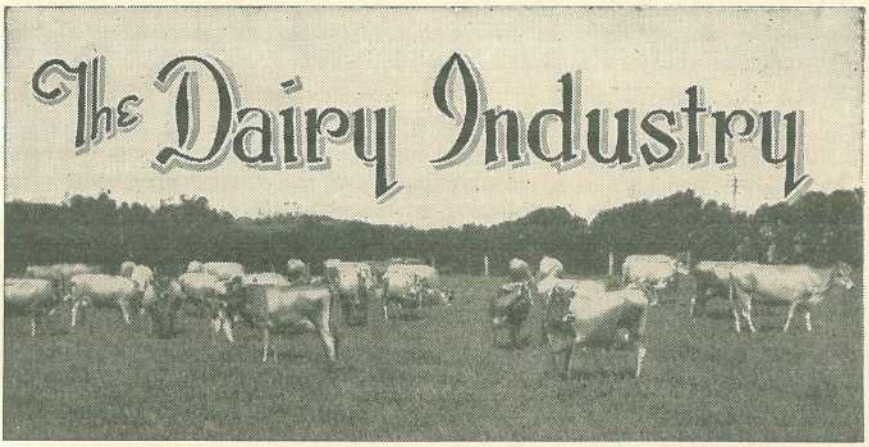
The production per tree varies very considerably, depending to a large extent upon the variety. Well-grown, mature Brown Turkey trees producing four to five cases per tree are considered satisfactory, but trees twenty to thirty years old are producing up to eight cases per year.

DISEASES AND PESTS.

In coastal districts the main diseases causing fig growers concern are brown leaf spot and fig rust. Both these diseases affect the leaves, which eventually shrivel and fall. They may be controlled by the application of suitable fungicidal sprays.

The principal pests affecting fig trees are the fig leaf beetle and fig leaf hopper. Both these pests are readily controlled by DDT sprays or dusts. Red scale and soft scale also occur from time to time. These insects, however, can be kept under practical control by the application of white oil sprays.

More detailed information regarding pest and disease control may be obtained on application to the Science Branch, Department of Agriculture and Stock, William street, Brisbane.



Queensland Butter Production, 1947-1948.

E. B. RICE, F. TREACY, and N. McCABE, Division of Dairying.

THE output of Queensland butter factories for the year ended 30th June, 1948, was 104,057,684 lb. Due to the excellent seasonal conditions experienced throughout the year in most dairying districts of the State this figure exceeded that of the previous year by 29,989,663 lb. and as the following table indicates was the highest since 1942-1943.

Year.	Tons.
1938-39	68,919
1939-40	62,408
1940-41	52,268
1941-42	42,712
1942-43	49,782
1943-44	45,275
1944-45	42,413
1945-46	45,197
1946-47	33,304
1947-48	46,454

The Commonwealth Government has continued to pay a subsidy to dairymen to bridge the gap between cost of production and market value. As a result of a survey conducted by the industry the amount of subsidy was increased as from 1st April, 1947 to a figure estimated to return to the supplier the sum of two shillings per pound for choice butter and the Commonwealth Government guaranteed to maintain this

price subject to any fluctuations in the cost of production for a period of five years from that date. The average payout to suppliers in recent years has been:—

Year.	Commercial Butter. Per lb. s.	d.
1938-39	1	1·55
1939-40	1	2·02
1940-41	1	1·88
1941-42	1	1·63
1942-43	1	3·9
1943-44	1	6·8
1944-45	1	7·9
1945-46	1	7·9
1946-47	1	8·29
1947-48 (estimated)	2	0

Of the total butter production 86 per cent. was officially examined by Commonwealth and State grading staffs.

Grading results were:—

	Boxes.	Per cent.
Choice grade	814,790	50·99
First grade	703,003	43·99
Second grade	72,711	4·55
Pastry grade	7,502	·47

The following table sets out the grading results in recent years:—

Year.	Grades. Choice.	First.	Second.	Pastry.
	Per cent.	Per cent.	Per cent.	Per cent.
1938–39 }	51·06	38·24	9·97	·73
1939–40 } Export Only ..	49·9	37·4	11·8	·97
1940–41 }	49·26	38·1	11·3	1·34
1941–42	52·51	41·11	5·77	·61
1942–43	54·94	39·94	4·68	·44
1943–44	52·0	43·0	5·0	..
1944–45	45·37	47·4	6·53	·7
1945–46	36·53	55·52	6·87	1·08
1946–47	32·46	59·75	7·08	·71
1947–48	50·99	43·99	4·55	·47

It will be seen that butter quality has shown some improvement over recent years. However, there is still room for considerable improvement. The percentage of butter officially graded as choice is still lower than the figures for the years 1941 to 1944 and far below the record figure of over 60 per cent. choice grade achieved in 1937-1938.

The accompanying tables cover the operations of individual factories for the year. The figures for make and pay are compiled from the monthly returns which each factory is required to furnish to the

Department of Agriculture and Stock under the *Dairy Produce Acts*, and the figures show the total quantity of butter and the quantity of each grade made by each factory. The pay figures show the total quantity of butter and the quantity of each grade for which suppliers have been paid.

There is a natural relationship between the two sets of figures and and an examination of them will show whether the quantity of butter manufactured in each grade can be reconciled with the quantity paid for. While it is not possible to make exactly the same quantity of each grade of butter as is paid for, the discrepancy observed in the figures for some factories, especially when they are compared with the official gradings, suggests that in some instances at least, butter is not being manufactured or paid for in accordance with its true grade.

The official gradings show the result when the factory gradings are checked by the Commonwealth and State graders. Butter is manufactured at the factory into three grades and the figures in the tables indicate the quantity and the percentage of this butter which is true to grade when it is officially graded. These figures indicate whether factories are manufacturing butter true to grade. It must be remembered that in most cases only portion of a factory's manufacture is graded officially, as, except in the case of Brisbane, there is no provision for the official grading of butter for local consumption.

SUMMARY OF PRODUCTION AND GRADINGS.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
104,057,684	65,411,637	35,599,002	3,029,042	18,003

PAY IN LB.

104,361,376	67,877,185	33,884,060	2,588,526	11,605

OVER-RUN.

Actual	.. .. ..	3,006,129 = 2.97 per cent.
Paid	.. .. ..	3,104,008 = 3.07 per cent.

Butter Submitted for Grading.		Grading Result.			
Grade.	No. of Boxes.	Choice.	First.	Second.	Pastry.
Choice	941,030	814,790	125,456	677	107
First	604,655	..	577,547	26,758	350
Second	51,934	..	..	45,276	6,658
Pastry	387	..	..	..	387
Totals	1,598,006	814,790	703,003	72,711	7,502
		50·99%	43·99%	4·55%	·47%

Percentage of Production Graded = 86

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948.

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Atherton	Make	2,385,998	2,384,162	..	1,836	..	91,500	90,270	48·12
	Pay	2,384,768	2,369,477	..	15,291	..	3·99%	3·93%	..
* Bushy Creek	Make	7,316	7,316	..	..	..	..	..	..
	Pay	..	..	..	..	..	..	..	..
Caboolture	Make	2,047,087	1,845,355	201,732	..	..	69,949	78,055	73·17
	Pay	2,055,119	1,912,160	141,208	1,751	..	3·54%	3·95%	..
Eumundi	Make	2,119,948	1,939,418	177,618	2,912	..	79,333	80,146	91·76
	Pay	2,120,761	1,976,955	141,452	2,354	..	3·89%	3·93%	..
Pomona	Make	1,692,795	1,604,917	87,878	..	..	47,925	47,702	96·15
	Pay	1,692,572	1,649,071	42,860	641	..	2·91%	2·9%	..
Chinchilla	Make	1,853,007	1,023,703	615,552	203,672	10,080	25,714	26,789	95·94
	Pay	1,854,082	1,078,141	609,799	159,245	6,897	1·41%	1·47%	..
Daintree	Make	89,042	89,042	..	..	..	2,354	2,354	nil
	Pay	89,042	89,042	..	..	..	2·72%	2·72%	..
† Dayboro	Make	134,652	..	134,652	..	..	..	..	20·00
	Pay	347,590	314,402	33,188	..	..	..	..	..
Toowoomba	Make	2,634,520	1,756,832	733,936	143,752	..	89,939	89,959	60·75
	Pay	2,634,540	1,744,244	747,289	143,007	..	3·53%	3·53%	..
Clifton	Make	1,101,408	839,776	256,928	4,704	..	30,575	30,620	95·58
	Pay	1,101,453	838,316	259,036	4,101	..	2·86%	2·86%	..

*Ceased operations 31st December, 1947. Complete pay figures not available.
† A large proportion of this factory's cream was resold as cream.

OFFICAL GRADINGS IN BOXES.

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Atherton ..	20,125	19,420 96·5%	705 3·5%	..	..	31	..	31 100%	..	347	347 100%	..	..
Caboolture ..	23,149	19,040 82·25%	3,989 17·23%	25 ·11%	95 ·41%	3,461	3,003 86·77%	458 13·23%	..	136	136 100%	..	..
Eumundi ..	31,545	17,752 56·28%	13,674 43·35%	119 ·37%	..	3,051	1,435 47·03 %	1,616 52·97%	..	139	139 100%	..	..
Pomona ..	27,490	21,882 79·6%	5,608 20·4%	..	..	1,539	858 55·75%	663 43·08%	18 1·17%	35	35 100%	..	..
Chinchilla ..	16,969	12,954 76·34%	3,986 23·49%	29 ·17%	..	10,962	10,278 93·76%	684 6·24%	..	3,637	2,904 79·85%	733 20·15%	178
Daintree ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dayboro ..	481	..	450 93·56%	31 6·44%	..	..	..	..	..	..	..	..	..
Toowoomba ..	14,761	14,132 95·74%	629 4·26%	..	..	13,105	12,776 97·49%	329 2·51%	..	714	546 76·47%	168 23·53%	..
Clifton	14,105	14,044 99·57%	61 ·43%	..	..	4,609	4,588 99·54%	21 ·46%	..	84	19 22·62%	65 77·38%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Crow's Nest	Make	1,549,296	868,728	659,512	21,056	..	45,853	45,802	100
	Pay	1,549,245	868,554	660,747	19,944	..	3·05%	3·05%	..
Dalby	Make	2,829,118	1,023,566	1,769,264	36,288	..	83,874	83,881	93·66
	Pay	2,829,125	1,023,733	1,775,746	29,646	..	3·06%	3·06%	..
Goombungee	Make	1,539,160	471,856	1,041,992	25,312	..	40,401	40,436	100
	Pay	1,539,195	472,109	1,042,252	24,834	..	2·70%	2·70%	..
Jandowae	Make	2,140,153	815,582	1,178,691	145,880	..	61,963	62,003	99·32
	Pay	2,140,193	815,807	1,178,504	145,882	..	2·98%	2·98%	..
Miles	Make	908,236	85,192	662,144	160,900	..	25,630	25,620	89·08
	Pay	908,226	85,157	662,862	160,207	..	2·9%	2·9%	..
Esk	Make	2,296,585	1,148,707	1,120,504	27,374	..	43,302	43,291	95·40
	Pay	2,296,574	1,141,947	1,134,695	19,932	..	1·92%	1·92%	..
Evelyn Tableland ..	Make	519,340	519,340	..	..	..	19,946	19,957	52·16
	Pay	519,351	495,377	21,988	1,986	..	3·99%	4·00%	..
Gayndah	Make	1,574,968	1,001,416	524,160	49,392	..	61,085	60,650	96·35
	Pay	1,574,533	1,000,785	530,691	43,057	..	4·03%	4·01%	..
Killarney	Make	1,522,074	941,142	539,392	41,540	..	32,154	32,105	81·61
	Pay	1,522,025	868,105	608,642	45,278	..	2·16%	2·15%	..
Logan and Albert ..	Make	3,151,061	2,647,453	503,608	..	..	112,923	112,950	96·66
	Pay	3,151,088	2,707,272	443,047	769	..	3·72%	3·72%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Crow's Nest ..	16,269	15,014 92·29%	1,255 7·71%	..	..	11,972	11,727 97·95%	245 2·05%	..	376	376 100%	..	..
Dalby	14,924	14,695 98·47%	229 1·53%	..	..	31,744	31,637 99·66%	107 ·34%	..	648	580 89·51%	68 10·49%	..
Goombungee ..	8,181	7,444 90·99%	737 9·01%	..	..	19,038	19,014 99·87%	24 ·13%	..	452	452 100%	..	..
Jandowae ..	14,132	13,881 98·22%	251 1·78%	..	..	21,227	20,438 96·28%	789 3·78%	..	2,600	2,301 88·5%	299 11·5%	..
Miles	188	188 100%	..	..	..	11,119	9,043 81·33%	2,076 18·67%	..	2,732	1,957 71·63%	775 28·37%	..
Esk	18,647	15,469 82·96%	3,178 17·04%	..	..	19,988	19,276 96·44%	712 3·56%	..	489	355 72·6%	134 27·4%	..
Evelyn Tableland	2,959	2,674 90·37%	285 9·63%	..	..	1,648	1,648 100%	..	..	193	193 100%	..	37
Gayndah ..	16,856	14,106 83·69%	2,750 16·31%	..	..	9,376	7,776 82·94%	1,600 17·06%	..	866	654 75·52%	212 24·48%	..
Killarney ..	10,084	9,016 89·41%	1,068 10·59%	..	..	11,199	11,012 98·33%	187 1·67%	..	899	873 97·11%	26 2·89%	..
Logan and Albert	45,397	37,363 82·31%	7,969 17·55%	65 ·14%	..	8,994	7,670 85·28%	1,324 14·72%	..	..	..	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Maleny	Make	2,390,453	2,281,533	108,920	..	..	66,260	65,334	94·47
	Pay	2,389,527	2,300,448	88,004	1,075	..	2·85%	2·81%	..
Maryborough	Make	918,580	519,449	364,019	35,112	..	36,300	38,288	42·38
	Pay	920,568	574,362	316,112	30,094	..	4·11%	4·34%	..
Biggenden	Make	1,863,179	1,104,491	758,688	..	..	82,350	84,173	93·15
	Pay	1,865,002	1,189,939	675,063	..	..	4·62%	4·73%	..
Kingaroy	Make	3,981,663	3,634,575	252,448	94,640	..	156,801	170,255	67·52
	Pay	3,995,117	3,682,338	232,353	80,426	..	4·10%	4·45%	..
Mundubbera	Make	2,537,396	2,198,652	256,928	81,816	..	73,646	74,472	97·16
	Pay	2,538,222	2,246,493	233,148	58,581	..	2·99%	3·02%	..
Wondai	Make	2,583,403	1,768,494	771,400	43,509	..	121,345	123,415	95·98
	Pay	2,585,473	1,858,159	694,191	33,123	..	4·93%	5·01%	..
Millaa Millaa	Make	902,618	893,770	..	8,848	..	25,591	27,349	40·33
	Pay	904,376	897,302	..	7,074	..	2·92%	3·12%	..
Milmerran	Make	1,392,582	522,566	742,112	127,904	..	32,328	37,956	98·59
	Pay	1,398,210	533,467	768,314	96,429	..	2·38%	2·79%	..
Nanango	Make	2,806,881	1,711,409	1,041,880	53,592	..	83,874	84,425	96·38
	Pay	2,807,432	1,871,400	904,026	32,006	..	3·08%	3·10%	..
Oakey	Make	3,850,200	2,875,632	749,112	225,456	..	129,655	131,368	94·80
	Pay	3,851,913	2,922,631	765,839	163,443	..	3·49%	3·53%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted as Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Maleny ..	38,311	34,967 91·27%	3,344 8·73%	..	..	2,014	1,866 92·65%	148 7·35%	..	..	..	..	..
Maryborough ..	3,071	438 14·26%	2,495 81·24%	126 4·11%	12 ·39%	3,336	2,845 85·28%	491 14·72%	..	522	85 16·28%	437 83·72%	22
Biggenden ..	17,388	13,168 75·73%	4,220 24·27%	..	..	13,603	12,802 94·11%	725 5·33%	76 ·56%	..	..	..	..
Kingaroy ..	41,838	40,583 97·0%	1,255 3·0%	..	..	4,508	4,380 97·16%	128 2·84%	..	1,664	1,496 89·9%	168 10·1%	..
Mundubbera ..	37,982	28,440 74·88%	9,522 25·07%	20 ·05%	..	4,603	2,517 54·68%	2,086 45·32%	..	1,439	1,031 71·65%	408 28·35%	..
Wondai ..	29,783	27,380 91·93%	2,403 8·07%	..	..	13,796	13,473 97·66%	323 2·34%	..	670	583 87·01%	87 12·99%	30
Millaa Millaa ..	785	785 100%	..	..	..	5,557	5,557 100%	..	..	158	76 48·1%	82 51·9%	..
Milmerran ..	8,372	7,191 85·89%	1,181 14·11%	..	..	13,308	12,979 97·53%	329 2·47%	..	2,247	1,900 84·56%	347 15·44%	21
Nanango ..	28,568	24,511 85·8%	4,056 14·2%	1	..	18,712	18,023 96·32%	689 3·68%	..	1,028	926 90·08%	102 9·92%	..
Oakey	47,974	45,719 95·3%	2,255 4·7%	..	..	13,178	12,866 97·63%	294 2·23%	18 ·14%	4,026	3,968 98·56%	58 1·44%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAD ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Bundaberg	Make	1,984,242	693,978	1,290,264	..	..	53,771	55,283	72·07
	Pay	1,985,754	702,250	1,283,234	270	..	2·79%	2·86%	..
Gladstone	Make	1,422,483	316,045	1,103,629	2,809	..	35,559	36,541	86·66
	Pay	1,423,465	358,425	1,062,142	2,898	..	2·56%	2·63%	..
Mackay	Make	630,770	179,135	444,048	..	7,587	10,732	13,045	nil
	Pay	633,083	185,419	440,496	2,950	4,218	1·73%	2·10%	..
Monto	Make	3,648,627	1,719,075	1,928,584	968	..	67,734	74·635	98·87
	Pay	3,655,528	1,856,778	1,797,158	1,592	..	1·89%	2·08%	..
Rockhampton	Make	1,582,755	522,142	1,025,340	35,273	..	16,044	23,513	22·87
	Pay	1,590,224	532,780	1,024,133	33,311	..	1·02%	1·50%	..
Wowan	Make	2,252,903	1,111,680	1,134,947	6,276	..	24,160	54,363	91·06
	Pay	2,283,106	1,151,290	1,125,883	5,933	..	1·08%	2·44%	..
Biloela	Make	3,797,313	2,035,909	1,748,468	12,936	..	76,047	83,077	86·89
	Pay	3,804,343	2,133,842	1,660,183	10,318	..	2·04%	2·23%	..
Q.A.H.S. and College ..	Make	45,682	45,682	..	..	..	762	748	nil
	Pay	45,668	44,708	857	103	..	1·70%	1·67%	..
Boonah	Make	3,708,532	1,211,648	2,172,817	324,067	..	133,776	133,833	95·49
	Pay	3,708,589	1,346,772	2,114,700	247,117	..	3·74%	3·74%	..
Booval	Make	3,074,298	1,305,435	1,443,736	324,791	336	83,400	87,275	73·26
	Pay	3,078,173	1,124,492	1,676,003	277,678	..	2·79%	2·92%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Bundaberg ..	4,282	3,417 79·8%	865 20·2%	..	..	21,254	21,210 99·79%	44 ·21%	..	..	..	..	..
Gladstone ..	2,842	2,714 95·5%	128 4·5%	..	..	19,172	19,026 99·24%	146 ·76%	..	..	..	..	..
Mackay ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Monto	29,392	27,832 94·69%	1,523 5·18%	37 ·13%	..	34,989	34,186 97·7%	803 2·3%	..	34	34 100%	..	..
Rockhampton	..	..	..	..	..	6,092	5,919 97·16%	173 2·84%	..	373	157 42·09%	216 57·91%	..
Wowan ..	17,732	17,246 97·26%	486 2·74%	..	..	18,858	18,339 97·25%	519 2·75%	..	43	22 51·16%	21 48·84%	..
Biloela	29,929	29,150 97·40%	779 2·60%	..	..	28,753	28,136 97·85%	379 1·32%	238 ·83%	240	195 81·25%	45 18·75%	
Q.A.H.S. and College	..	..	..	..	..	..	..	..	..	..	..	..	..
Boonah ..	19,574	13,300 67·95%	6,274 32·05%	..	..	37,933	36,999 97·54%	934 2·46%	..	5,733	5,642 98·41%	91 1·59%	..
Booval	8,950	7,539 84·23%	1,411 15·77%	..	..	25,733	24,946 96·94%	787 3·06%	..	5,535	5,192 93·8%	343 6·2%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Grantham	Make	2,063,589	584,283	1,417,978	61,328	..	58,214	58,136	95·16
	Pay	2,063,511	601,582	1,408,038	53,891	..	2·90%	2·90%	..
Laidley	Make	1,789,971	869,146	873,942	46,883	..	55,009	54,930	95·09
	Pay	1,789,892	904,509	844,874	40,509	..	3·17%	3·17%	..
Lowood	Make	806,506	189,404	580,390	36,712	..	19,513	19,460	93·81
	Pay	806,453	194,524	581,619	30,310	..	2·48%	2·47%	..
Roma	Make	871,794	..	601,146	270,648	..	24,788	24,788	54·63
	Pay	871,794	179,900	438,025	253,360	509	3·32%	3·32%	..
Murgon	Make	2,637,985	1,604,393	1,026,816	6,776	..	78,987	78,672	84·14
	Pay	2,637,670	1,980,892	654,073	2,705	..	3·09%	3·07%	..
Proston	Make	1,389,823	840,911	510,832	38,080	..	52,965	53,039	96·81
	Pay	1,389,897	902,557	455,386	31,954	..	3·96%	3·97%	..
Kingston	Make	3,924,536	2,187,696	1,555,568	181,272	..	115,622	115,778	99·59
	Pay	3,924,692	2,322,152	1,438,943	163,597	..	3·04%	3·04%	..
Woodford	Make	1,452,251	863,783	587,476	992	..	37,176	36,140	96·8
	Pay	1,451,215	1,238,632	212,583	..	..	2·63%	2·55%	..
Allora	Make	1,337,102	1,328,699	8,291	112	..	32,723	30,992	86·2
	Pay	1,335,371	1,307,792	27,273	306	..	2·51%	2·38%	..
Inglewood	Make	473,088	244,664	213,136	15,288	..	16,361	16,021	78·08
	Pay	472,748	197,961	260,525	14,262	..	3·58%	3·51%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Grantham ..	8,428	5,729 67·98%	2,699 32·02%	..	..	25,499	24,483 96·02%	1,016 3·98%	..	1,140	884 77·54%	256 22·46%	..
Laidley ..	13,939	10,777 77·32%	3,132 22·47%	30 ·21%	..	15,624	15,235 97·51%	389 2·49%	..	831	723 87·00%	108 13·00%	..
Lowood ..	2,514	2,060 81·94%	454 18·06%	..	..	10,356	9,925 95·84%	431 4·16%	..	640	505 78·91%	135 21·09%	..
Roma	..	..	..	..	..	3,811	3,677 96·48%	134 3·52%	..	4,694	4,365 92·99%	329 7·01%	..
Murgon ..	21,159	15,688 74·14%	5,471 25·86%	..	..	18,355	17,992 98·02%	363 1·98%	..	121	95 78·51%	26 21·49%	..
Proston ..	14,361	11,515 80·18%	2,846 19·82%	..	..	8,866	8,515 96·04%	351 3·96%	..	800	702 87·75%	98 12·25%	..
Kingston ..	39,441	33,487 84·9%	5,954 15·1%	..	..	27,134	27,030 99·62%	104 ·38%	..	3,217	2,960 92·01%	257 7·99%	..
Woodford ..	14,665	9,429 64·3%	5,152 35·13%	84 ·57%	..	10,421	9,441 90·6%	980 9·4%	..	17	17 100%	..	..
Allora	20,435	19,764 96·72%	615 3·01%	56 ·27%	..	143	139 97·2%	4 2·8%	..	3	3 100%	..	..
Inglewood ..	2,499	2,025 81·03%	474 18·97%	..	..	3,824	3,776 98·74%	48 1·26%	..	272	262 96·31%	10 3·69%	1

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Mill Hill	Make	1,359,303	1,349,951	2,576	6,776	..	37,720	40,637	55·11
	Pay	1,362,220	1,209,522	145,720	6,978	..	2·85%	3·07%	..
Texas	Make	161,055	120,827	27,328	12,900	..	6,517	7,231	24·2
	Pay	161,769	72,809	73,267	15,693	..	4·22%	46·8%	..
Cooroy	Make	1,413,528	1,250,904	146,720	15,904	..	45,604	45,652	93·64
	Pay	1,413,576	1,342,347	69,370	1,859	..	3·33%	3·33%	..
Gympie	Make	6,906,829	6,311,473	502,600	92,756	..	150,137	150,601	95·06
	Pay	6,907,293	6,458,037	378,519	70,737	..	2·22%	2·22%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Mill Hill ..	13,210	12,718 96·28%	492 3·72%	..	..	46	46 100%	..	..	121	68 56·2%	53 43·8%	..
Texas	..	..	..	..	..	466	280 60·09%	186 39·91%	..	230	207 90%	23 10%	..
Cooroy	20,731	19,465 93·89%	1,212 5·85%	54 ·26%	..	2,621	1,953 74·51%	668 25·49%	..	284	244 85·92%	40 14·08%	..
Gympie ..	106,613	98,679 92·56%	7,934 7·44%	..	..	9,027	6,807 75·41%	2,220 24·59%	..	1,505	1,067 70·9%	438 29·1%	98

Fat Lamb Production in Queensland.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

INTRODUCTION.

WHILE there is a demand for Australian merino wool from many countries, Australian lamb and mutton sold overseas have gone mainly to the English market. Total exports of lamb amount to almost 50,000 tons annually and in 1946-47 returned £A3,632,000.

The lamb industry is centred mainly in Victoria, which contributes over half of Australia's total exports, though New South Wales and South Australia are also heavy producers. Queensland has not a well-developed export trade in lamb, but the industry is capable of considerable expansion.

It is well known Australians are heavy meat eaters. They consume approximately 1¾ lb. of beef, 1½ lb. of mutton, and ½ lb. of lamb a week. This means that there is an important local market for lamb and this is particularly true of Queensland.

The whole of the world faces a desperate food shortage and, while any development in the export lamb trade may come comparatively slowly, the local trade is capable of immediate expansion. It is well known that food production in Australia will have to be increased very considerably to maintain an exportable surplus of meat, unless present rates of consumption decrease. This means that more lamb is needed to meet the requirements of the home trade.

PRESENT POSITION OF THE LAMB INDUSTRY.

Production and Expansion Possibilities.

In all States the number of lambs produced per year has been increasing and Australian slaughterings reached a peak of 11,931,260 in 1942-43. In Queensland, annual lamb production has varied between 49,768 and 150,349 carcases in as short a period as four years, but since 1938-39 has not been below 100,000. During the war years there was a steady increase and in 1945-46 the number of lambs slaughtered was 139,000. In 1943-44 the total slaughtering of lambs in Queensland amounted to 108,825 and of these only 425 carcases were exported.

When the Australian Meat Board was formed in 1936 a general survey was made of the Australian lamb industry by Mr. J. M. Coleman of the New South Wales Department of Agriculture. He stressed that

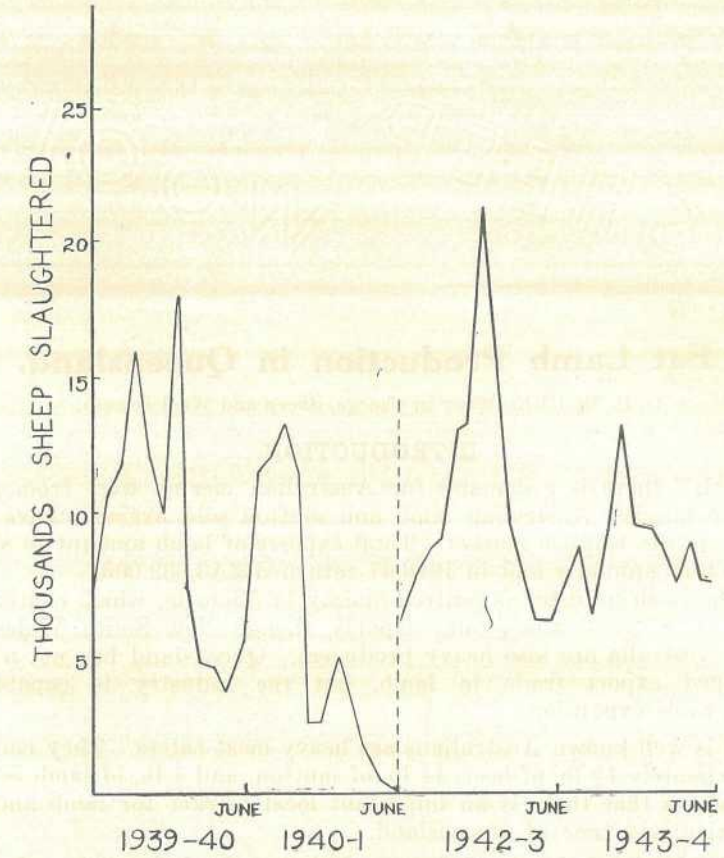


Plate 124.

LAMBS SLAUGHTERED PER MONTH FROM JULY, 1939, TO JUNE, 1944.

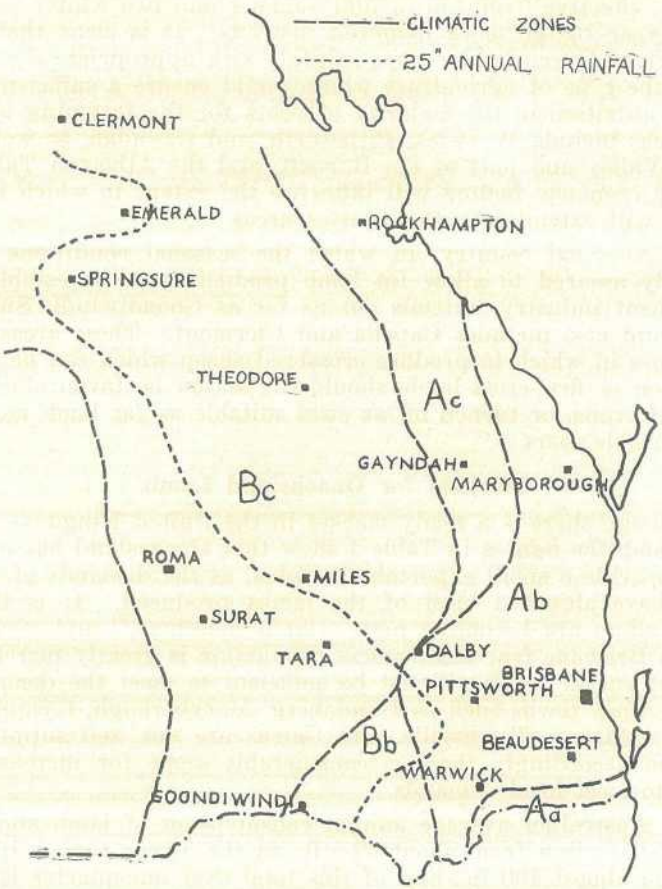
uniformity of type must be aimed at and that, in view of the fact that the United Kingdom takes about 98 per cent. of Australian lamb exported, a "Downs" type of carcase should be the standard. With a view to implementing these recommendations, and at the same time to stress to the producer the type of carcase required, the Australian Meat Board inaugurated a series of fat lamb competitions, which were conducted at Smithfield. The competitions were suspended at the outbreak of war, but it is to Queensland's credit that in the last one an entry from this State obtained second place. However, Queensland is greatly handicapped on the overseas market and our product suffers on the home market because of seasonal fluctuations in quality and quantity, which are evident from Table 1, showing gradings of Queensland export lamb from 1936-37 to 1943-44.

It should be pointed out that the sudden decrease in 1941-42 in the number of carcases exported from Queensland was largely due to the war. The American troops in Queensland consumed a considerable amount of lamb and the rationing scale was designed to increase mutton and lamb consumption and to decrease that of beef.

TABLE 1.

GRADINGS OF EXPORT CARCASES.

Year.	Carcases Exported.	1st Grade.	2nd Grade.	3rd Grade.
		Per cent.	Per cent.	Per cent.
1936–7 ..	30,250	22·1	53·0	24·8
1937–8 ..	7,848	19·8	62·4	17·8
1938–9 ..	15,789	31·9	51·8	16·3
1939–40 ..	24,362	32·4	53·6	14·0
1940–1 ..	13,614	34·0	53·1	12·9
1941–2 ..	3,238	51·1	42·4	6·5
1942–3 ..	5,887	32·6	50·5	16·8
1943–4 ..	425	25·2	50·1	24·7



Aa = 6 months summer rainfall + 6 months winter rainfall.
Ab = 6 months summer rainfall + 4 months winter rainfall.
Ac = 6 months summer rainfall + 2 months winter rainfall.
Bb = 4 months summer rainfall + 4 months winter rainfall.
Bc = 4 months summer rainfall + 2 months winter rainfall.

Plate 125.

SIXTY-SIX PER CENT. RELIABILITY OF RAINFALL.

Practically all the lamb produced in Queensland comes from the Darling Downs, though recently there has been a slight tendency for the industry to extend to the subcoastal areas. The seasonal nature of lamb production in Queensland is seen from the graph (Plate 124) showing lambs slaughtered each month between July, 1939, and June, 1944. The rise commencing in the winter months and extending to a summer peak is a characteristic of each year except 1940-41, when slaughterings reached almost 14,000 in September and fell to just over 5,000 in February.

A climatological survey of Queensland has indicated that lamb production can be extended. As it is largely dependent upon the plane of nutrition which, in turn is governed mainly by climatic conditions, the occurrence of effective rain (that is, rainfall heavy enough to stimulate plant growth) has been studied. Plate 125 shows the percentage reliability of "effective" rainfall in four summer and two winter months in any one year in the more favoured districts. It is clear that only a small part of Queensland enjoys rainfall with appropriate distribution to allow the type of agriculture which would ensure a sufficiently even plane of nutrition in the majority of years for the fattening of lambs. These areas include Warwick, Pittsworth, and Gayndah, as well as the Lockyer Valley and part of the Burnett, and the Atherton Tablelands. Naturally economic factors will influence the extent to which the lamb industry will extend into these latter areas.

The marginal country, in which the seasonal conditions are not sufficiently assured to allow fat lamb production to be established as a permanent industry, extends out as far as Goondiwindi, Surat, and Yuleba, and also includes Capella and Clermont. These areas are the logical ones in which to produce crossbred sheep which can be fattened for mutton or first-cross lamb, should the season be favourable for the growth of crops, or turned off as ewes suitable as fat lamb mothers in less favourable years.

Markets for Queensland Lamb.

Although there is a ready market in the United Kingdom for Australian lamb the figures in Table 1 show that Queensland has only been able to provide a small exportable surplus, as the demands of the local market have absorbed most of the lambs produced. It is true that Queenslanders are becoming more "lamb conscious," and meat distributors in Brisbane fear that, unless production is greatly increased, the supply of sucker lamb will not be sufficient to meet the demand. At the same time, towns such as Bundaberg, Maryborough, Gympie, Rockhampton, Mackay, Townsville, and Cairns are not well supplied with lamb, and accordingly there is considerable scope for increasing production to meet local demands.

The Australian average annual consumption of lamb and mutton per head has risen from about 62·5 lb. in the 5-year period 1921-22 to 1925-26 to almost 100 lb., and of this total over one-quarter is lamb.

Market Requirements.

Because the man who eats the "chop" dictates the market requirements it is difficult to describe the ideal carcase in exact terms. Men who undertake heavy manual work like more fat with their meat, and the chop which would be considered palatable by a coal miner probably would not be relished by an office worker.

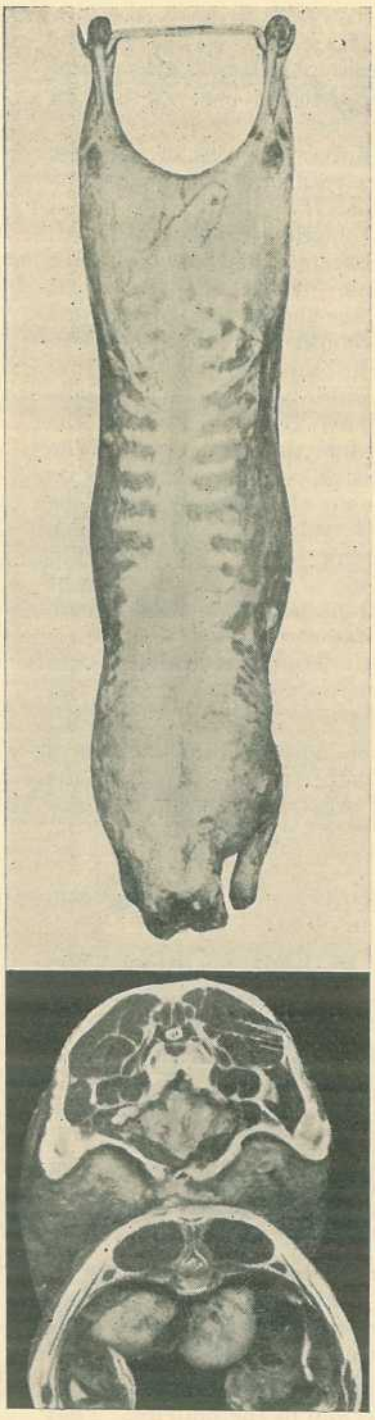


Plate 126.

An Ideal Carcase Produced by Good Breeding and Good Feeding.

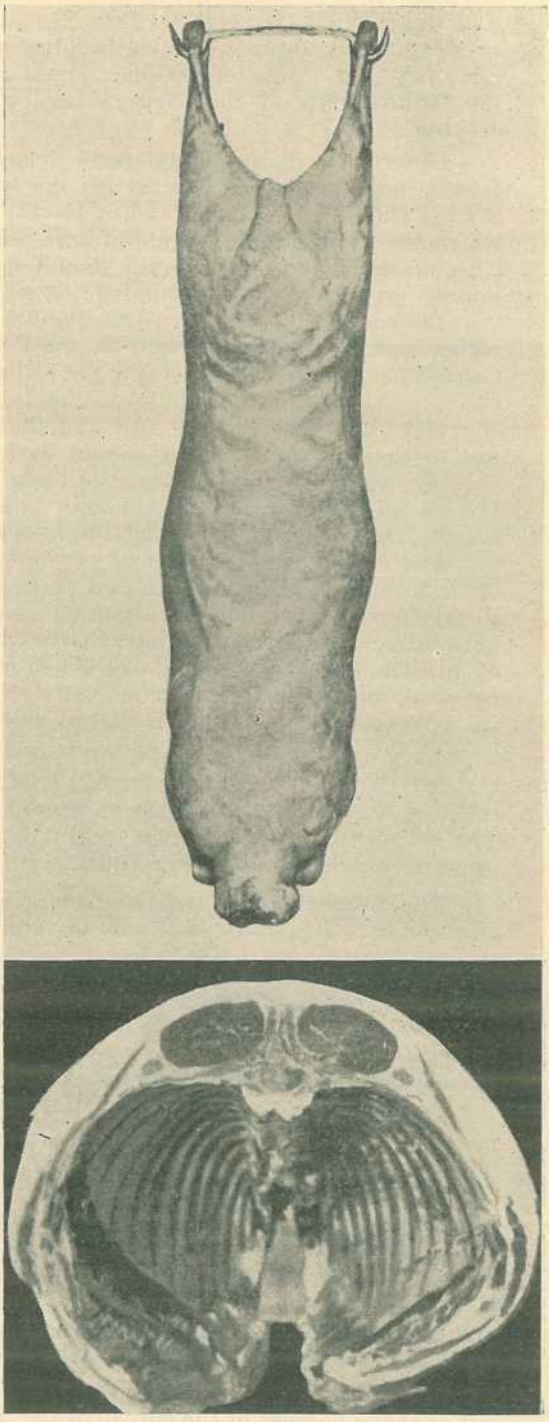


Plate 127.

A Poor Carcase with Long, Badly Covered Legs, Slack Loins, and Uneven Distribution of Fat, Produced by Bad Breeding and Bad Feeding.

The trend towards smaller families has also influenced the type of lamb required. Smaller, blockier joints are now popular, as these meet the requirements of the average family and there is less wastage on cooking.

Differences in individual taste demand different types of carcases for the local market as well as for the export trade. Nevertheless, the carcase should be compact, and at the same time the hindquarters, from which the most expensive cuts of meat come, should be well developed. This means that the leg bones should be short but well covered with muscle, giving a nicely rounded leg of lamb. When the carcase is "on the hooks" the space between the hind limbs should be "U"-shaped rather than "V"-shaped; that is, the twist should be well filled. The carcase should be wide between the stifles, and the measurement from stifle to stifle across the butt of the tail should be large. The loins should be well covered and full and the distance from the base of the tail to the base of the neck should be long, but the neck short. The shoulder should be well covered but not massive. There should be no bruises on the carcase, and the thin muscles on the outside should be a soft, rosy pink to give the impression of "bloom." This is also indicated by a bright colour of the open shank joints. There should be a suitable blend of muscle and fat, and this is especially important in the loin chops. The "eye muscle" should be both deep and broad, with an even covering of $\frac{1}{8}$ inch to $\frac{1}{4}$ inch of fat at the level of the first chop. The fat should extend well down over the hind legs, which should be evenly but not heavily covered. Plate 126 shows the ideal carcase, and for purpose of comparison an undesirable carcase is shown in Plate 127.

At a conference arranged in 1948 by the Australian Meat Board and attended by producers from all States support was given to the adoption of a uniform system of grading of Australian lamb carcases. The schedule was drawn up originally in Victoria and is based on overseas weight/quality requirements.

The weight classes suggested for lambs were up to 28 lb., from 29 to 36 lb., 37 to 42 lb., 43 to 50 lb., and from 50 to 56 lb.

On a quality basis the lambs were graded as "Downs," first, second, or third "Lamb," and "Summer Lamb."

Carcases which show the characteristic squareness of frame, depth of fleshing, shortness of bone, well-filled twist, and good coverage of the loins are graded as "Downs."

Generally speaking, carcases weighing from 29 to 42 lb. are the most saleable because of their small joints. In the lower (third) grade lambs a special weight classification of 20 to 28 lb. is made. Generally speaking the carcases which go into this class have "Merino" legs, they lack a covering of fat, are slack in the loin, and have a blue tinge on the shoulder.

The more "rangy" carcases fall into the 43 to 49 and 50 to 56 lb. classes, and many are unattractive. The joints are heavy, the legs and shoulders blue, and the loin slack. Neither of these classes is in demand on the home or export market because of the large joints.

"Summer" lambs are inclined to be older, and accordingly may be out of shape because of the spread of the pelvis and of the midribs. They have a barky appearance, but because they usually come in late in the Queensland season when the home market is not particularly well supplied, they may bring unexpectedly high prices.

Economic Aspects of Lamb Production.

Fat lamb production is a specialised form of sheep husbandry in which both meat and wool are produced. This gives the lamb-raiser two sources of income from his sheep. In most years that derived from meat is more important than that derived from wool, but this depends upon the relative prices of meat and wool.

Merino and comeback wools have commanded exceptionally high prices since the end of the war. Coarse crossbred wool, however, has not experienced a proportional rise. By comparison with wool overseas meat prices have not risen very much. On the other hand lambs sold on the local market have brought high prices, almost irrespective of conformation.

Under these circumstances the most profitable ewes to run may be Merinos. They are easily obtained and the income earned by their wool more than compensates for the comparatively slow growth and spare fleshing of their offspring. This is particularly true at times when there is only slight differentiation in lamb prices on a quality basis.

At a time when markets are less buoyant the double source of income contributed by sheep used for fat lamb production is an important consideration. The difference in the return from the wool of Merinos and crossbred ewes is not so great, but on a discriminating market the difference in price per lb. between lambs from Merino and crossbred ewes is very apparent. In addition, the lambs from crossbred ewes are more profitable because of more rapid growth rate, which gives a quicker return. Finally, old crossbred ewes have a better carcase value than worn-out Merinos.

Obviously, the producer must consider which method of husbandry will give the greater return. At the same time the well-informed sheep-raiser will vary his methods to meet changing market requirements.

It is difficult to arrive at an accurate figure for the cost of producing lambs. Even if an average figure could be given it probably would not be applicable to many individual cases because there are so many variations in farming practices.

Because of its dependence on agriculture, lamb production in Queensland is more expensive than in southern States. It is the considered opinion of some of the most successful lamb producers on the Darling Downs that about 1,000 acres is the ideal size of a farm for lamb raising. It is preferable to have about 400 acres under cultivation and the remaining 600 acres suitable for grazing purposes. With the usual farm implements and improvements, such a property would represent a fairly high capital investment. At the same time it would probably carry 1,500–2,000 ewes besides a few cattle and the farmer would be able to produce some grain from crops which had been allowed to mature after one or two grazings.

(TO BE CONTINUED.)

Rearing Dairy Calves.

R. D. CHESTER, Officer in Charge, Cattle Husbandry Branch.

EACH year there is a wastage of approximately 20 per cent. of milking cows from the average dairy herd. These cows must be replaced by heifers raised from within the herd or purchased as springers.

On the majority of farms, it is preferable to rear calves for replacement purposes rather than to purchase them from outside sources. The status of health and the production potential of the purchased springer must always be largely unknown. Those of the home-grown heifer are to a greater extent under the control of the farmer.

The aim is to rear only healthy calves capable of developing into high-producing milkers. When possible, the calves should be from cows with production records above the average for the herd. They should be normal and vigorous at birth and sired by a bull of good conformation and of proven worth as a sire of high-producing females. They should be kept in clean, sanitary pens and paddocks; and, finally, they must be raised on well-balanced rations containing adequate food for normal growth and development.

The health and the development of the calf in the first three weeks after birth have a profound effect on its future well-being. During this early period of life, the calf is particularly susceptible to infection and the utmost care is necessary to ensure normal healthy growth immediately after birth. An animal which sickens with scours or pneumonia during the first month of life will not thrive and subsequently will remain stunted and backward even though the original infection no longer operates. On the other hand, the animal which grows normally for a few weeks will seldom prove difficult to rear later in life.

In order that only the best calves are reared to replace culled cows, it is necessary that the farmer know something of the individual production of various cows within his herd. To obtain this knowledge, he must test the cows for production. Having classed his cows, he is then in a position to know just which heifer calves are most likely to be worth keeping. As far as possible, calves should be kept only from cows with production above the herd average.

FEEDING REQUIREMENTS.

Having selected calves from these high-producing cows, it is necessary to raise the animals in such a way that they have the opportunity to develop their frame, so that when mature they will have the capacity to produce. The growing animal should be maintained in strong active condition. Underfeeding results in a small "weedy" heifer unable to consume enough feed to produce more than a few pints of milk. Overfeeding results in a gross over-developed heifer tending rather to beef production and coarseness than to the production of milk.

To ensure that calves thrive and grow normally, the animals' requirements of protein, energy, minerals and vitamins must be met fully.

Protein Needs.

Initially, the calf requires a high-protein diet. This can be reduced gradually as the animal matures. Thus, in calf starters it is wise to have 20 per cent. crude protein. This can be reduced to 16 per cent. by the time the calf is 6 to 8 weeks old, and after four months the protein in the ration may be further reduced.

While the calf is still young, it is necessary to supply some protein of animal origin. Calves which are to receive no milk after 8 or 10 weeks of age require a meal mixture which contains an animal protein, such as dried skim milk, dried butter-milk, blood meal or meatmeal. Only small quantities of these meals are necessary to produce satisfactory results.

After four months of age, lucerne hay alone is sufficient as a source of protein.

Energy Requirements.

At birth, the calf has a small stomach, the rumen being undeveloped and all food material being passed direct to the abomasum or fourth stomach. For this reason, it requires its food in concentrated form. As the rumen develops, more and more feed of a roughage nature can be eaten. Thus, during the first few days milk alone is digested. After about two weeks, the calf will begin to eat a little grain and pick at pasture and hay; but it is not until it is six to eight months old that it will thrive on roughage feeds alone.

Mineral and Vitamin Requirements.

At birth, the young calf is deficient in vitamin A. The chief role of this vitamin is to protect against infection. It is important, therefore, to ensure that adequate supplies are available. Best sources are in mother's colostrum; other good sources are green pasture, rich green lucerne hay and yellow maize.

Several mineral elements are essential for normal development of the calf, but those which require special attention on the part of the calf feeder are calcium (lime) and phosphorus. Both are adequately supplied by milk, but if milk can only be given in limited quantities it may be necessary to feed either ground limestone for lime or bone meal for a supply of phosphates. Foodstuffs rich in lime are lucerne hay and good pasture; in certain localities pastures may be low in phosphates. Grains are usually rich in this mineral.

HANDLING THE VERY YOUNG CALF.

The cow near calving should be separated from the herd and placed in a small well-sheltered paddock handy to the milking yards. When the calf is born, it should be examined to see that it is normal and then left alone in the paddock with the mother for 24 hours. If the mother is a heavy milker, she should be milked out three times during the first day in order to ease the pressure and inflammation in the udder and reduce the risk of mastitis.

After about 24 hours, the calf should be taken from the mother and taught to feed from a bucket. It may either be placed in a small pen or else tied with a collar and chain in a grassy spot. During inclement weather, it is necessary to provide some protection from wind and rain, but normally the calf should be raised under natural conditions, with plenty of direct sunlight and only sufficient shade to form a cool camp.

The housing of young calves of varying ages in one large pen is bad and this type of husbandry is frequently responsible for great loss from disease. The very young calf is particularly susceptible to infection and it must be treated accordingly.

It is essential that the newborn calf receives mother's milk for the first four or five days. When born, the young animal has no reserves of vitamins. The mother's colostrum is equipped to provide these as well as minerals, protein and important antibodies which provide the calf with resistance against infection. If colostrum is not fed, it is almost impossible to raise a calf which does not develop scours or pneumonia.

Quantity of Milk to Feed.

The most common mistake in feeding young calves is to over-feed. It should be borne in mind that the newborn calf has only a very small stomach. If this stomach is filled beyond its normal capacity, digestive upsets will occur and the calf will develop scours.

The amount to be fed will vary from three-quarters of a gallon to one gallon according to the size of the calf.

How to Feed Milk.

It is better to feed three times a day for the first 10 days, but if this is not possible then the two feeds should be spread at equal intervals. Feeding at intervals of 8 and 16 hours, as is frequently done, is a bad practice and one likely to end in disaster.

Milk should be fed at blood heat. In the case of colostrum and mother's milk, it will be fed directly after milking, but when bulk milk is being fed it may be necessary to warm it before feeding. After 4 to 6 weeks, cool milk is suitable, provided it is quite fresh and clean.

Whole milk should be fed for the first seven days to all calves. Strong animals may then be weaned gradually on to separated milk. In the case of more delicate calves, whole milk should be continued for a few more days and in some cases even up to a fortnight or longer.

When feeding whole milk, it should be diluted with boiling water to reduce the butterfat content to between 3 and 3.5 per cent.

The diluted milk is more easily digested because of the formation of a soft curd within the stomach. Milk which is too rich frequently forms a hard, indigestible curd.

Each 10 pounds of milk should be diluted according to the fat content. The following method has been suggested by Hewitt in Victoria:—

To each 10 lb. of 3 per cent. milk, add no water;
To each 10 lb. of 3.5 per cent. milk, add no water;
To each 10 lb. of 4 per cent. milk, add 1½ pounds of water;
To each 10 lb. of 4.5 per cent. milk, add 3 pounds of water;
To each 10 lb. of 5 per cent. milk, add 4½ pounds of water;
To each 10 lb. of 5.5 per cent. milk, add 6 pounds of water.

Thus for each 0.5 per cent. increase in butterfat content over 3.5 per cent., add 1½ pounds of water to each ten pounds of milk.

For the first six or eight weeks of life there is no complete substitute for milk, though after 10 weeks of age calves can obtain sufficient nutrients for normal growth from pasture, hay and concentrates.

In the case of weak calves, it is often useful to add a little lime water to each milk feed. This will prevent the formation of a solid curd in the gut.

Necessity for Cleanliness.

When feeding bulk separated milk, it is essential to be certain that the milk is not contaminated by unsterilized containers. The practice of running all separated milk into an old 44-gallon drum, and dipping out of this for the calf feed before feeding the remainder to pigs, cannot be too strongly condemned. Calves taken from their mother and raised artificially are delicate creatures and only the best hygiene and sanitation will be sufficient to avoid a breakdown.

Various Methods of Calf Raising.

Where stud calves are being raised for Show purposes and cost is no object, whole milk may be fed for the first 12 to 15 weeks of life. Reduce to a butterfat content of between 3 and 3.5 per cent., as explained previously. Calves on this ration will grow actively and vigorously. Good calves may also be reared on foster mothers, but this method has only limited application. A good foster mother under normal Queensland conditions should raise five or six calves during each lactation. The cow should be restrained for each feed until she accepts the new calf. After 12 weeks, fostered calves can be taken from the cow and replaced by young animals.

However, the common method of raising calves is on a diet consisting chiefly of skim milk. Two other important methods in Queensland are whey feeding, in cheese making districts, and minimum milk feeding in districts where whole milk is produced.

SUPPLEMENTARY FEEDING STUFFS.

The important supplements to be fed in addition to milk or whey are pasture, hay, grain and, to a lesser extent, protein-rich concentrates.

Pasture.

Pasture forms the chief supplement in normal calf-raising methods on Queensland farms. Good pasture is cheap and contains adequate nutrients to balance the milk diet. If immature, rapidly growing pasture is available, it may be used to replace all hay recommended in

the ration, and after the first 12 weeks calves will thrive on milk and good quality pasture without a grain ration. However, if good pasture is not available, some hay should be fed and the grain ration should continue until calves have matured sufficiently to ensure that they are capable of dealing with roughage containing a high fibre content.

After the initial training period, which lasts two or three weeks, calves should be placed in a well-grassed paddock where they have ample shade and fresh water and constant access to good grazing. It is desirable that facilities should be available for rotational grazing of such paddocks or of alternating young stock with mature cattle. Constant stocking with young animals leads to heavy contamination with eggs and larvae of internal parasites.

Hay.

In the absence of good grazing, some hay is essential if the calf is to make normal growth. Good lucerne hay will supply large quantities of protein, calcium and vitamin A, three food constituents essential to health and growth.

In the absence of pasture, calves should have constant access to good hay. It is unwise to limit the intake of roughage. At about 4 weeks, the normal calf will eat approximately 1 lb. of hay per day; 3 lb. at 3 months and about 5 lb. at 6 months.

If good quality hay is available on the farm, it may be used to replace some of the grain portion of the ration. However, overfeeding on rich leafy lucerne hay will sometimes scour calves.

Concentrates.

Grain forms the bulk of most concentrate meals fed to calves; and, indeed, if adequate milk is available, protein-rich concentrates are not required, as the milk-grain ration is quite well balanced. However, if extra protein meal is available at cheap rates, there is no reason why it should not be fed.

Cracked or crushed grains alone are sometimes slightly unpalatable, and in order to increase palatability it is wise to add a little bran or peanut meal to the mixture if these are available.

Even if good pasture is available, calves will thrive better if given some grain in their ration. The amount fed will depend to some extent on the availability and price, but when grain can be grown on the farm it is profitable to feed it in relatively large quantities.

Calves should be started on grain as soon as they begin to cud—at about three weeks of age.

It is wise to feed the grain ration immediately after the milk drink, as this avoids bolting of the mixture and also lessens the tendency for calves to suck one another when the milk is finished.

Most grains are of equal value as calf foods, and farmers should be guided only by availability and price when making their selection of a grain to feed. Yellow maize has an advantage in that it contains vitamin A, but in ordinary circumstances this vitamin will be supplied by the pasture.

The grain should be ground into a coarse meal rather than to a flour.

In areas where molasses is available cheaply, it may be used as portion of the concentrate meal. To avoid scouring, start with small quantities. As little as one ounce per day, mixed with grain, is sufficient. Build this up, gradually, until a maximum of about 2 lb. per day is fed at six months. It is advisable to avoid molasses in the case of whey feeding.

Protein-rich meals and mill offals are necessary in the concentrate ration when there is insufficient milk.

Where no milk protein is fed, animal protein in another form must be fed for the first 12 weeks, after which time calves are capable of obtaining their full protein requirements from vegetable sources.

TABLE 1.

GRAIN MIXTURES FOR YOUNG CALVES.

Grain and Concentrate.	10 to 12 Per Cent. Protein. (Calves on Adequate Milk).			14 to 16 Per Cent. Protein. (Calves on Limited Milk).			18 to 20 Per Cent. Protein. (Calves on Whey or Meal.)		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
Corn	1	1	1	2	2	1	2	1	1
Sorghum	..	1	1	2	2	1	1	..	1
Pollard	..	..	1	..	2	..	1	2	1
Bran	..	..	1	1	1	1	1	1	1
Linseed Meal ..	..	..	..	1	1	1	4	2	2

Table 1 (adapted from the United States Department of Agriculture Year Book for 1939) sets out suggested concentrate rations suitable for feeding with adequate milk, limited milk, and whey or meal. Under A, B and C, three mixtures in each group are suggested.

Calves getting adequate skim milk require a concentrate ration containing only 10 per cent. crude protein. If the quantity of milk is limited, the protein content of the concentrate should be increased up to about 15 per cent. On a basic ration of whey or when minimum milk is to be used and calves are raised largely on whey or meal, then 18 to 20 per cent. of crude protein is required.

The maize and oats in the table may be replaced wholly or in part by other grain, and linseed meal may be replaced wholly or in part by other protein meals provided the equivalent amount of crude protein is supplied. Linseed meal, however, has the advantage of being highly palatable, a feature which is not shared by meatmeal or blood meal, which at the moment are more readily available in Queensland.

Table 2 sets out the food values of the various concentrates likely to be available in Queensland.

RAISING CALVES ON SKIM MILK.

The normal routine described previously is carried through for the first two weeks. The calf is left with the mother for 24 hours, weaned into isolation, fed mother's colostrum for three or four days, then whole milk for a varying period, according to strength and development, and gradually weaned on to skim milk fed at the rate of about 1 lb. of milk for each 10 lb. weight of calf.

After the initial isolation period of two to three weeks, the calf is placed in the calf paddock with other calves of varying age. Individual feeding should be continued either by the bail system or in open buckets held for each calf by the feeder.

The bail system has several advantages. A small concrete yard can be built and calves can be shut in and controlled for routine operations such as drenching for parasite control and Strain 19 vaccination. Each calf enters the bail; the yoke is closed and held securely until all animals have finished their drink. Provided enough bails are available, it is as well to feed the grain ration in the bail immediately the milk drink is finished. This ensures that all calves get their share of grain.

Fresh warm milk direct from the separator should be fed, if possible; otherwise it should be warmed to blood heat before feeding to younger calves.

When an ample supply of milk is available, calves should be fed at the rate of about one pound of milk to every 10 pounds weight of the calf, to a maximum of about one-and-a-half gallons a day. Overfeeding must be avoided just as carefully as underfeeding.

As soon as the calf is allowed free range, it should have access to first quality grazing or, failing that, good lucerne hay; if neither grazing or hay is available, a greater quantity of grain can be fed.

If grain is home grown and cheap, it should be made available as a meal, and the calf allowed all that it will eat up to a maximum of about three pounds. Where grain is not so cheap, the ration should be restricted accordingly. Cracked grain alone contains sufficient protein for the calf being raised on skim milk, but if milk becomes scarce the protein percentage of the ration should be gradually increased by the inclusion of protein-rich concentrates as the milk feed is reduced.

TABLE 2.

AVERAGE FODDER VALUE OF COMMONLY USED CONCENTRATE FOODS.

Concentrate.	Food Units Per 100 Lb. (Starch Equivalent).	Digestible Crude Protein Per 100 Lb.
Energy–Rich Concentrates.		
Barley	71	7
Maize	77	8
Oats	61	8
Sorghum	76	7
Wheat	72	8
Bran	56	10
Pollard	66	10
Molasses	50	0
Whey	6	0
Whey, dried	85	12
Protein–Rich Concentrates.		
Blood Meal	63	68
Meatmeal	80	55
Meat and Bone Meal	60	45
Peanut Meal	78	43
Cottonseed Meal	67	33
Linseed Meal	72	25
Whole Milk	20	3·5
Fresh Separated Milk	8	3·5
Dried Separated Milk	80	30
Fresh Buttermilk	9	3·5
Dried Buttermilk	85	32

RAISING CALVES ON WHEY.

In cheese producing districts of Queensland, skim milk is frequently scarce and there are plentiful supplies of whey available from the cheese factory. Provided whey is treated hygienically and not adulterated with wash water and condensed steam, it constitutes an excellent basis on which to build the daily calf meal.

There is some difficulty in many localities in obtaining good quality whey, and wherever difficulty is being experienced by the farmer in raising calves on whey some consideration should be given to inspecting the source of the product at the factory. Naturally, contamination and dilution not only reduce the food value of the resultant product but also increase the tendency of the whey to produce scours.

For the first three weeks, the calf is raised in the same manner as is the case with the calf intended for skim milk feeding. At the end of this period, the change-over from milk to whey should be a gradual one, taking about two weeks to complete. Even good quality whey has a tendency to scour young calves and any sudden change from milk to whey is likely to accentuate this tendency.

Whey is low in protein and has a much lower energy value than skim milk. It is therefore necessary to feed a high-protein calf meal as a supplement to whey. Initially, the meal should contain 18 to 20 per cent. crude protein, but as the calf matures this may be reduced to 16 per cent. crude protein.

Calves over two months of age may be given up to a maximum of one-and-one-half gallons of whey per day along with good quality lucerne hay and a concentrate mixture.

Feeding will follow the same pattern as skim milk feeding, except that a little more of a higher protein content mixture will be fed.

Suitable concentrate supplements may be prepared in any of the following ways:—

30 parts of crushed grain (maize, sorghum or barley) plus 30 parts of pollard or brain, plus any one of the following:—

17 parts of blood meal, 20 parts meatmeal, 22 parts peanut meal, 25 parts cottonseed meal *or* 30 parts linseed meal.

Some wheat and some oats may be substituted for part of any of the grains listed, but wheat should not constitute more than one-third of the grain ration. Oats is especially valuable as a grain if blood meal or meatmeal is used, as it increases the palatability of the ration. Grains should not be finely ground but fed either rolled or crushed.

So far as the protein concentrate is concerned, it is better to dilute the blood meal and meatmeal with one of the more attractive meals if possible, as this increases the palatability.

RAISING CALVES ON LIMITED QUANTITIES OF MILK.

On farms supplying whole milk for city milk consumption, it is not profitable to use more than a few gallons of milk for calf food. Fortunately calves will thrive quite well on meals, provided they receive colostrum and mother's milk for a few days and then decreasing

amounts of skim milk from the herd to the eighth to tenth week. During the first few weeks after milk feeding is suspended, it is desirable that the calf meal should contain some animal protein.

For very young calves there is no substitute for milk, and if calf meals are used to replace milk at too early an age, scours and digestive disorders are certain to occur.

After the calf is two to three weeks old, calf meals can be used to replace increasing amounts of milk, and whole milk may be replaced by skim milk.

Age alone is insufficient indication for reducing the amount of milk in the diet. Greater consideration should be given to the development and thriftiness of the calf.

Well-grown calves may be completely weaned from milk between the seventh and eighth week. After weaning they will thrive on dry calf meals provided they have access to good quality lucerne hay or good grazing with adequate water supply.

Whilst the milk is being reduced, extra water should be added to keep the fluid intake at approximately the same level. If this is not done, very young calves may not drink enough water for normal requirements.

The meal may be fed dry, as a gruel or as reconstituted milk. The method of feeding is one of personal choice, as calves will thrive equally well on all three methods. However, considerable labour is saved if the calf is educated to take the meal in a dry state, though frequently it is difficult to accustom calves to the meal in this way.

Calves raised on limited quantities of milk frequently do not grow as well as milk-fed calves during the first six months, but they will reach normal weight by the time they are 12 months old, provided good pastures are available.

Calves raised on meal may be fed according to the following system :—

Normal methods of colostrum and whole milk feeding for two weeks. Calves which are not strong and healthy at the end of this period should continue on milk. Healthy calves can be started on meal just as soon as they will eat solid food.

Reduce the milk allowance as more and more meal is taken. For example, during the 4th week, feed 9 lb. of milk, in the 8th week, 8 lb. of milk, 6th week, 7lb. of milk, and so on until the calf is three months old. Allow it all the meal it will eat up to three or four pounds a day along with good lucerne hay as grazing.

After four months, the protein content of the meal can be reduced and the calf may be raised on grain and lucerne hay or first-class grazing.

For the young calf the protein content of the meal is important. Calves of 100 lb. liveweight will eat about 2½ lb. of meal and need 0·40 lb. of digestible protein a day. The meal, therefore, should contain in the vicinity of 20 per cent. crude protein. It is preferable to include a small quantity of animal protein, such as meatmeal, blood meal or skim milk powder, in the meal.

TABLE 3.

Feeding Plan on Separated Milk—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Separated Milk.	Concentrate.	Hay.
1 to 2 days ..	Calf on mother			
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight			
5 to 10 days ..	Whole milk at rate of 1 lb. to each 10 lb. body weight			
10 to 14 days ..	Change from whole to separated milk at same rate			
3rd week ..	..	10	A trace	Free access
4th week ..	..	10	0·25	do.
5th week ..	..	10	0·50	do.
6th week ..	..	12	0·75	do.
7th week ..	..	13	1·00	do.
8th week ..	..	13	1·00	do.
9th week ..	..	13	1·00	do.
10th to 14th week	..	14	2·00	do.
14th to 24th week	..	16	3·00	do.

TABLE 4.

Feeding Plan on Whey—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Whey.	Concentrate.	Hay.
1 to 2 days ..	Calf on mother			
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight			
5 to 10 days ..	Mixed whole milk at rate of 1 lb. to each 10 lb. body weight			
10 to 14 days ..	ditto			
3rd week ..	10	..	A trace	Free access
4th week ..	7	3	0·25	do.
5th week ..	3	8	0·75	do.
6th week ..	..	13	1·00	do.
7th week ..	..	13	1·00	do.
8th week ..	..	14	1·50	do.
9th week ..	..	14	1·50	do.
10th to 14th week	..	14	2·00	do.
14th to 24th week	..	16	3·00 to 4·00	do.

TABLE 5.

FEEDING PLAN ON MEAL—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Water.	Concentrate.	Hay.
1 to 2 days ..	Calf on mother	Dilute whole milk with water to maintain fluid bulk.		
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight			
5 to 10 days ..	Mixed whole milk at rate of 1 lb. to each 10 lb. body weight			
10 to 14 days ..	ditto			
3rd week ..	10			
4th week ..	10		0·25	
5th week ..	8	2	0·50	Free access
6th week ..	5	3	0·75	do.
7th week ..	5	3	0·75	do.
8th week ..	3	4	1·00	do.
9th week ..	2	5	1·50	do.
10th to 14th week	0		2·50	do.
14th to 24th week	0		3 to 5	do.

Tables 3–5 set out the rations for an average A.I.S. calf from birth to six months of age. Such a table should be taken as a guide only. It will be accurate only under average conditions, and alterations will be necessary according to the health and development of the calf. Modification will also be necessary for breeds other than A.I.S. Obviously, the best basis for rationing is according to body weight rather than age. The average Jersey calf weighs in the vicinity of 50 to 55 pounds at birth; the average for other breeds are:—Ayrshire and Guernsey, 65 pounds, A.I.S. 70–75 pounds and Friesian, 90 pounds.

The hay ration may be entirely replaced by grazing, but in the absence of green grazing it may be necessary to supply some other form of vitamin A. If calves are given free access to hay as suggested, it will be found that they eat about one pound at four to six weeks, three pounds at three months, and about five pounds at six months.

ASTRONOMICAL DATA FOR QUEENSLAND.

FEBRUARY.

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

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.21	6.42	Cairns	41	17	Longreach ..	40	30
6	5.24	6.40	Charleville	29	25	Quilpie	34	36
11	5.28	6.36	Cloncurry	57	42	Rockhampton ..	15	5
16	5.32	6.32	Cunnamulla ..	28	30	Roma	18	16
21	5.35	6.28	Dirranbandi ..	18	20	Townsville ..	34	16
26	5.38	6.23	Emerald	24	14	Winton	46	34
28	5.39	6.21	Hughenden ..	42	27	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	7.45	8.42
2	8.37	9.09
3	9.28	9.36
4	10.20	10.04
5	11.13	10.33
	p.m.	
6	12.08	11.07
7	1.07	11.46
8	2.08	..
		a.m.
9	3.10	12.32
10	4.12	1.26
11	5.09	2.29
12	6.01	3.37
13	6.47	4.48
14	7.28	6.00
15	8.04	7.09
16	8.39	8.17
17	9.14	9.23
18	9.51	10.28
19	10.31	11.34
		p.m.
20	11.15	12.38
21	..	1.42
	a.m.	
22	12.04	2.41
23	12.57	3.36
24	1.54	4.24
25	2.52	5.06
26	3.49	5.43
27	4.45	6.15
28	5.39	6.44

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

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

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	23	16	39	32	14	8	45	36
6	13	26	28	42	3	18	32	50
11	10	30	25	45	0	21	27	54
16	20	19	36	35	11	10	42	41
21	30	9	46	24	21	0	53	26
26	27	13	43	28	18	2	51	31
28	24	15	40	31	15	7	46	35

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	38	23	56	45	41	30	32	20
3	28	32	50	53	34	38	24	28
5	19	42	42	59	27	44	17	36
7	9	51	37	64	21	50	8	43
9	3	53	34	66	18	51	4	44
11	5	56	35	67	19	53	5	46
13	13	47	39	62	24	47	12	39
15	26	36	47	55	32	40	22	31
17	38	24	56	46	41	31	32	21
19	48	11	63	38	48	23	40	11
21	55	3	68	32	51	18	45	4
23	56	2	68	32	52	17	46	3
25	53	7	67	35	50	21	44	8
28	40	21	57	44	42	29	33	18

Phases of the Moon.—First Quarter, 6th February, 6.05 p.m.; Full Moon, 13th February, 7.08 p.m.; Last Quarter, 20th February, 10.43 a.m.; New Moon, 28th February, 6.55 a.m.

On 15th February the Sun will rise and set 15 degrees south of true east and true west respectively, and on the 2nd and 16th the Moon will rise and set approximately at true east and true west respectively.

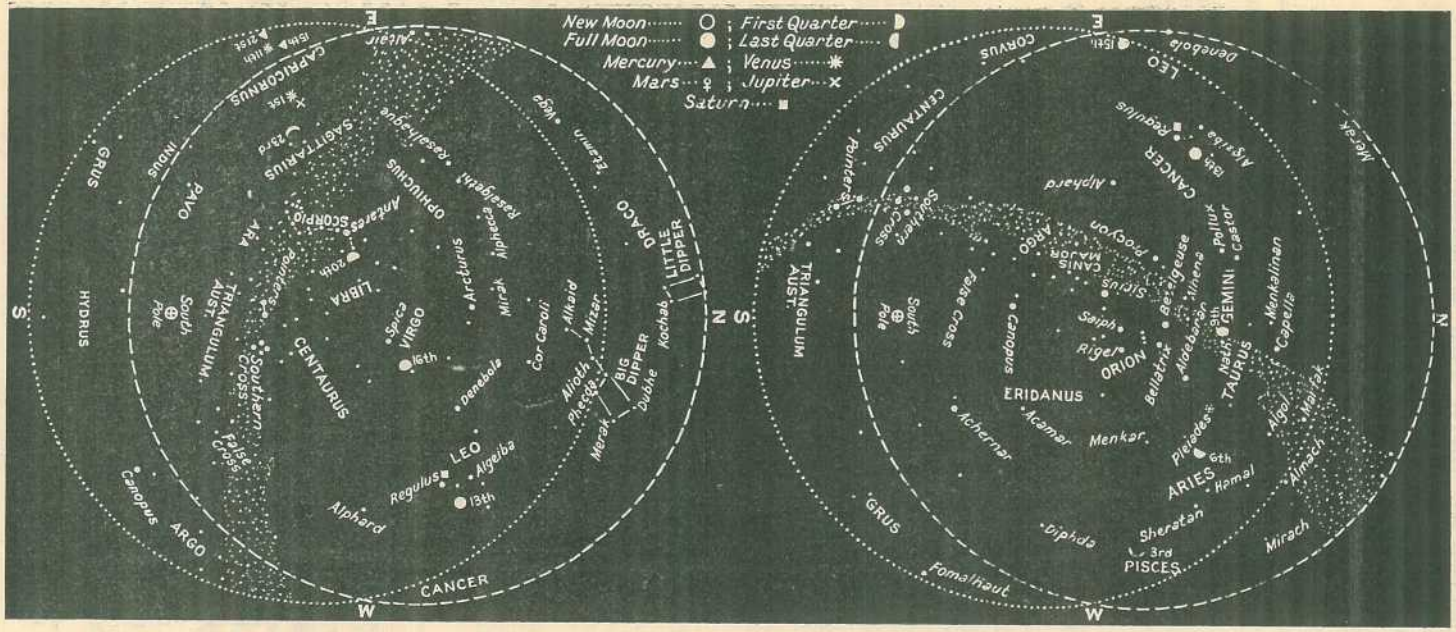
Mercury.—Will be in line with the Sun on the 2nd, after which it will become a morning object and on the 28th, in the constellation of Capricornus, will reach greatest angle west of the Sun when it will rise 2 hours before sunrise.

Venus.—At the beginning of the month, in the constellation of Sagittarius may be seen low in the east during morning twilight, when it will rise about 1½ hours before the Sun. After passing through the constellation of Capricornus, by the end of the month it will be too close in line with the Sun for observation.

Mars.—Too close in line with the Sun for observation.

Jupiter.—In the constellation of Sagittarius. At the beginning of the month will rise 1 hour 53 minutes before the Sun and by the end of February will rise between 2 a.m. and 3.15 a.m.

Saturn.—In the constellation of Leo, will be opposite the Sun on the 21st and thus favourably placed for observation throughout the night during this month. On the 1st it will rise a little over an hour after sunset and by the end of the month will rise about ½ hour before sunset.



Star Charts:—The chart on the right is for 8.15 p.m. in the south-eastern corner of Queensland to 9.15 p.m. along the Northern Territory Border on the 15th February (for every degree of Longitude we go west, the time increases by 4 minutes). The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales Border, when facing north hold "N" at the bottom; when facing South hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.