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DEPARTMENT OF AGRICULTURE

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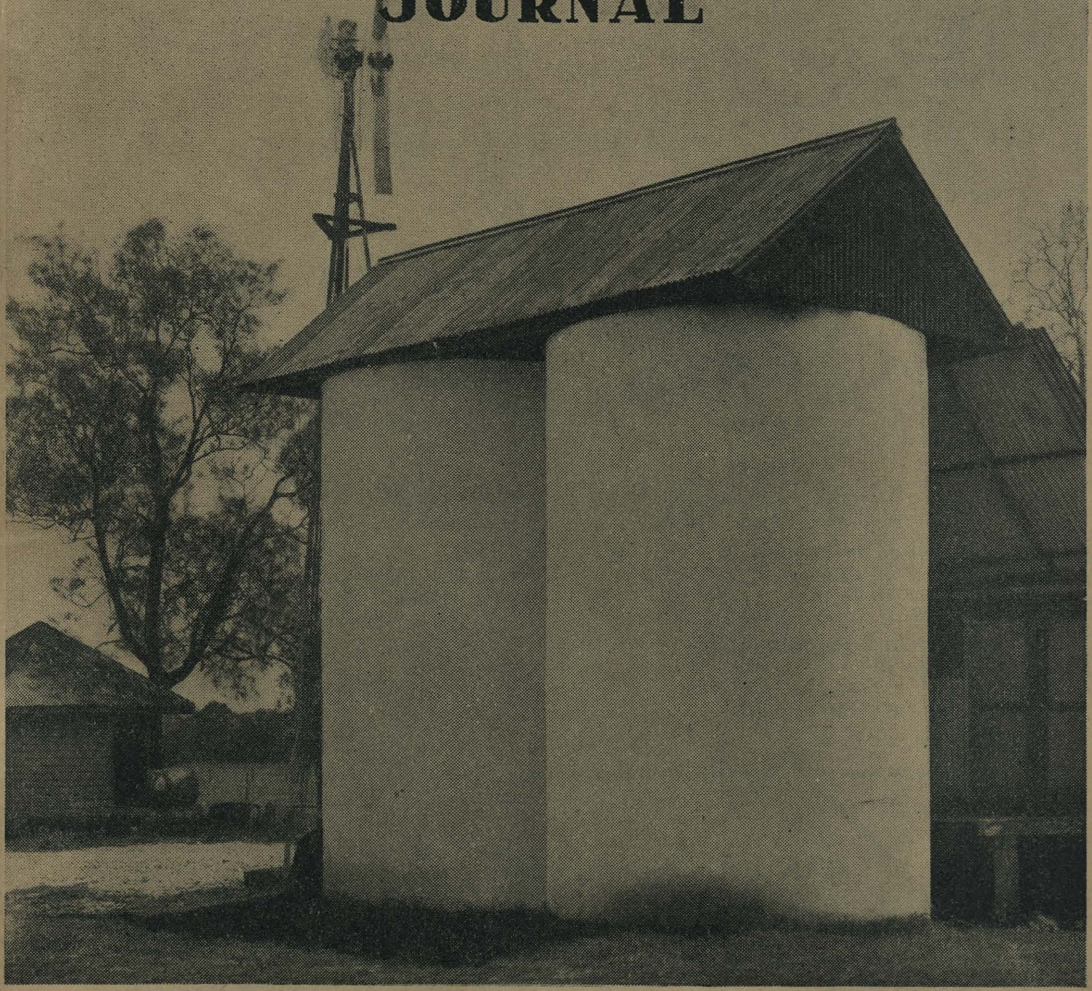

Ready for the Dry Spell.

LEADING FEATURES

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QUEENSLAND AGRICULTURAL JOURNAL

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Contents

Peanut Growing in Queensland.

J. A. KERR (Plant Breeder) and W. J. CARTMILL (Senior Soils Technologist).

PEANUT growing in Queensland is largely concentrated in the South Burnett (Plate 43) of which Kingaroy is the centre. Appreciable quantities of peanuts, however, are produced in the Rockhampton district (Plate 44) and on the Atherton Tableland (Plate 45).

Plate 43.

A Field of Peanuts in the South Burnett District, the Main Production Area.

The peanut plant is a source of highly nutritious food for both human beings and farm livestock. The uses to which the crop is put are many, and its importance is steadily increasing. As a human food, the kernel is consumed raw, salted, or roasted and is used in various forms of confectionery; the oil is excellent for margarine manufacture. Peanut paste and oil are also marketed. Peanut meal, which remains after oil extraction, contains up to 48 per cent. crude protein and as a stock food ranks as a high-grade palatable product.

Plate 44.

A Peanut Crop at Rossmoya, Central District. Crown rot disease is responsible for the broken stand.

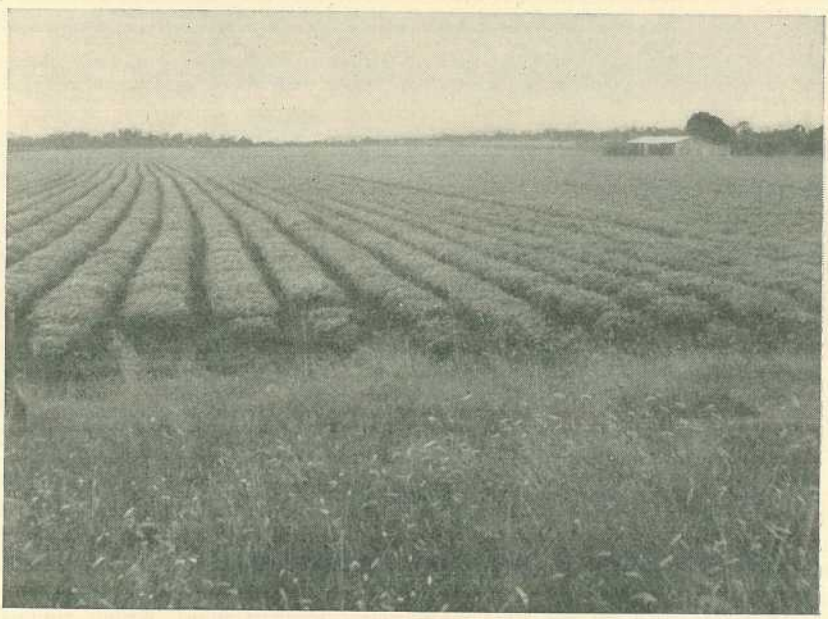


Plate 45.

Peanuts at Carbeen, on the Atherton Tableland.

The crop may be eaten down by pigs, but its consumption will result in objectionable qualities in the carcases. Breeding sows and weaners, however, may be fed limited amounts without detriment. The tops of the plant make a useful though rather coarse hay, which, overall, is not as good as cowpea hay in either yield or protein content.

The residue of the crop, after threshing to remove the nuts, is often stacked as reserve fodder. The trash as it leaves the thresher contains a proportion of light peanuts, and the food value is thus dependent to some extent on the percentage of peanuts remaining in the trash.

Peanut trash which is relatively free from soil is said by animal nutrition experts to have a higher feeding value for stock than is commonly recognised. It is true that the loss in vitamins during exposure is great, but the proteins, carbohydrates and mineral fractions are sufficiently high to make this by-product comparable in value with fair to good lucerne hay. It is interesting to note that the low fibre figure often allows cattle to eat daily several pounds more of peanut trash than they could of most hays. This means greater production than might be anticipated.

The peanut is regarded as being a native of Brazil, where several closely allied species are found. It is an annual summer-growing plant which is easily killed by frost, but it will adapt itself to a wide range of summer climatic conditions, provided the soil is suitable. Moderate rainfall, abundance of sunlight, and comparatively high temperatures, however, are necessary for best results with this crop.

The flavour of the kernel and the type of the shell enclosing it have led to the fruit of the peanut plant being incorrectly known as a nut; as the plant belongs to the pea family, the fruit is really a pod. Like other members of that family, its roots bear numerous nodules containing bacteria which make nitrogen in the air available to the plant.

The peanut plant grows to a height of from 12 to 18 inches and may have either a bunched or a running habit. The former type is preferred by farmers because, owing to its less straggling habit of growth, cultivation is much easier and harvesting is very much simpler than in the case of a variety possessing a running habit.

The flowers, which are small and yellow, are borne in the axils of the leaves. After pollination, the flower stalk elongates, bends downwards, and carries the developing pod into the soil (Plate 46). This flower stalk is commonly known as a peg, and the pod (Plate 47) does not develop unless the peg penetrates the soil.

The period of growth in the case of peanuts varies from 16 to 22 weeks, according to the variety, the district in which it is grown, and the seasonal conditions experienced during the growth of the crop. Early maturity is usually characteristic of the upright or Spanish type of plants.

The yield of peanuts per acre will naturally vary greatly with soil fertility and with the climatic conditions experienced during growth. Virginia Bunch yields average 1,700 lb. per acre, though 2,200 lb. is fairly common and 3,000 lb. occasionally exceeded. Red Spanish yields average 1,100 lb. per acre with high yields rarely more than 2,200 lb. The average bushel weight of peanuts as delivered by the thresher is 17 lb. for Virginia Bunch and 22 lb. for Red Spanish.

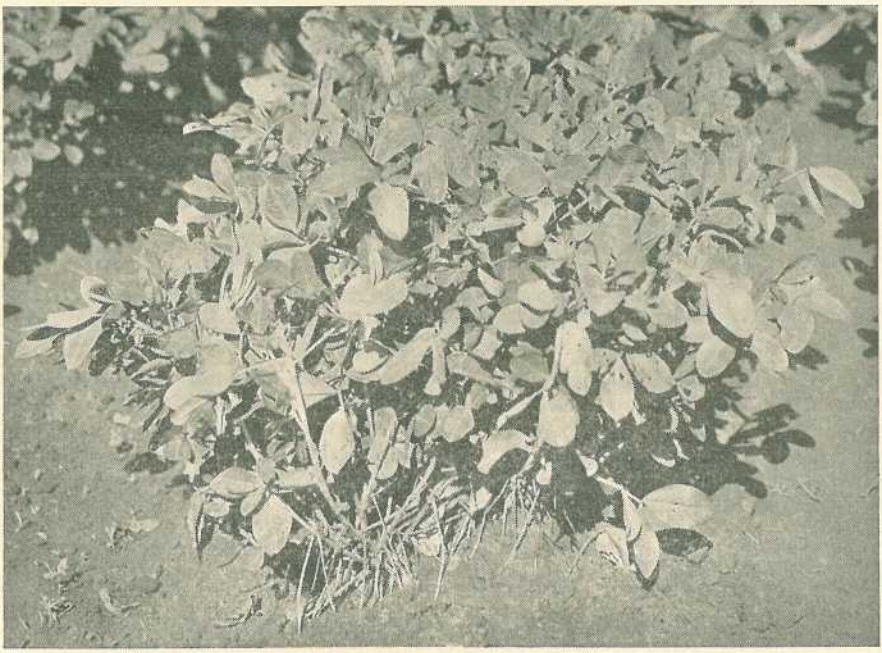


Plate 46.

A Peanut Plant in the "Pegging" Stage. The pegs are the very young pods, which mature in the ground.

Suitable Soils.

Well-drained, open-textured soils with a high humus content are the most suitable types for the growth of this crop. Satisfactory crops can be grown on a wide range of soils, but heavy soils which are inclined to become hard and compact should be avoided. Heavy soils frequently produce large crops of peanuts, but considerable losses are experienced when harvesting, particularly in varieties which readily shed the pod. Other things being equal, sandy loams usually produce the best results.

In Queensland, the crop is grown principally on the red volcanic loams which occur extensively in the South Burnett and on the Atherton Tableland. These are self-mulching, friable, well-drained soils of great depth and with a high level of fertility. Such desirable chemical and physical properties make them ideally suited to the production of peanuts. In the heavy rainfall districts of the Atherton Tableland, however, wet weather at harvesting, which may reduce the quality of the nut, is always a risk. Under intensive cultivation the granular-crumb structure of the red volcanic loams is liable to break down and their productivity to decrease as a consequence. Rotational cropping practices, preferably including a period under grassland, are particularly desirable on these soils to maintain or restore their productivity.

The crop is also grown on sandy loam soils in various parts of the State. While these soils all have a desirable physical condition, the low to moderate fertility status of some of them requires the use of fertilizers for satisfactory results. The light grey sandy soils tend to produce "pops" (no kernels in shell), particularly in Virginia Bunch. Deep sandy loams of alluvial origin are the most suitable types.

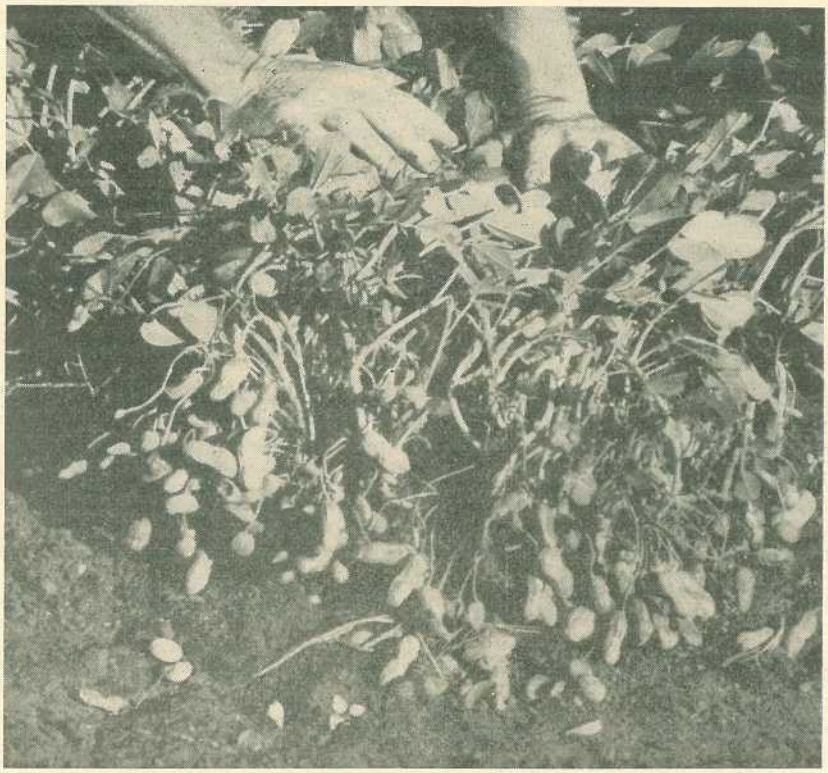


Plate 47.

A Peanut Plant Partly Pulled from the Soil to Show the Development of the Pods.

Rotations.

Observations indicate that the first crop of peanuts on a suitable soil is usually particularly good, yields of as much as 2,500 lb. per acre being frequently obtained with Virginia Bunch. Uninterrupted cropping with peanuts, however, soon reduces the yield to an uneconomic level, and in few crops grown under Queensland conditions is a suitable rotation more essential to the maintenance of a satisfactory standard of production than in peanuts.

The eradication of all weeds in the growing crop, which is essential for the successful production of peanuts, combined with the method of harvesting (entailing as it does the removal of practically the whole plant), results in a serious lowering of the humus content of the soil, with a consequent adverse effect on its physical structure. The total effect thereof is reflected in reduced yields. A lack of balance between the different soil nutrients following continuous cropping with peanuts probably also contributes to a reduction of yield.

The selection of suitable crops for rotating with peanuts depends upon the type of farming practised, but where dairying is combined with peanut growing the problem is somewhat simplified. Queensland climatic conditions are such that the main selections must be made from

summer crops, but these should be supplemented where possible by winter crops. Maize, grain sorghums, sweet sorghums, Sudan grass, white panicum and Japanese millet provide some of the possible selections for summer growing. Cowpeas should also be included in the rotation, but there is evidence to suggest that they should precede the abovementioned fodder crops rather than the peanut crop. All residues of ordinary crops included in the rotation should be ploughed in, and in the case of the more open soils it is recommended that a bulky fibrous crop, such as Sudan grass, should be included in the rotation and ploughed in as a green manure prior to the planting of the peanut crop. The beneficial results obtained from Rhodes grass as a soil renovator, indicated by first-crop peanut returns following that grass, suggest the adoption of the practice of grassing available cultivation areas from time to time for periods of from two to three years.

The restriction of peanut-growing to one crop in three years, or two crops in five or seven years, may prove to be necessary if satisfactory production is to be maintained. The benefits of the rotation will not be limited to the peanuts, but will also be apparent in the other crops which are included in the cropping programme. A rotation, however, must be adopted at an early stage in the development of a farm in order to achieve the highest degree of maintenance of soil fertility, and not merely as a measure adopted at a later date to restore the fertility of soils which have been mined rather than farmed.

In the Mareeba-Atherton area of the Atherton Tableland, crops of maize, velvet bean and cowpeas for seed, and tobacco are rotated with peanuts.

Land Preparation.

A field comparatively free from weeds should be selected for the production of peanuts in order to reduce hand work in the growing crop, and cultivation prior to planting should be thorough. A rotation which includes two or three years of Rhodes grass is very useful in checking weed population. If no cover crop is being grown during the winter, the first ploughing should be completed by the end of June, and, if the land is not being contour farmed, should be across the slope of the land, which is then allowed to lie in a rough state until the spring. On land subject to erosion, planting on the contour, in combination with contour banks and/or strip cropping, should be adopted. Spring ploughing should then be followed by cultivation to produce a loose, fairly fine seed-bed, and to conserve soil moisture by keeping weed growth in control. A further ploughing may be necessary, but the amount of cultivation required will naturally vary with the soil type and with the weather conditions.

In the Mareeba district, where rain in the early winter months may be negligible, it is common to plough in late March or April, especially on soils which tend to pack hard, in order to take advantage of soil moisture available from the summer wet season.

Fertilizers.

Peanuts make a heavy demand on the mineral plant foods of the soil, particularly calcium, phosphorus, and potassium. Nevertheless, the crop does not generally respond to fertilizers to the same extent as several other crops. When fertilizer has been applied to the crop in the rotation which immediately precedes the peanuts, it is usually not necessary to add more for the peanuts. In the principal peanut growing

districts of Queensland, fertilizers are not commonly used, though in some areas superphosphate applied at 2-3 cwt. per acre has given beneficial results. On light-textured soils of low or moderate fertility, it would be advisable to use a complete fertilizer mixture containing a high percentage of phosphate and a low percentage of nitrogen at rates of about 3 cwt. per acre if the soil has not been heavily fertilized for a preceding crop.

The fertilizer may be applied in the row before planting. It should be mixed with the soil or covered by a layer of soil so that it does not come in direct contact with the seed and thereby impair its germination. In the case of the red volcanic loams, close contact between the fertilizer and the soil is liable to render the phosphate unavailable to the plant and the practice of applying the fertilizer in a narrow band and covering it with a layer of soil is to be preferred to mixing it with the soil.

Use of Lime.

Calcium is a plant nutrient of major importance in peanut production. The supply of available calcium in the soil must be high for satisfactory yields. In the case of the large type peanuts, such as Virginia Bunch, a high percentage of unfilled shells in the harvested crop is usually an indication of a deficiency of available calcium in the soil. The smaller Spanish varieties do not seem to be affected as much in this respect by a low calcium status. The amount of available calcium in the fruiting (or pegging) zone has a marked influence on the development of the kernels. In areas where pops are prone to occur, either the soil should be limed or the crop topdressed with a relatively soluble source of calcium, such as gypsum (calcium sulphate). The latter practice is preferable as it ensures a supply of available calcium within the fruiting zone of the plant. The gypsum should be applied to the foliage of the plant at the early flowering stage, using about 3 cwt. per acre. If lime is used, 10-15 cwt. per acre should be broadcast three or four weeks prior to planting; higher rates are needed if the soil is very acid. It is desirable, however, to maintain the soil in a slightly to moderately acid state for the most satisfactory growth of the crop and the use of excessive quantities of lime should be avoided.

Varieties.

Only two varieties are grown extensively in Queensland, these being Virginia Bunch and Red Spanish (Plate 48).

Virginia Bunch is a strong-growing variety, and produces a large quantity of dark-green foliage. The plants, on suitable soils, may reach a height of 12 to 18 inches and a diameter of from 24 to 30 inches. The pods are usually borne fairly close to the centre of the plant, but late flowers may develop and fruit along almost the whole length of the branches. The pods are fairly smooth, of good size and shape, and usually contain two pale-coloured kernels. On maturity, these pods generally break off easily, thus resulting in loss in cases in which harvesting is delayed. Peanuts of the best quality of this variety are usually reserved for the "whole nut" trade.

Red Spanish has a smaller plant of semi-erect, bushy habit, with light green foliage. Its pods, which are closely clustered round the main stem, are small and completely filled with two dark-red kernels. At maturity, they do not break off easily, and so do not present a harvesting problem, as may be the case with Virginia Bunch. On account of their

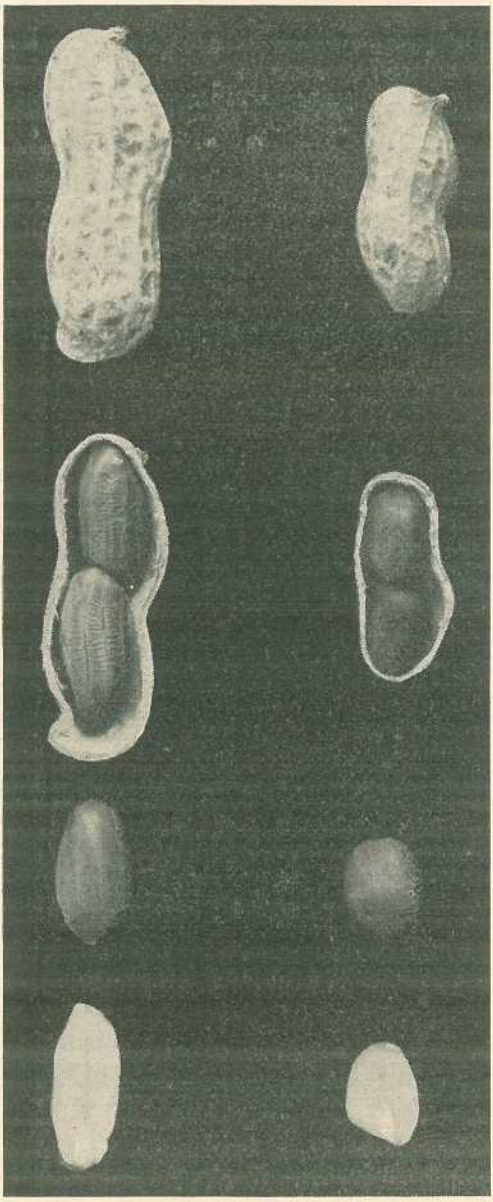


Plate 48.

Pods and Kernels of Virginia Bunch (left) and Red Spanish (right) Varieties.
The photograph is natural size.

high oil content, Red Spanish kernels are frequently used for the oil trade, but they are also used for the manufacture of peanut paste and are consumed as salted and devilled kernels.

In North Queensland, Red Spanish gives better results than Virginia Bunch in areas within the 30 inch rainfall belt, especially on the grey sandy loams.

Planting.

The planting season in Queensland extends from October to January, inclusive, December-January planting being favoured on the Atherton Tableland. Peanut planters and maize drills fitted with special peanut plates operate in a very satisfactory manner for planting. These mechanical planters, plant shelled seed or kernels only, and with them even-graded seed is necessary to ensure the fairly regular spacing of plants. Small areas may also be planted by hand in shallow furrows opened at the desired spacing of the rows. When planting is done by hand, the use of kernels is not essential. The whole pod or the pod broken in halves may, therefore, be used, but the germination is slower than is the case with kernels. Soaking of the pods in water prior to planting may prove to be advantageous.

A width of 36 inches between rows and a plant spacing of from 10 to 15 inches is recommended for Virginia Bunch, this spacing requiring approximately 30 lb. of kernels per acre. For Red Spanish, a width of from 30 to 36 inches between the rows with a plant spacing of from 6 to 10 inches in the row is recommended. The kernel of Red Spanish is smaller than that of Virginia Bunch, and approximately 25 lb. per acre is therefore adequate for the closer spacing usually adopted in the case of the former variety. The seed should be sown at a depth of two to three inches.

The treatment of Virginia Bunch kernels with Ceresan, Agrosan, or a similar organic mercury dust for the purpose of checking the development of seedling diseases is very desirable in order to ensure a more satisfactory germination. Crown rot, however, is not entirely prevented by this treatment and it is a common practice to increase planting rates by as much as 25 per cent. of those recommended in order to provide for seedling losses.

Cultivation of the Crop.

Crop cultivation for the first month after planting may be carried out with light peanut harrows dragged across the rows. Ordinary light lever harrows may also be used. The initial harrowing may be done shortly after the plants appear, and the judicious use of the harrows in this early stage of the growth of the crop considerably reduces later hand work, since cross-harrowing eradicates many weeds in the row. The stand of young peanut plants is not harmed if the surface of the ground is free of debris. Inter-row cultivation should be continued until the first pods are developing. At least one hand chipping will probably be necessary to ensure the eradication of weeds. During the last cultivation a slight hilling is frequently given with the object of providing a free entrance for the fruiting pegs.

Harvesting.

As the peanut crop does not mature evenly, harvesting is carried out when the majority of the pods are mature. The plants at that stage usually develop a yellowing of the foliage, but as that is not invariably the case an examination of the pods is necessary before a decision is made to harvest the crop. When maturity has been reached, the inside of the shell usually begins to colour, at least at one end, and shows darkened veins. In the case of Virginia Bunch, a few of the early pods are usually lost, but no difficulty in this respect is experienced with Red Spanish, which retains its pods for a considerable period after they have reached maturity.

Although manual labour is still required at harvesting for the bulk of the crop, recent developments in mechanical harvesting are promising and reasonably efficient pick-up threshing has been in operation since the 1948-49 season. Indications are that all harvesting operations will be mechanised in the future.

Two rows of peanuts are cut by means of specially designed cutting blades directly attached to the tractor (Plate 49 and 50), and a side delivery rake, also attached to the tractor, moves the peanuts over into a windrow (Plate 51). Where the stand is light and plants small in size, four or more rows may be placed in the windrow.

The peanuts may be ready for threshing in about ten days, depending on weather conditions, but have been threshed satisfactorily after over ten weeks exposure in the field.

Variations to the headers used for threshing (Plate 52) include the fitting of pick-up attachments where such are not standard equipment, the replacement of standard rasp drums with peg drums, the enlargement of elevators, and the fitting of special sieves and shakers. Results have generally been very satisfactory when operating with Red Spanish but variable with Virginia Bunch.

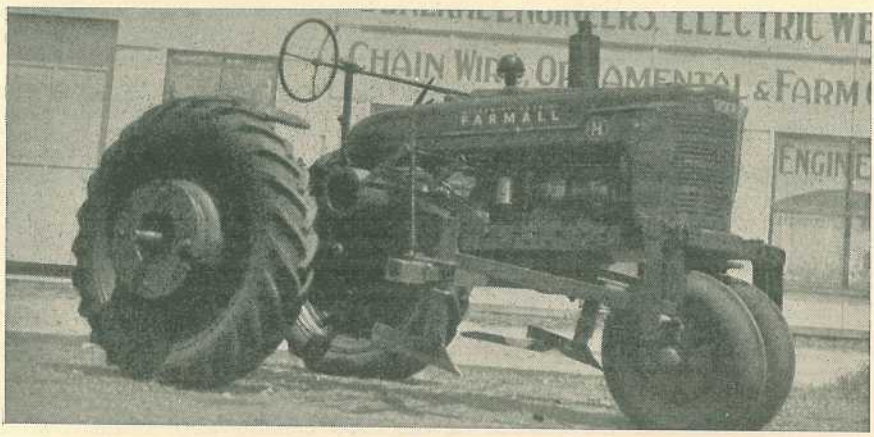


Plate 49.
A Tractor Fitted With a Pair of Peanut Cutters.

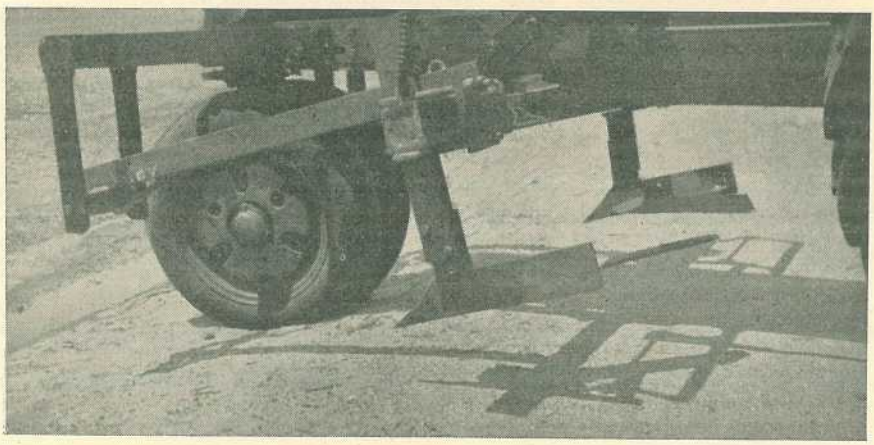


Plate 50.
View of Cutters Attached to a Tractor.

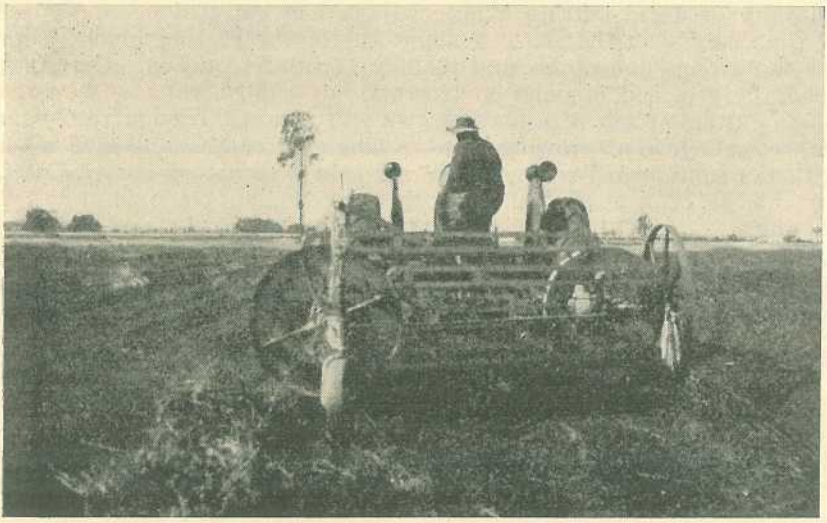


Plate 51.

A Side Delivery Rake Windrowing Peanuts for Pick-up Threshing.

Plate 52.

A Converted Harvester Picking Up Peanuts for Threshing.

An experimental machine designed especially for pick-up threshing is being built at Kingaroy. This method of harvesting will be adopted by a large number of growers when equipment is more readily available.

Several machines have been developed to cut, pull and deposit peanut plants in bundles in readiness for stooking, but none has proved entirely satisfactory. An efficient machine which pulls two rows of peanuts and diverts them to a single central windrow from which they may be hand sorted and stooked has recently been marketed.

When hand harvesting, the tap root is usually cut by means of specially designed cutting blades, adjusted to cut just below the level of the peanuts in the soil. A slight tilt of the cutting blades loosens the soil around the plants and thereby facilitates pulling. Cutters are generally attached in pairs on tractors, but small areas may be cut by single cutters attached to horse-drawn cultivators. Though rarely used in the main peanut growing areas, a single furrow mouldboard plough with the mouldboard removed will act as a satisfactory cutter, but the attachment of a special share with an extended blade improves the cutting.

After cutting, the plants are pulled by hand and placed in bundles of a size convenient for handling when stooking, the soil being simultaneously shaken from the plants.

The usual practice is to stook the plants without support. The plants from eight to twelve rows are generally placed in a single line of stooks (Plate 53), the average size of the stooks being about 36 inches in diameter and 42 inches in height. The first plants are placed on the ground with the pods upwards, followed by some other outer plants with the pods towards the centre. The stooks can then be built in successive layers, each bundle of plants being firmly placed in position with the pods always to the centre of the stook. The last 12 inches are tapered to a point and capped by a plant with the foliage directed downwards with the object of shedding as much rain as possible.

Plate 53.
Stooked Peanuts Curing in the Field.

On the Atherton Tableland, especially in the high rainfall districts, the practice is to make fairly large stacks rather than stooks. This is carried out by the use of slides, on to which the plants are loaded and then driven to the stack. The load is anchored by stakes and the slides pulled out from beneath, leaving the load in position. The plants are stacked with the nuts out, to reduce moulding and discoloration of the nuts. While this system has merit, it is probable that normal stooking, combined with periodic turning of stooks in wet weather, would give better results.

Stacking around poles may be used for curing the crop prior to threshing, but the method is rarely adopted in Queensland now. For this purpose, poles about seven feet long are driven firmly into the ground and two cross-pieces three feet long are nailed on to the poles at right angles to each other about nine inches from the ground. The first plants are placed on these cross-pieces in order to keep the pods off the ground, and the stack is then built round the pole with the pods inside. Towards the top of the pole the plants are arranged so as to taper off the stooks gradually. It is capped by using inverted peanut plants or grass. From twenty to thirty poles are required per acre for curing the crop in this manner.

Dry weather is essential for the first week after pulling, in order to allow the plants to dry, but after that period has elapsed, rain damage is usually of minor importance, provided the wet weather does not continue for a long period. Unfavourable harvesting weather produces a darkening of the pods, and moulds may develop under such conditions, with a consequent loss of quality; moulds may even cause the destruction of a large percentage of the crop.

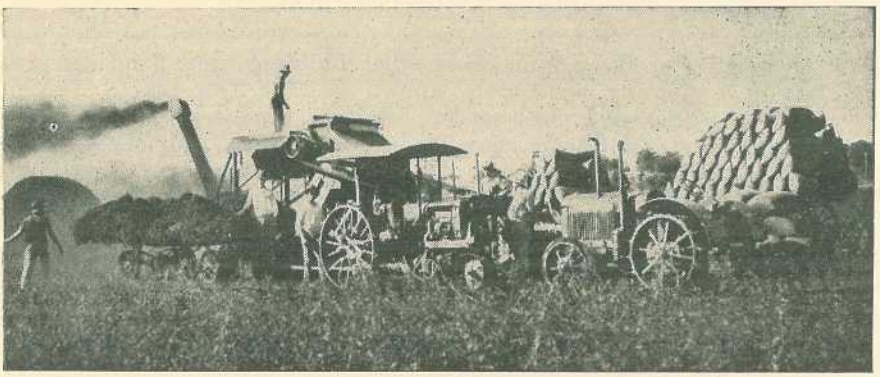


Plate 54.

Cured Peanuts Being Threshed by a Mobile Thresher.

The peanut plants may remain in the stooks for a period of from 14 to 28 days, the duration of the period depending on the prevailing weather conditions. The plants must be dry and the pods must shatter easily from the pegs before threshing is attempted. Threshing is usually done by contractors who operate machines designed for handling this crop (Plate 54). The stooks are generally conveyed on low wagons to the thresher, which is moved from time to time to convenient positions in the field. The plant residue, after the thresher has removed the pods, is frequently stacked in the field in the position in which it is delivered from the threshing machine and is subsequently used as fodder.

Marketing.

The Peanut Marketing Board controls the marketing of the crop. The Board operates extensive silos, shelling and cleaning machinery and other equipment. The main storage facilities are at Kingaroy (Plate 55), but there are also depots at Brisbane, Atherton and Rockhampton.

Plate 55.

Peanut Silos and Treatment Plant at Kingaroy.

Ownership of the peanut silos, other buildings and fixed assets is vested in a holding association known as The Queensland Peanut Growers' Co-operative Association Limited, registered under "The Primary Producers' Co-operative Associations Acts." Members of the Association are the suppliers of peanuts to The Peanut Marketing Board established under "The Primary Producers' Organization and Marketing Acts," and the rules of the Association provide that the directors shall be the members from time to time of the Board. By this means the Association has been able to provide storage accommodation for the Board at Kingaroy, Rockhampton and Atherton.

Pests and Diseases.*

Since the commencement of peanut growing on a commercial scale in Queensland, the activities of insect pests in the crop have, from time to time, attracted attention. Compared with some other cultivated crops the toll taken by insects in peanuts is relatively light. However, some species can at times cause considerable damage. They are pea mite, white grubs, brown scarab beetle, crown borer, corn ear worm, green vegetable bug, and mealy bugs. Two minor pests are red-shouldered leaf beetle and a small scarabeid beetle.

The diseases of peanuts are of much greater importance, one of them, crown rot, being frequently responsible for greatly depleted stands. The control of this disease depends on both seed treatment and on cultural conditions which maintain a good soil structure. Crop rotation is discussed elsewhere in this article and the adoption of the practices there recommended will minimise the risk of loss from crown rot. The fungus *Sclerotium rolfsii* causes a rot of mature or nearly mature plants which is regarded as a serious disease. Other diseases, including leaf-spot, wilt, bunchy plant and spotted wilt, are less serious.

Further information on pests and diseases of peanuts is contained in Departmental publications which can be obtained on application.

* Notes contributed by the Science Branch.

The Effect of Pasture Management on White Clover.

O. L. HASSELL, Senior Adviser in Agriculture.

THE solution of many pasture problems lies in good management. Good management requires that the farm should be well subdivided into small paddocks, so that pasture renovation, rotational grazing, rotational cropping, manure spreading and harrowing, and cutting or heavy grazing of pastures at certain periods may be carried out efficiently.

The plant foods usually employed for stimulating pasture growth are phosphates and nitrogen. Phosphates assist the root development of the grasses and legumes, and the nitrogenous fertilizers are especially valuable in promoting the leaf growth of grasses. Phosphates are applied to the soil in the form of superphosphate, but the nitrogen is best supplied by incorporating a legume with the pastures.

The problem in most Queensland pastures is to provide a protein-rich supplement to the ordinary carbohydrate-rich grasses. The productivity of a grass growing in association with a legume is higher than that of the same grass growing in a pure stand, so that mixed pastures of a grass and a legume, in addition to having a higher feeding value than single type pastures, may be expected to yield more heavily than pure grass stands.

Many coastal farmers in southern Queensland are able to make good use of white clover as a legume for the improvement of their pastures, but good management is necessary to make the most effective use of this plant.

A Brisbane District Example.

A striking example of how pasture management may be employed to maintain white clover in paspalum paddocks is provided on the "Brookland" farm of Mr. W. S. Conochie at Sherwood, in the Brisbane district. Seen in September, 1950, most of the pasture contained an extremely useful proportion of white clover. In several paddocks which had been closed to stock for some weeks, the clover was in full flower, about twelve inches high and suitable for haymaking.

According to Mr. Conochie, small patches of clover were first noticed growing in watercourses on the property about 1925, and since then it has spread over the whole property, the seed being carried by stock.

The pasture managment on this farm might well serve as an example to other farmers whose land can grow clover. The essential features of Mr. Conochie's system are:—

(*a*) Subdivision and rotational grazing;

(*b*) Control of summer growth of paspalum by mowing or stocking to ensure that white clover will develop well in the winter and spring months;

(*c*) Manure spreading and mowing to check weeds or patches of coarse grass growth, as required at any time of the year.

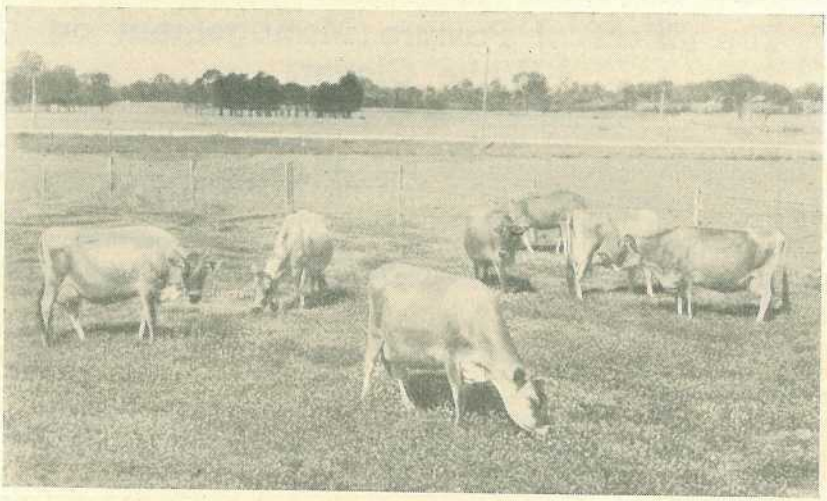


Plate 56.

Jersey Cows Grazing on Paspalum-White Clover Pastures at "Brookland," Sherwood.

Photo by "Queensland Country Life."

The property covers 65 acres, of which there are 12 acres of swampland. The remainder of the farm is sub-divided into small paddocks which average about 2½ acres each, the largest being four acres. Fodder crops are cultivated on eight acres, the rest being under pasture. Fourteen acres of managed pasture provide all the grazing for 24 head of high producing, milking Jersey cows. The balance of the pasture is used for dry cows, young stock and working horses, totalling an additional 40 head.

On the cultivation, either a pure stand or a mixture of wheat and field peas or tares is grown each year for winter and spring fodder, followed by summer crops of maize and cowpeas, also for green fodder. When summer pasture is abundant, the cowpeas are not cut for fodder but are ploughed in as a green manure crop. The guiding principle of the cropping system is to plant the crops at regular intervals of time in order to provide a reserve of green fodder for stall feeding to the milking cows throughout the year to the fullest extent that seasonal conditions will allow.

Effect of Mowing.

The pasture paddocks on which it is desired to have a good clover growth are mown twice during the summer months. If there is a good growth of grass at the time of mowing, the mown grass is made into hay, raked and stored in the hay shed for later feeding to the herd. Usually the first cutting is made between early December and late January and the second mowing is made in the February–March period. The exact time of mowing is dependent on the type of summer rainfall season experienced. Different paddocks are mown each year. Some judgment needs to be exercised in determining how large an area of the summer pasture should be mown. Too large an area may be a disadvantage, as a dry winter and spring may result in pasture shortage. Under these conditions, removal of the grass cover causes a

rapid drying out of the surface soil and the mown pasture does not then make much growth. Of the 14 acres of managed pasture on Mr. Conochie's farm, up to eight acres may be mown twice in the summer season. Failure to carry out summer mowings on paddocks where there is a heavy growth of paspalum usually results in smothering of the clover regrowth in the following winter.

Plate 57.
Clover Development in a Paddock Mown in December and February.

Plate 58.
Paddock Mown Only Once (Early December). Clover is not so evident as in paddocks mown twice in summer.

Heavy stocking on the summer pasture, of course, will achieve a similar effect to mowing, although in this case a light mowing is also usually resorted to in order to cut back any weeds and patches of rank grass growth. The mown material is left lying in the paddock.

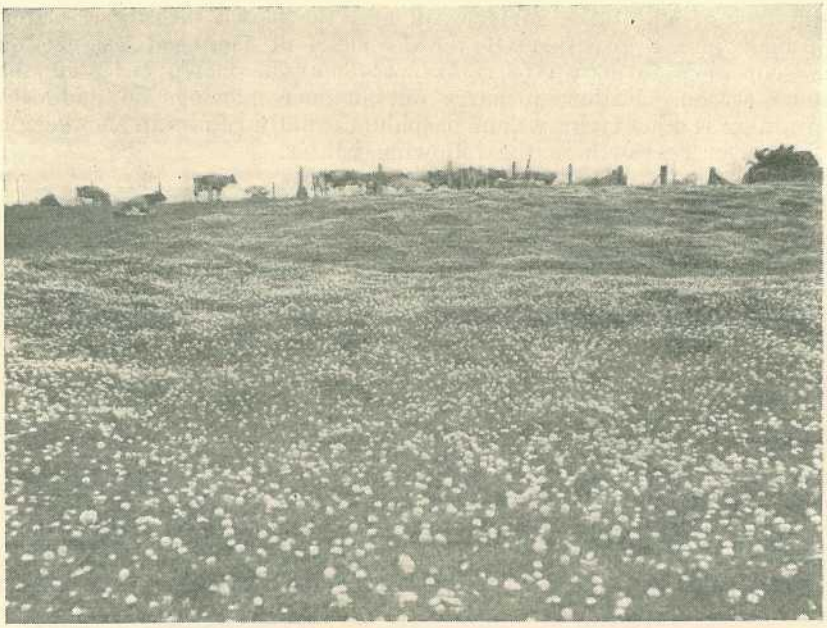


Plate 59.
Clover Development Resulting from Close Grazing During Summer.

Other advantages claimed for mowing the paspalum are, firstly, that seeding of the paspalum is delayed, thus apparently reducing the occurrence of ergot; and, secondly, that mowing results in a greater production of young protein-rich, palatable grass while growing conditions are favourable.

The pasture paddocks are regularly worked over following rain with a home-made clod crusher slide, frequently with a harrow attached behind, in order to break up and distribute cow manure. Attention to manure spreading is a feature of pasture management on this property.

The virtues of pasture management are well illustrated by the fact that a paddock less than an acre in area, which developed a heavy growth of clover in the winter, provided grazing for 20 milking Jersey cows for half an hour, night and morning, for a fortnight before it required spelling. Stock were removed on 22nd August and by 16th October the pasture was about four inches high and suitable for light grazing again. It was allowed to stand over, however, and when inspected on 17th November there was a lush growth of an excellent mixture of paspalum and white clover, averaging 10 inches in height.

Pasture hay is made on this property whenever there is a suitable opportunity. The growing conditions of the winter and spring of 1950 enabled an excellent cut of clover hay to be made in August and of a mixture of paspalum and clover hay, containing some burr medic, in October. Mr. Conochie finds that grass hay is a very useful supplementary feed, especially when clover growth is at a peak in the winter and spring months, as it checks scouring in the cows.

Although the provision of protein-rich pasturage and the utilization of pasture hay and farm grown green fodder crops constitute the foundation of Mr. Conochie's stock feeding system, he still finds it necessary and profitable to purchase and feed additional concentrates to make the fullest use of the high producing capacity of his herd.

Horticultural Districts of Queensland.

6. The Burnett and Adjacent Coast.

A. A. ROSS (Horticulturist) and S. J. KUSKIE (Inspector, Diseases in Plants Acts).

THE Burnett River drains an area of approximately 15,000 square miles, its watershed being bounded on the west by the Auburn Range, which is about 150 miles from the sea, on the north by the Dawes Range, and on the south by Craig's Range (Plate 60).

The Burnett flows through open forest country of a sub-coastal tableland (Plate 61) for the greater length of its course and breaks through a gap in the Coast Range and descends on to the coastal plain to run into the sea at Burnett Heads. At its mouth it is sufficiently deep to admit coastal shipping to the city of Bundaberg, which is some six miles from the sea.

The Burnett district assumes the general form of a coastal plain from 30 to 50 miles wide rising to a sub-coastal tableland which extends a further 100 miles to the west. The eastern edge of this tableland is bounded by the Coast, Bin Bin and Burnett ranges and the western edge by the Auburn Range, which is part of the Great Dividing Range. This tableland is 397 feet above sea level at Biggenden, and rises gradually to Monto (774 feet) in the north-west, and to Wondai (1,058 feet) in the south. On this sub-coastal tableland, grazing, dairying and general agriculture are the main rural pursuits, while horticultural crops are grown on specially selected sites. Biggenden, Gayndah, Mundubbera, Eidsvold and Monto are the chief towns in that portion of the district usually referred to as the Central Burnett, and Kingaroy, Wondai, Murgon and Goomeri are the main centres in the South Burnett.

In the north, the coastal plain is traversed by several relatively short rivers, which rise in the Coast Range. In the south, the Mary River, which is comparable to the Burnett in size, runs northwards, roughly parallel to the coast, and receives several streams of moderate size which rise in the Coast Range. A comparatively large propor-

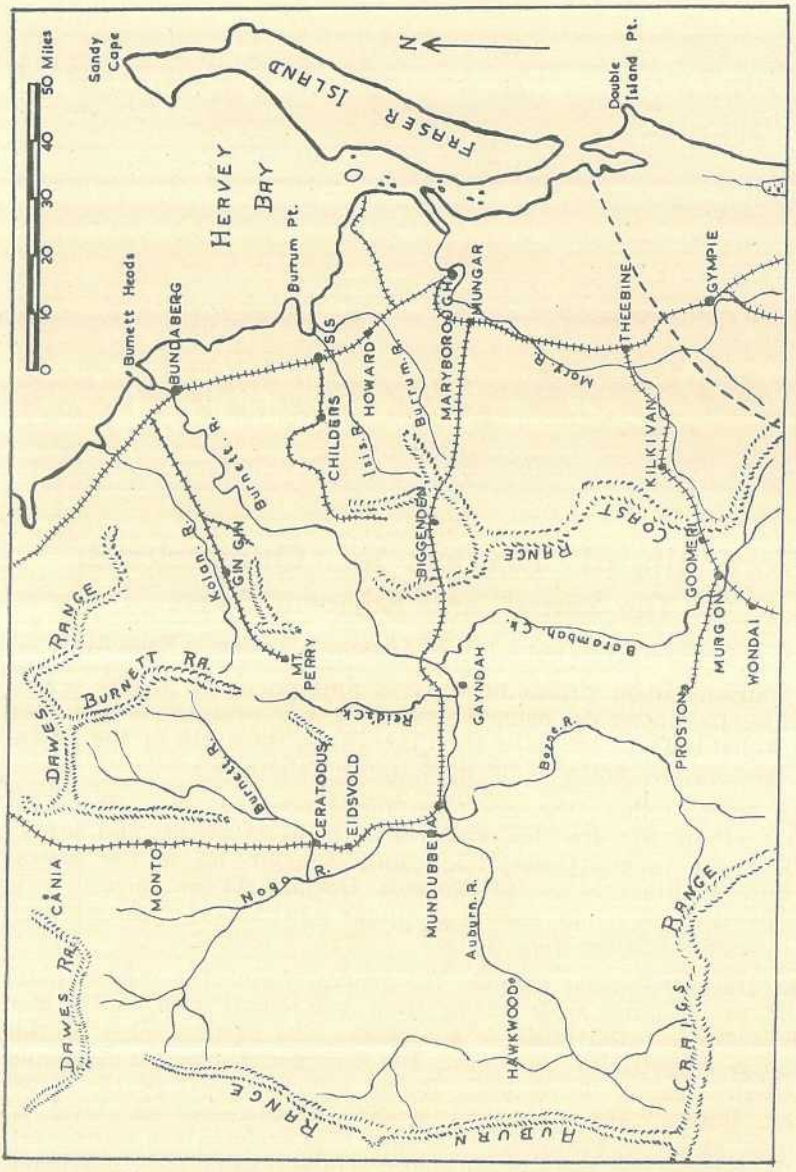


Plate 60.

Sketch Map of the Burnett District. The south-eastern corner forms part of North Coast District.

tion of this coastal area is devoted to sugar cane growing and dairying, and horticultural industries have not been greatly developed. The cities of Bundaberg and Maryborough, each with a population of approximately 15,000, and several smaller centres such as Gin Gin, Childers, Howard, Pialba and Urangan, are located on the coastal plain.

The district is well served by railways and roads. The main north-south railway passes through the principal coastal towns, and branch lines leaving the main line at Theebine, Mungar, Isis and Bundaberg provide access to the South Burnett, Central Burnett, Isis, and Mount Perry areas, respectively.

Plate 61.

The Burnett River Near Gayndah.

CLIMATE.

The district lies between latitudes 24½ and 26½, so the climate (Table 1) may be referred to as sub-tropical. The climate of the coastal plain country is greatly influenced by the proximity of the sea, there being no natural barrier to the prevailing easterly winds. This tends to restrict the temperature range, making heavy frosts in winter rather exceptional and high summer temperatures infrequent. Further inland, winter frosts increase in both frequency and severity with altitude and distance from the sea, while summer temperatures are higher and sustained for longer periods. As is to be expected, relative humidity is generally higher along the coast.

Rainfall in coastal towns ranges from 40 to 50 inches annually, and inland from 25 to 30 inches. It occurs mainly in late summer, and particularly during late January and February. It is the rule for spring weather to be dry and this is liable to have a deleterious effect on fruit crops which are not irrigated.

NATIVE VEGETATION.

There is a marked difference between the vegetation on the coastal plain and that on the sub-coastal tableland. The former comprises four main types of formation, namely:—

(1.) Coastal sand dune flora, including rank grasses of poor fodder value and trees such as the coastal sand cypress (*Callitris columnellaris*), sometimes known as cypress pine, casuarinas and banksias.

TABLE 1.

METEOROLOGICAL DATA FOR THE BURNETT DISTRICT.

—	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Year.
Mean Maximum Temperature (°F.)													
Bundaberg	85·6	85·7	84·1	81·4	76·6	72·6	71·9	73·7	77·3	80·5	83·4	85·8	79·9
Gayndah	89·8	89·4	87·1	83·8	77·9	72·6	71·8	74·8	80·9	85·9	89·6	91·1	82·9
Maryborough	86·3	85·8	84·0	80·7	75·7	71·8	70·8	73·1	77·6	82·0	85·3	87·2	80·0
Mean Minimum Temperature (°F.)													
Bundaberg	69·5	69·4	67·0	62·4	55·3	51·9	48·7	49·9	55·3	60·6	65·2	68·9	60·3
Gayndah	66·2	66·3	62·6	56·1	48·0	44·4	41·2	42·3	48·7	55·6	61·4	65·4	54·8
Maryborough	68·2	68·4	66·0	61·4	54·0	51·2	46·6	48·2	53·8	59·0	63·8	67·3	59·0
Mean Relative Humidity (%)													
Bundaberg	70	71	73	71	72	75	73	70	65	63	62	64	69
Gayndah	66	68	68	65	65	68	66	62	59	58	59	62	64
Maryborough	70	73	74	75	74	77	74	70	64	61	62	64	70
Average Rainfall (points)													
Bundaberg	920	619	519	312	263	296	180	131	164	199	246	493	4,342
Gayndah	479	431	307	141	157	189	144	118	157	233	281	411	3,048
Maryborough	731	667	596	378	302	308	186	169	194	269	313	502	4,615
Monto	432	411	357	160	184	171	206	94	95	208	309	341	2,948

(2.) Wallum, which includes a dense growth of relatively short growing shrubs, such as leptospermum, boronia, and epacris, together with short twisted trees such as banksia and tea trees (species of *Melaleuca*) and grass trees (species of *Xanthorrhoea*).

(3.) An open forest formation containing a variety of eucalypts, of which red bloodwood (*E. corymbosa*) and stringy bark (*E acmenioides*) are predominant, accompanied by a range of wattles, banksias, tea trees and grass trees.

(4.) On the ridges rising towards the Coast Range, a denser forest formation containing tall straight trees of excellent milling quality; prominent species are spotted gum (*Eucalyptus maculata*), red bloodwood, flooded gum (*E. saligna*), tallow-wood (*E. microcorys*), and southern kauri pine (*Agathis robusta*).

The inland country of the Burnett district is mostly open fores which carries a comparatively dense cover of native grasses such as Queensland blue (*Dichanthium sericeum*), Burnett blue (*Bothriochloa intermedia*), bunched spear (*Heteropogon contortus*), and three awned spear (*Aristida striata*). Several introduced grasses are thriving well in this district, namely Rhodes (*Chloris gayana*), green panic (*Panicum maximum* var. *trichoglume*), and buffel (*Cenchrus ciliaris*). The trees in this country are mainly those which withstand drought well, such as grey ironbark (*Eucalyptus paniculata*), narrow-leaved iron-bark (*E. crebra*), silver-leaved ironbark (*E. melanophloia*), grey box (*E. hemiphloia*), poplar box (*E. populifolia*), Moreton Bay ash (*E. tesselaris*), and numerous wattles. On poorly drained flats with heavy soils, brigalow (*Acacia harpophylla*) is a common tree. Along the rivers and creeks a typical river bank flora is developed which includes blue gum (*Eucalyptus tereticornis*), Moreton Bay ash, Portuguese elm (*Celtis sinensis*), tea trees, and several figs.

SOILS.

As is to be expected in so large an expanse of territory, a wide range of soil types is found, and in the development of the country, land usage has followed the distribution of the various types of soils. The poorer, shallower soils capable of carrying only a fair grass cover are devoted to grazing on a wide scale. Better class soils with a clay-loam texture are used for the production of agricultural crops, while horticultural crops are confined to specially selected soils which lend themselves to intensive systems of management.

On the coastal plain, the soils used for the production of horticultural crops can be broadly grouped into three classes:—

(1) Alluvial soils, which are for the most part light textured, deep and well drained. They occur along the coastal rivers, and at points above tidal influence are adjacent to good supplies of water for irrigation. It is this soil type which is used mostly for citrus growing in the Howard-Burrum-Torbanlea district.

(2) Volcanic residual soils, mostly red in colour, which occur in isolated places, usually on hilltops or overlying a basaltic flow. The largest development of this type is in the vicinity of Bundaberg on the slopes of the Hummock. These soils

are well supplied with plant nutrients and frequently have a good supply of underground water. They are suitable for a wide range of horticultural crops, including vegetables, bananas, pineapples, and sub-tropical tree fruits.

(3) Medium textured, light coloured, residual soils derived from sedimentary rocks such as shales and sandstones. These are relatively shallow and not suitable for tree crops. They frequently occur on elevated slopes where the frost hazard is reduced, and conditions are suitable for pineapples.

In the inland portion of the district two main soil types are used for horticultural purposes. Other soils would probably be satisfactory for vegetables but they are not used extensively for this purpose. Soils of horticultural interest at present are:—

(1) Alluvial river bank soils of light texture, free drainage and great depth. Approximately 25 years ago most of these were over-run by prickly pear, but numerous citrus orchards now flourish on them.

(2) Volcanic residual soils, generally red in colour, loamy in texture and well supplied with plant foods. They are generally developed on plateaux or spurs of the main ranges and are well protected against frost. They are frequently used for tropical fruit crops such as bananas, pineapples and passion fruit, and provide a source of these fruits for local consumption.

HORTICULTURAL CROPS.

Citrus.

All species of commercial citrus fruits are grown in the district and the locations most commonly chosen for orchards lie close to the rivers or subsidiary creeks (Plate 62). There are two reasons for this. Firstly, in such places the soil is most suitable, being deep, of light texture and well drained. Secondly, for best results, the natural rainfall needs to be supplemented by irrigation; although the total annual rainfall is above 25 inches, its distribution is somewhat erratic and in most years a dry spring is experienced.

Plate 62.

Citrus Orchard at Burrum. Young trees in foreground; older trees behind.

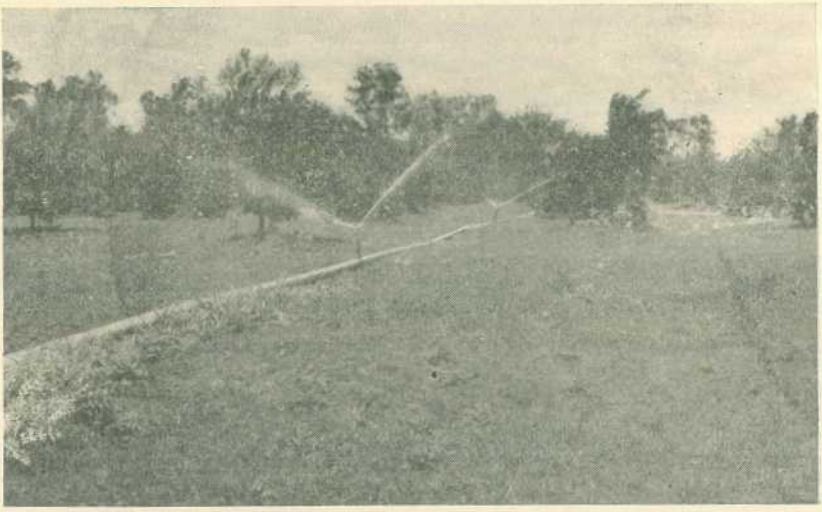


Plate 63.

Overhead Irrigation in Citrus. Irrigation ensures consistent cropping in most varieties and is particularly necessary in a dry spring or early summer.

Citrus growing is well-developed in the Central Burnett in the vicinity of the towns of Biggenden, Gayndah, Mundubbera, and Eidsvold. Here, the orchards are all serviced with irrigation, the plants being owned and operated by individual growers. The water is pumped direct from watercourses and is applied in all cases by means of portable spray lines (Plate 63). In this area high grade navel oranges and lemons are produced, while mandarins also thrive particularly well. Mid-season and late varieties of oranges, such as Joppa and Valencia, are grown only to a limited extent, the early varieties being preferred. The main lemon variety is Villa Franca, the Lisbon having fallen into disfavour on account of its thorniness. Glen Retreat and Ellendale (Plate 64) are the chief mandarin varieties, and both are in demand on southern and export markets. Grapefruit mature early in this district and usually are marketed in southern cities towards the end of March.

On the coast, the Howard-Burrum-Torbanlea district produces approximately the same quantity of citrus fruits as the Central Burnett. Here, however, mandarins and mid-season and late oranges are the main commercial lines. Most orchards are situated on the banks of the coastal rivers, particularly the Burrum, but several have been established on selected sites away from the watercourses where the soil has been found suitable. Irrigation is not generally practised in this area as the coastal rivers are tidal for many miles from their mouths and only those properties above salt-water mark and those with a dam or some other storage structure possess irrigation facilities. In this part of the district the principal varieties of citrus grown are Emperor mandarins, and Joppa and Late Valencia oranges. Navel oranges do not set profitable crops in many seasons, while lemons are troubled with gum diseases and do not develop as good a quality as they do further inland.

Plate 64.

Ellendale Mandarin. A late maturing variety which thrives in inland areas and is very popular on southern markets.

Plate 65.

Pineapple Plantation at Nikenbah. The soil is a basaltic loam not far from the coast.

Pineapples.

Pineapples are grown mostly on the coastal plain on ridges where frost is not particularly severe. Largest plantings are in the Nikenbah area in close proximity to the sea on hilly country of volcanic origin (Plate 65). Around Aramara, on the foothills of the Coast Range, an area of frost-free land with suitable soil produces pineapples of a high standard. There are also several excellent pineapple plantations in the Bundaberg area on relatively flat land.

In the inland portions of this district, only the plateaux are suitable for pineapple culture, as low-lying land is subject to frosts which are sufficiently severe to prevent the growth of the crop. Several of these plateaux are found throughout the district, carrying a soil of volcanic origin, usually red in colour, and very fertile when first cleared of the heavy vegetation which it supports in its natural state.

Bananas.

To a great extent, bananas are grown on similar sites to those used for pineapples, that is, on coastal hillsides (Plate 66) and inland plateaux. Inland, the rainfall is rather too light to produce vigorous growth and consistently high yields. Tall growing varieties such as Lady Finger and Sugar are most successful, but there is scope for the introduction of a plant improvement programme to provide better planting material.

Plate 66.

Lady Finger Bananas. Tall varieties such as Lady Finger do well near the coast.

Vegetable Crops.

Large scale truck-crop growing has not developed in this district, due mainly to the absence of big local markets. Several small market gardens are found close to the towns, but only in the Bundaberg area are vegetable crops grown to any extent for marketing elsewhere. Here, beans are grown as a winter crop, mostly under irrigation, the principal variety being Brown Beauty. Odd crops of tomatoes are grown, usually on a small scale, for southern markets.

Macadamia Nuts.

The Macadamia or Queensland nut grows wild in the hilly country of the Coast Range and several commercial plantations have been developed from the seed of these native trees (Plate 67). For

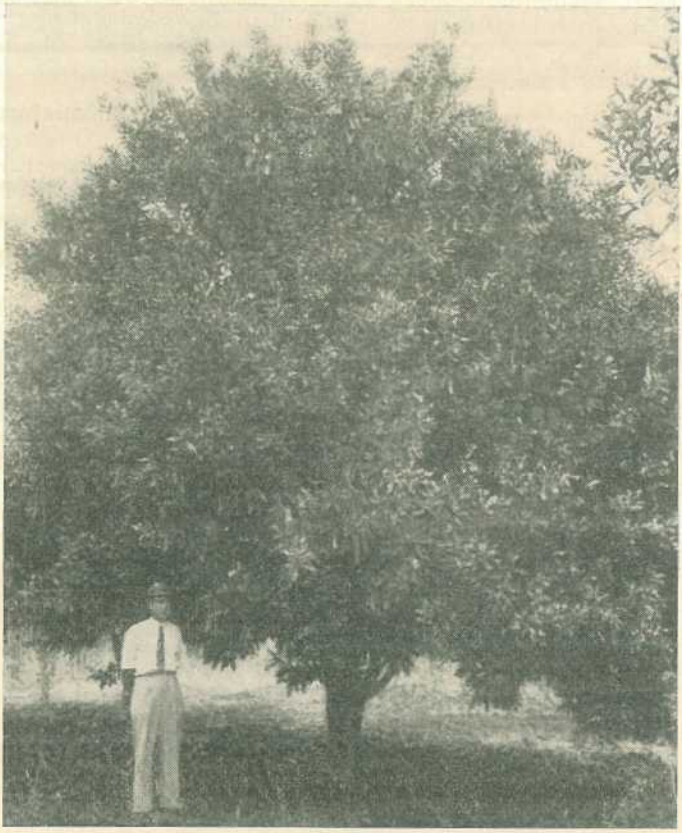


Plate 67.

Macadamia Nut Tree. The tree is native to the coastal scrubs and is grown on an orchard scale to supply expanding markets.

the most part, the smooth leaf or integrifolia variety is predominant in this area. Generally, smoothness and thickness of shell characterise this variety, and amongst them many attractive strains are found. The commercial plantations are all at present on the coastal plain and trees are growing very satisfactorily. However, there exists a wide range of types, several very desirable, but many somewhat poor, which is only to be expected within a population of seedlings. Superior strains have recently been selected and by asexual propagation of these it is expected that high yielding, uniform plantations will be established.

Passion Fruit.

Several areas of passion fruit are established in parts of the district, their location being decided mostly by freedom from frosts. Some excellent crops are produced in the Bundaberg district, and on

several of the plateaux of the sub-coastal tableland, growers have taken advantage of the comparative warmth of the situation. Unfortunately, woodiness, brown spot and Fusarium diseases have penetrated practically all these areas and regular rotational planting is necessary.

Rockmelons.

Rockmelons provide a very profitable sideline for citrus growers in inland areas, especially for those whose orchards are not yet bearing. Because of the lower rainfall and relative humidity of inland compared with coastal areas, the incidence of mildew is not severe and in most seasons crops can be raised successfully. The netted varieties such as Hales Best are preferred and these are usually marketed towards the end of November and early December, when they meet a ready demand in southern capitals.

POTENTIALITIES.

There is not a great area of virgin land suitable for citrus growing available in the present main areas of production. That which remains is mostly in small broken areas where working methods would be complicated. While much suitable soil is to be found along the upper reaches of the Burnett River, low winter temperatures are liable to cause heavy losses from frost. The town of Eidsvold approximately marks the upper boundary of successful citrus production.

Greatest scope for horticultural expansion in this district lies in the development of the production of sub-tropical fruits, such as avocadoes, Macadamia nuts and custard apples, and vegetables. The area most suitable for such expansion is on the coastal plain north from Maryborough. Development will proceed provided irrigation facilities and worthwhile markets are available.

In the country adjacent to Bundaberg, not assigned to sugar cane, the comparative mildness of the climate should allow the successful production of many varieties of truck crops, especially those which lend themselves to transport to southern markets, and tropical fruit such as pineapples and the tall growing varieties of bananas. A frequent air service operating between the coastal cities and southern capitals should result in the commercial production of strawberries.

The whole of the district is subject to recurring droughts and consequently the horticultural industries can only be made safe by the provision of reliable irrigation. While the total annual rainfall is sufficient to support most crops, its monthly distribution is very erratic and periods of temporary droughts are frequent. Also, rainfall varies considerably from year to year, and in all years irrigation is a necessity if high production of quality goods is to be achieved.

MARKETING.

Most of the fruit produced in this district is marketed on distant markets and consequently must be carefully packed in standard containers. Citrus growers all operate their own packing sheds which, for the most part, are well equipped with up-to-date machinery. In no part of the district is co-operative marketing attempted.

There are two market agents in Bundaberg and one in Maryborough who sell produce daily by auction. These are relatively small establishments designed mainly to meet the needs of local retailers. Vegetable crops are almost entirely marketed through these channels at present.

In Maryborough there is a factory which processes certain of the raw products of the district, producing such things as candied peel, marmalade, pickles, and orange wine.

PRODUCTION STATISTICS.

Current production of horticultural crops in the Burnett district is summarised in Table 2. The more interesting points to be noted are the present importance of citrus and pineapples and the scope for expansion in the area under sub-tropical tree fruits and vegetables.

TABLE 2.

HORTICULTURAL PRODUCTION—BURNETT DISTRICT (1948–49).

FRUIT.

Crop.	Not Bearing.	Bearing.	Production.
	Trees.	Trees.	
Citrus—			
Navel Oranges	9,284	9,388	41,505 bush.
Valencia Oranges	9,429	14,492	31,011 bush.
Other Oranges	6,508	16,140	34,976 bush.
Lemons	3,909	10,555	43,534 bush.
Mandarins	10,331	37,834	80,764 bush.
Grapefruit	1,941	2,697	12,881 bush.
Other Citrus	129	45	29 bush.
Other Orchard Fruits—			
Custard Apples	351	755	1,494 bush.
Mangoes	423	653	1,319 bush.
Nuts	267	476	6,100 lb.
Other Orchard Fruit	301	116	55 bush.
	Acres.	Acres.	
Grapes (Table)	1	18	15,135 lb.
Plantation Fruit—			
Bananas	73	88	4,619 1¼ bush. cases
Pineapples	198	415	85,784 1½ bush. cases
Papaws	15	45	7,820 bush.
Passion Fruit	16	16	4,286 half-bush. cases
Strawberries	..	1	658 lb.

VEGETABLES.

Crop.	Acreage.	Production.
Potatoes	459	964 tons
Sweet Potatoes	20	63 tons
Turnips	18	60 tons
Carrots	12	654 cwt.
Beetroot	11	519 cwt.
Onions	3	5 tons
Tomatoes	62	10,973 half-bush. cases
French Beans	115	7,695 bush. cases
Green Peas	60	2,851 bush.
Cabbages	43	16,219 doz.
Cauliflower	15	1,226 doz.
Lettuce	1	130 bush.
Melons—Water	57	240 tons
Rock	118	523 tons
Pumpkins	429	1,160 tons
Marrows and Squashes	6	12 tons
Cucumbers	38	1,975 bush.

Approved Strawberry Runners.

FOR some years past the Department of Agriculture and Stock has been operating an approval scheme for strawberry runners designed to reduce the incidence of strawberry virus diseases and to improve the general quality of strawberry planting material.

The crops of the following growers were inspected during the past season and found to be free or practically free from virus diseases and to be grown under good cultural conditions. These growers may now sell their runners as "Approved by the Department of Agriculture and Stock."

Grower.	Address.	Variety.
L. Kocho	Image Flat road, Nambour	Phenomenal
W. B. Stuffins	Pringle road, Nambour	Phenomenal
W. Thomas	West Woombye road, Woombye ..	Phenomenal
C. Armstrong	Old Bowling Green road, Palmwoods ..	Phenomenal
G. Armstrong	Old Bowling Green road, Palmwoods ..	Phenomenal
J. Bowden	Old Bowling Green road, Palmwoods ..	Phenomenal
C. L. Tompkins ..	Old Bowling Green road, Palmwoods ..	Phenomenal and Aurie
A. H. Rann	Western road, Montville	Phenomenal and Aurie
J. Wilson	Western road, Montville	Phenomenal and Aurie
R. B. and G. G. Deans ..	Zillmere road, Boondall	Phenomenal
W. Sulnman	Sandgate road, Boondall	Phenomenal
J. B. McLauchlin ..	Upper Mount Gravatt	Phenomenal
G. W. Franklin	Mains road, Sunnybank	Phenomenal
W. A. Mackley	Brandon road, Runcorn	Phenomenal
W. J. Akers, Jnr. ..	Underwood road, Eight Mile Plains ..	Phenomenal
A. Fels	Underwood road, Eight Mile Plains ..	Phenomenal
E. H. Lambley	Birkdale	Phenomenal
D. J. Brown	Cleveland	Phenomenal
L. H. Keating ..	Pinklands, *via* Cleveland	Phenomenal
G. E. Lax	Pinklands, *via* Cleveland	Phenomenal

1951 SHOW DATES.

February.

Warwick .. 7, 8 and 9
Clifton .. 22 and 23

March.

Pittsworth .. 6 and 7
Killarney .. 9 and 10
Oakey .. .. 16 and 17
Sydney .. 16 to 27
Chinchilla .. 29, 30 and 31

April.

Tara .. .. 3 and 4
Miles .. .. 5, 6 and 7
Wandoan .. 9 and 10
Toowoomba .. 14 to 19
Blackbutt .. 20 and 21
Jandowae .. 23 and 24
Dalby .. .. 26, 27 and 28
Monto .. .. 27 and 28
Warrillview .. 28

April—continued.

Nanango .. 26, 27 and 28
Goondiwindi .. 28 and 30
Taroom .. 30, May 1 and 2

May.

Kingaroy .. 3, 4 and 5
Barcaldine .. 3 and 4
Beaudesert .. 4 and 5
Wallumbilla .. 4 and 5
Mundubbera .. 4 and 5
Longreach .. 8, 9 and 10
Roma .. .. 9 and 10
Ipswich .. 8, 9 and 10
Murgon .. 10, 11 and 12
Mitchell .. 16 and 17
Blackall .. 15, 16 and 17
Thangool .. 17 and 18
Marburg .. 18 and 19
Kilkivan .. 18 and 19
Charleville .. 23 and 24

[*Continued on page* 115.]

PLANT PROTECTION

Pasmo Disease of Linseed.

T. McKNIGHT, Pathologist, Science Branch.

THE following notes on pasmo disease will acquaint linseed growers with the symptoms of this disease and with the measures at present available for its control. As the disease has only recently appeared in Queensland, investigational work is in a preliminary stage. However, determinations of the resistance of individual plant selections from the varieties Walsh and Golden Viking are being made, in addition to the testing of new linseed varieties for their resistance to this disease. Certain other avenues likely to lead to effective control, such as the influence of time of planting and the use of recently developed seed treatments, are being explored by officers of the Department of Agriculture and Stock.

Pasmo disease, caused by the fungus *Sphaerella linorum*, appeared for the first time in Queensland in maturing crops of Walsh on the Darling Downs in November, 1949. This highly infectious disease quickly established itself and spread with great rapidity under conditions of showery weather and high humidity. In the crop harvested late in 1950, no disease-free crop has been detected in the Darling Downs, Kingaroy and Lockyer Valley districts, where the bulk of Queensland's linseed is produced.

The disease is present in practically all of the linseed growing countries of the world. In Australia, it appeared in Victoria in 1940 and was recorded for the first time in New South Wales in 1948.

In Queensland, good conditions for the development of the fungus early in the life of the crop result in stem girdling near ground level and the death of the main stem, and losses from this disease may then be of the order of 5 to 50 per cent. Fortunately, the disease is more often confined to the post-flowering period, and if the bolls are well developed at the time of attack, although the plant may be severely blighted at harvest time, the yield may not be materially reduced. However, a severe attack at the commencement of this period results in the production of light-weight, crimped and shrivelled seed which is frequently discoloured, as well as in a proportion of the bolls failing to set.

Symptoms.

The earliest symptoms of the disease are shown by the seed leaves and young true leaves, on which small brown lesions appear. Generally no further symptoms are noticed until the flowering and post-flowering periods, but in several crops in 1950, when the stems were a foot or more in height a single pasmo lesion which encircled the stem was formed near ground level and resulted in the collapse of the plant.

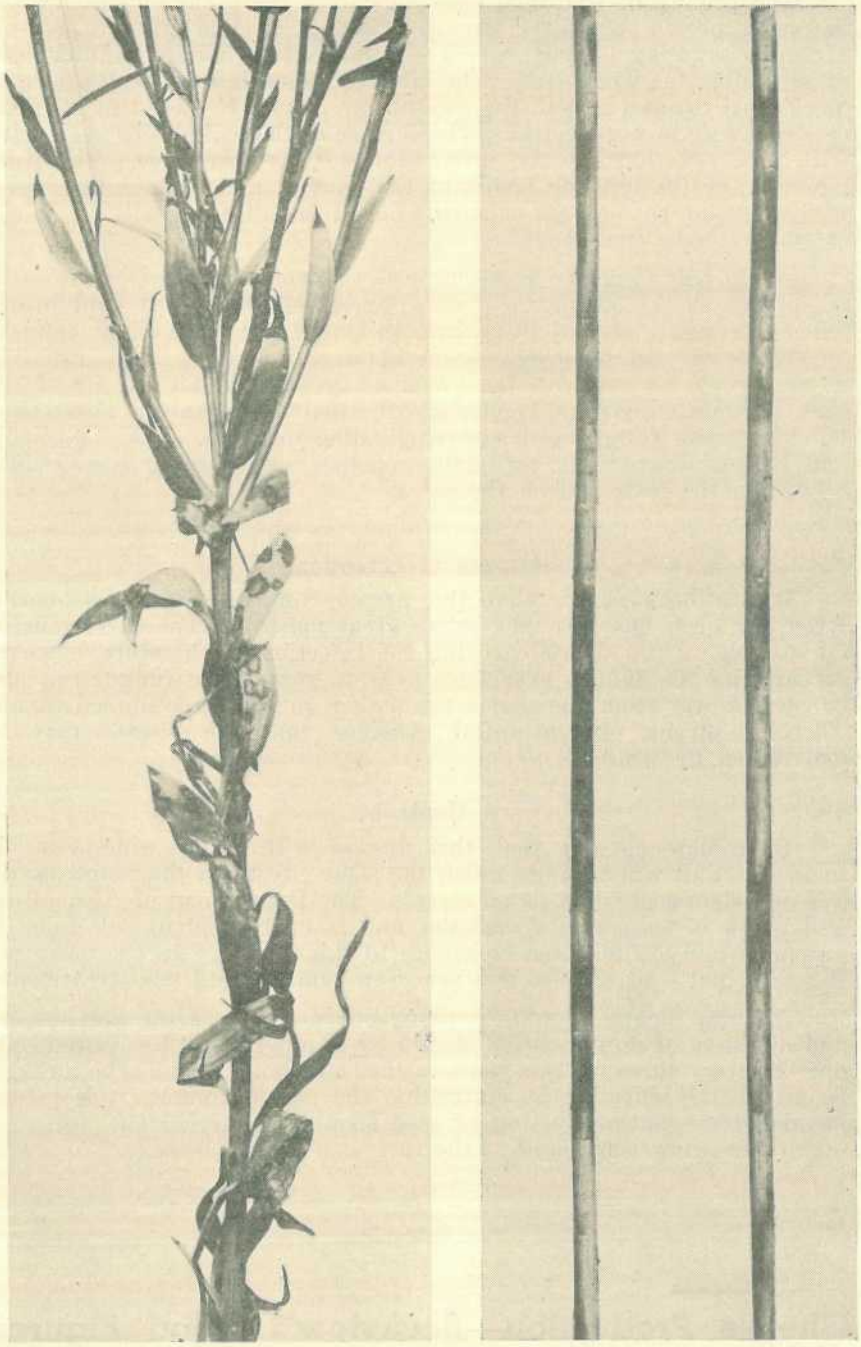


Plate 68.

Symptoms of Pasmo Disease of Linseed. Left, spotting and destruction of leaves. Right, stem markings.

The prominent leaf symptoms appear as the plant approaches the flowering period, when the fungus produces circular grey to greyish brown spots (Plate 68, left) which soon merge to produce irregular dead areas, killing the whole leaf. The infected leaves become dark brown to black, curl up and fall to the ground, or adhere to the stem by their whole surface in wet weather. The surface of the leaf lesions is studded with numerous black spots, just visible to the naked eye. These are pycnidia, or the fruiting bodies of the fungus, and contain the spores which spread the disease. During moist weather tendrils of spores extend from the ripe pycnidia.

As the leaf blighting proceeds from the bottom of the stem upwards to involve the whole of the leaves, prominent elongated oval brown lesions commonly about half an inch in length (Plate 68, right) appear on the stems. In the early stages of stem infection, the alternating of the brown lesions with the green or greenish yellow colour of the stem produces a very characteristic mottled appearance. These stem lesions coalesce to form a dead area girdling the stem. Simultaneously, long lesions occur on the boll stalks together with more or less circular lesions on the bolls and on the calyx.

Sources of Infection.

It has been shown that the pasmo fungus can be seed-borne. After the crop has been harvested, great masses of spores remain on the stubble. Crop debris carrying the infection is, therefore, a means of carrying the fungus over from year to year. The fungus can also be carried over from one season to another on volunteer linseed plants. There is strong circumstantial evidence that the disease may be distributed by wind.

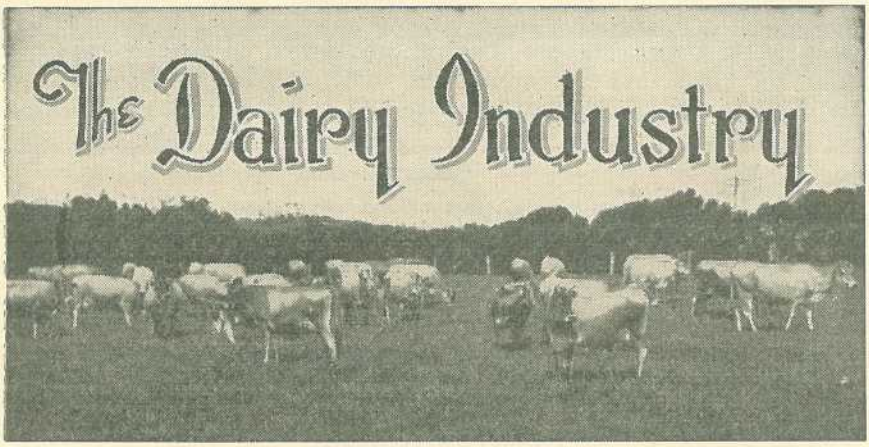
Control.

It is now obvious that this disease will be as widespread in incidence, and will produce much the same effects on the plant, as the leaf and stem rust fungi do on cereals. The Department of Agriculture and Stock is testing new varieties and is making plant selections in an endeavour to find some resistance to this disease. In the meantime the principal control measures are crop rotation and seed treatment.

All crop debris should be ploughed in deeply after the harvest, and a system of crop rotation should be employed, sowing linseed only once in every three or four years in the same land. While the measure is only partly effective in controlling the pasmo fungus, it is recommended that routine dusting of seed should be carried out, using an organic mercury compound at the rate of 3 oz. per bushel.

Cheese Production—Rockview's Good Figures.

The Rockview Cheese Factory made 96·97 per cent. first grade cheese and 3·03 per cent. second grade in the year 1949-50. The figures were given incorrectly as 76·25 and 23·75 in the December issue of the Journal.



Cream Defects—Probable Causes and Prevention.

E. B. RICE, Director of Dairying.

MOST defects which cause a lowering of cream quality are of bacterial origin, but some are caused in other ways. Every care should therefore be taken during production and while the cream is held on the farm to remove or minimise sources of contamination.

The common defects of cream, their probable causes, and methods of prevention are set out below. Any producer whose cream is being degraded at a factory should, by referring to the notes on the specific defect which is occurring in his produce, be able to bring about a prompt improvement in quality if the appropriate action is taken in connection with his milking shed methods.

Absorbed Flavours.

Caused by absorption of odours from nearby surroundings; engine exhaust fumes; coal tar; oil from engine or on separator block; smoke from dairy fire; paint; vegetables or fruit stored in dairy; kerosene; benzine.

Prevention.—Keep milking shed, separator room and dairy tidy; do not use the dairy for storage of anything other than milk or cream; lead exhaust away from dairy; and keep strong-smelling substances away from cream.

Albuminous.

Abnormal milk due to cow's physical condition; using cream of freshly calved cows; late lactation cream; cows wading in swamps.

Prevention.—Reject abnormal milk; wash thoroughly udders of cows which have waded in swamps (chlorine solution 100 parts per million is advised).

Bitter.

Certain weeds eaten by cows; milk from cows late in lactation; protein-attacking bacteria.

Prevention.—If due to food consumed, graze such pastures immediately after milking and keep cows away from suspected paddocks three hours before milking. Dry off any cow in an advanced stage of lactation which may be causing the trouble. (Test such cow's milk individually by holding for 24 hours and noting if bitter.)

Cheesy.

General insanitation (cheesy cream is always graded second or rejected); straining milk or cream through cheese-cloth; unclean machines. High temperature and infrequent delivery will accentuate this defect.

Prevention.—A complete overhaul of shed practices is indicated; avoid cheese-cloth strainers and use cotton filter discs; keep brushware clean by washing and drying; use only seamless utensils.

Cowy or Cowyard.

Unclean bails and yards, and bad drainage, the smell often being drawn through teat-cups, or taken up by cream stored in unsatisfactory surroundings; dirty udders and hands; milk from unhealthy cows, or cows milked too soon after calving; general insanitation.

Prevention.—Take the necessary precautions during and after production of cream to avoid contamination from the sources indicated. Reject abnormal milk from freshly-calved or sick cows. An overhaul of production methods is indicated if the cause is general insanitation.

Curdy.

High acidity caused by holding cream at too high a temperature; failure to blend cream properly; skimming too thin; leaving skimming dishes out of separator bowl; neglect to stir cream.

Prevention.—Separate cream to give at least a 36 test in winter and a 40-44 test in summer; cool cream; do not mix hot with cold cream; stir cream several times daily.

Disinfectant Flavours.

Odorous disinfectants used in shed or for washing cows' teats; handling disinfectants and not washing hands before milking; using salves, carbolic compounds, or other strong disinfectants on cows' udders.

Prevention.—Avoid using carbolic and other odorous disinfectants in the cowshed; carefully follow instructions if chlorine compounds are used in the dairy.

Feed Flavours.

Cows fed silage, lucerne, clovers (green, and as hay), mouldy or musty hay, turnips, onions, especially if within three hours of milking.

Prevention.—If practicable, flavour-tainting feeds should be fed straight after milking; remove cows from such feeds at least three hours before milking. Aeration and cooling tends to diminish feed flavour. Modern factory processing usually removes feed taints from cream.

Fermented, Gassy, Yeasty.

General uncleanliness, particularly due to yeasts and gas-forming bacteria; washing separator only once daily; improperly cared for milking machines; wood stirrer; mixing hot and cold cream; dirty yards and bails. Infrequency of delivery to factory and high temperatures aggravate these defects.

Prevention.—Production methods should be carefully revised; remove manure from yard daily; do not use rag strainers or wash-up cloths; use only seamless utensils. Clean utensils, clean hands, clean udders and cooling are the essentials of control.

Machine Taint.

Unclean and fat-saturated inflations and rubber tubing; unclean air pipeline and vacuum tank.

Prevention.—Carefully wash and steam-sterilize milking machine; renew perished inflations and rubber tubes; clean vacuum tank and airline.

Metallic.

Holding cream in vessels, the tinning of which is imperfect; rusty utensils; pitted milking machine pipelines; using kerosene tins for buckets.

Prevention.—Have faulty utensils retinned or replaced; avoid using rusty, broken or dented utensils; all dairy utensils should be seamless.

Overripe, Sour, High Acid.

Excessive acidity, due to failure to cool and hold cream at low temperature (not over 70 degrees F.); keeping cream too long on the farm or infrequent delivery to factory; use of unclean utensils, separator or milking machine; separating cream at too low a test; careless dairy methods.

Prevention.—Use thoroughly clean and near-sterile utensils; cool cream and keep cool; deliver to factory as frequently as practicable; separate cream at 40-44 test in summer and at least 36 test in winter; stir cream occasionally.

Rancid.

Result of advanced undesirable bacterial fermentation; cream is low second grade or reject quality.

Prevention.—Same methods as for cheesy defect apply.

Ropy.

Result chiefly of bacteria in water supplies, especially in swamps and dams. Cows pick up the "ropy" germs on their udders, and later they become established in the utensils and bails.

Prevention.—Stop access of cows to possible sources of contamination; wipe udders well (chlorine is advised); whitewash bails; clean up yard; thoroughly clean and sterilize utensils after use and rinse them with chlorine solution (100 p.p.m.) just before next milking.

Slimy.

Flushing separator bowl with hot water; use of too small separator; unhealthy cows; access to stagnant water; newly-calved cows.

Prevention.—Do not flush separator bowl with water; fence off stagnant water, in dams, swamps, &c.; reject milk of freshly-calved and unhealthy cows.

Stale.

Cream kept too long on farm; high temperatures aggravate this defect.

Prevention.—Cooling of cream and frequent delivery to factory; hygienic shed methods.

Tallowy, Oxidised.

Advanced stage of metallic defect; exposure of cream to direct rays of sun; placing cream in cans kept in sun; cream of excessive fat content.

Prevention.—As for metallic defect. Protect cream from the sun's rays; separate cream at 40-44 test in summer and at least 36 test in winter. Stir cream occasionally.

Unclean, "Off" Flavour, "Tainted."

Faulty shed methods, particularly the use of cheese-cloth or rags as strainers instead of cotton-wool filter discs; dirty milking machines; dirty udder cloths; wet-hand milking; imperfectly cleansed utensils; use of cloths for washing-up; dirty wash-water; leaky milk float in separator; unwashed separator; wooden stirrer; dirty manure-laden cowyard; milking machine airline.

Prevention.—Milk with clean hands; wash udders; reject cloth strainers and wash-up cloths, and use only brushes; use near-sterile utensils; cool cream; renew perished inflations and rubber tubing; deliver cream frequently to factory; follow recommended procedure in cleaning and steam sterilizing of milking machines.

Weedy Flavours.

Common cream-tainting weeds in Queensland are lesser swine cress (*Coronopus didymus*), Peppercress (*Lepidium* species), turnip weed or mustard weed (*Rapistrum rugosum*) and coral berry (*Rivina humilis*).

Prevention.—Complete removal of taint cannot be effected even in the factory, hence cream is usually second grade. Pasture management is the only means of prevention.

Cardinal Points in Cream Production.

Healthy, well-fed stock.

Abundant and pure water supply at milking shed.

Adequate supply of hot water for cleaning purposes.

Clean, near-sterile utensils.

Milking clean udders in clean bails; using clean hands.

Cool cream as low as possible, and keep cool.

Frequent delivery of cream to the factory.

Consult the district dairy officer, who will advise on any cream defect or on other points in dairy practice.

Let QUALITY be every dairy farmer's watchword.

The Aerial Transport of Feed for Floodbound Sheep.

G. R. MOULE, Director of Sheep Husbandry.

THE unreliable nature of the rainfall of the greater part of Queensland's sheep country is well known. For instance, districts whose average annual rainfall lies between 15 and 24 inches may receive as little as 6-8 inches in a year or as much as 12-15 inches in a single month. Generally the late summer rains (that is, those of January, February and March) are the most reliable and heaviest of the year. Winter rains are usually unreliable and light. Southern Queensland, however, has a more evenly distributed rainfall than the tropical areas since its winter rains, although less intense than summer falls, are fairly reliable.

Occasionally, as in the years 1891, 1906, 1918, 1941 and 1950, exceptionally heavy rains occur. Those in 1950 were of particular interest because they were preceded by a bounteous season in which the most widespread and heaviest rains ever recorded in the late spring and early summer occurred. These were followed by a series of five cyclones in late summer (early 1950) and further heavy falls in early winter, so by the end of June a large part of this country, which usually receives about 20 inches a year, had received more than 60 inches in the previous 18 months. By this time most of the inland rivers, which are characterised by a slow run-off, were full and the ground was saturated. Winter evaporation is low, so there was little chance of the ground drying out before early summer. Thus, when further heavy rains fell over south-eastern Queensland in July, severe flooding resulted, which became serious in the Condamine, Macintyre and Balonne River systems. The floods spread rapidly over the low-lying flats of the Western Darling Downs and Maranoa pastoral districts and on many properties sheep were isolated on small islets of land.

As the State's sheep population was below average, woolgrowers realised that it would be difficult to replace any animals lost in the floods. Moreover, many ewes were in lamb and some were carrying more than six months' wool. High prices were ruling for sheep and wool at the time, so woolgrowers decided to feed the isolated flocks on fodder dropped from the air.

Plate 69.

A View of Some of the Flooded Country in the Maranoa District.

Over 400,000 lb. of stock feed were dropped by one airline company alone, which undertook 60 flights, necessitating more than 300 hours' flying time.

In undertaking this work, some interesting problems associated with the aerial transport of feed to floodbound stock were encountered. The purpose of this article is to inform stock owners how aerial transport can be used most profitably under such circumstances.

GENERAL CONSIDERATIONS.

Throughout the operations D.C.3 aircraft were used. An aircraft is designed to fly at a certain maximum weight, referred to as the "all up weight," and for the D.C.3 this is about 26,950 lb. Therefore, planes of this type, which weigh about 16,500 lb., are capable of lifting a load of about 10,450 lb. Not all of this can be regarded as pay load (that is, the amount of stock food which can be carried on each flight) as the plane must carry sufficient petrol for the flight, the crew who fly it and the additional staff required to push the fodder out of the escape hatches.

Fuel consumption of D.C.3 freight planes varies with the strength and direction of the prevailing winds, the height at which the plane flies, and the number of times it has to attain that height from low altitudes during the course of its flight. The amount of petrol carried by the planes depends on the length and nature of the trip to be undertaken.

This means that the actual pay load decreases as the distance it has to be transported increases. During the operations described in this article, the planes carried an average of 6,500 lb. of feed each trip, but this ranged from 5,500 to 7,000 lb.

The flying time for each trip varied from 4 to 8 hours, with the average at about 6 hours. A flat rate of £50 per hour flying time was made for the charter of the planes, so the freight charge alone for the delivery of a load of feed to the average property was in the vicinity of £300.

These charges show the importance of using methods which will permit most efficient utilisation of the pay load available on every aircraft engaged on the work. The main factors to consider are the type of feed which is carried and the way in which it is packed.

SELECTION OF FEED TO BE CARRIED.

The feed should be chosen upon the following points:—

(1) Availability of the foodstuff. This can be determined from market reports.

(2) The feeding value of the foodstuff and its cost per food unit.

(3) The suitability of the food for the purpose, including its palatability and its bulk/weight ratio, which is important in handling.

The value of the feed to the sheep varies a good deal because of differences in composition. These include variations in protein, carbohydrate, and mineral contents, but an overall figure is more suitable for purposes of comparison. Food values for the feeds commonly used in Queensland are given as percentage "food units" in Table 1. "Food unit" is a term which considers all variations.

TABLE 1.

FOOD VALUES OF COMMON FOODSTUFFS.

Foodstuff.	Number of Food Units per 100 lb. of Foodstuff.
Concentrates—	
Maize, wheat, barley and sorghum grains, linseed meal, and cottonseed meal	77
"Nuts" (varies with brand—average figure only)	65
Oat grain	60
Roughages—	
Cereal chaff	40
Lucerne hay	40

As the foodstuffs vary considerably in food value, different amounts of each are required to maintain sheep. This is shown in Table 2, which gives the number of sheep fully maintained by a bag of food per day, as well as the amount required for the maintenance of 1,000 sheep per week based on 8 oz. of maize per head per day.

TABLE 2.

REQUIREMENTS OF VARIOUS FOODSTUFFS TO MAINTAIN SHEEP.

Foodstuff.	Ounces Equivalent to 8 oz. of Maize.	Pounds per Corn sack.	Sacks per Ton.	Number of Sheep fed at rate of 8 oz. of Maize (or Equivalent) per Head per Day from 1 sack.	Number of Pounds at 8 oz. of Maize (or Equivalent) per Head per Day, per 1,000 Sheep per Week.
Concentrates—					
Whole maize ..	8	160	14	320	3,500
Crushed maize ..	8	120	19	240	3,500
Wheat	8	175	13	350	3,500
Grain sorghum ..	8	156	14	312	3,500
Oats	10	130	17	208	4,375
Nuts	9·5	125	18	210	4,156
Roughages—					
Lucerne hay ..	15·5	*	..	..	6,781
Cereal chaff	15·5	**	..	..	6,781

* Lucerne hay is measured in bales. There are 70–80 lb. per bale (28–32 bales to the ton) and 72–82 sheep can be fed at the rate of 8 oz. of maize or equivalent per head per day from one bale.

** Cereal chaff is measured in chaff bags. They are about 84 lb. to the bag (about 27 bags to the ton), and about 87 sheep can be fed at the rate of 8 oz. of maize per head per day from the bag.

From this table it is seen that less of any of the concentrates listed is required to maintain 1,000 sheep for a week than is needed when feeding the bulky foods such as chaff and hay.

The relationship between the bulk and the feeding value of the various foodstuffs is important, as upon it depends the relative ease of handling in the aircraft and the manner of packing the feed for successful dropping.

These facts have important practical application, and Tables 3 and 6 have been prepared to show comparisons between the purchase price and costs of air freight for different foodstuffs required to provide 1,000 dry sheep with 8 oz. of maize (or its equivalent) per head per day for a week, at varying market rates and different distances of haulage.

SOME ASPECTS OF THE PAY LOAD.

A D.C.3 is capable of lifting a load of about 10,450 lb., the load being made up of the necessary petrol, crew members, and the pay load.

In assessing the weight of petrol which must be carried on any trip, it is assumed that the fuel consumption of a D.C.3 is about 80 gallons an hour. In addition, an extra 70 or 80 gallons (1 hour's flight) is allowed for emergencies. For short flights, however, this is not so, as the plane always carries a minimum of 350 gallons. The weight of a gallon of fuel is 7·2 lb., so the weight of the fuel is as follows:—

Number of Hours' Flight.	Gallons of Fuel Carried.	Weight of Fuel in lb.
2	350	2,520
3	350	2,520
4	400	2,880
5	480	3,456
6	550	3,960
7	700	5,040
8	700	5,040

TABLE 3.

COMPARATIVE COSTS PER 1,000 SHEEP PER WEEK FOR VARYING COSTS OF FEED (EACH SHEEP GIVEN EQUIVALENT OF 8 OZ. OF MAIZE PER DAY).

Foodstuff.	Pounds per 1,000 Sheep per Week.	Purchase Price per Ton.									
		£1	£2	£3	£4	£5	£6	£7	£8	£9	£10
		Cost per 1,000 sheep per week.									
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Concentrates—											
Maize	3,500	1 11 3	3 2 6	4 13 9	6 5 0	7 16 3	9 7 6	10 18 9	12 10 0	14 1 3	15 12 6
Wheat ..	3,500	1 11 3	3 2 6	4 13 9	6 5 0	7 16 3	9 7 6	10 18 9	12 10 0	14 1 3	15 12 6
Grain sorghum	3,500	1 11 3	3 2 6	4 13 9	6 5 0	7 16 3	9 7 6	10 18 9	12 10 0	14 1 3	15 12 6
Oats	4,375	1 19 1	3 18 2	5 17 3	7 16 4	9 15 5	11 14 6	13 13 7	15 12 8	17 11 9	19 10 10
Nuts	4,156	1 17 1	3 14 2	5 11 3	7 8 4	9 5 5	11 2 6	12 19 7	14 16 8	16 13 9	18 10 10
Roughages—											
Lucerne hay ..	6,781	3 0 7	6 1 2	9 1 9	12 2 4	15 2 11	18 3 6	21 4 1	24 4 8	27 5 3	30 5 10
Cereal chaff ..	6,781	3 0 7	6 1 2	9 1 9	12 2 4	15 2 11	18 3 6	21 4 1	24 4 8	27 5 3	30 5 10

In addition to the fuel, the plane carries five men—a pilot, a co-pilot, and three men to unload the fodder. It is usual to allow 200 lb. for each man in the plane; this covers, too, any extra gear which might be carried. The weight of the crew in this case would be 1,000 lb.

The pay load can thus be worked out for each flight distance. For example, for a 4-hour flight it is:—

$$10{,}450 - (2{,}800 + 1{,}000) = 6{,}570 \text{ lb.}$$

This, of course, varies, depending on the weather conditions at the time.

There is one other factor which must be considered. When concentrated grains are dropped they must be bagged. As explained later in the section on packing, for most successful dropping the weight of the bags is approximately 150 lb. per ton of grain. Therefore, for every ton of grain dropped to the sheep the actual weight of the pay-load is 2,390 lb. (that is, 2,240 + 150 lb.). This must be considered in Table 5, which shows the number of sheep which can be fed from one load. Of every 64 lb. of load, only 60 lb. is grain.

For instance, for a 4-hour flight the pay load is 6,570 lb., but the actual amount of grain carried is $\frac{6{,}570 \times 60}{64}$, which equals 6,159 lb.

Similarly, when nuts are dropped they are bagged in hemp bags which weigh about 1½ lb. each. Each bag contains about 120 lb. of nuts, so there are about 19 to the ton. Thus for every ton of nuts dropped the actual weight of the load is about 2,270 lb. For instance, for a 4-hour flight the pay load is 6,570 lb., but the actual amount of nuts carried is $\frac{6{,}570 \times 120}{121.5}$, which equals 6,489 lb.

The weight of the roughages remains the same as the pay load, since the weight of the packing is negligible.

TABLE 4.

SHOWING THE RELATIONSHIP BETWEEN NUMBER OF HOURS OF FLIGHT AND CORRESPONDING WEIGHTS OF FOODSTUFFS CARRIED.

Hours of Flight.	Weight of Concentrates. in lb.	Weight of Nuts in lb.	Weight of Roughages in lb.
2	6,497	6,844	6,930
3	6,497	6,844	6,930
4	6,159	6,489	6,570
5	5,619	5,920	5,994
6	5,147	5,422	5,490
7	4,134	4,356	4,410
8	4,134	4,356	4,410

For example, 6,159 lb. of maize can be carried on a 4-hour flight. It takes 3,500 lb. to maintain 1,000 sheep for a week, so 1,760 could be maintained on this one load. Figures for other loads are shown in Table 5.

From information in Table 5 it is possible to work out values in Table 6.

By consulting Tables 3 and 6 it is seen that the overall costs—that is, cost of purchase and aerial transport of feeding concentrates—are far less than those incurred when feeding roughages. Consider, for

TABLE 5.

NUMBER OF SHEEP (TO THE NEAREST 10) WHICH CAN BE FED FOR ONE WEEK ON ONE LOAD OF VARIOUS FOODSTUFFS AT THE RATE OF 8 OZ. OF MAIZE PER HEAD PER DAY (OR ITS EQUIVALENT) CARRIED VARIOUS DISTANCES.

Foodstuff.	Pounds per 1,000 Sheep per Week.	Number of Hours of Flight.						
		2	3	4	5	6	7	8
Concentrates—		NUMBER OF SHEEP FED.						
Maize ..	3,500	1,860	1,860	1,760	1,610	1,470	1,180	1,180
Wheat ..	3,500	1,860	1,860	1,760	1,610	1,470	1,180	1,180
Grain sorghum	3,500	1,860	1,860	1,760	1,610	1,470	1,180	1,180
Oats	4,375	1,490	1,490	1,410	1,280	1,180	950	950
Nuts	4,156	1,650	1,650	1,560	1,420	1,300	1,050	1,050
Roughages—								
Lucerne hay ..	6,781	1,020	1,020	970	880	810	650	650
Cereal chaff ..	6,781	1,020	1,020	970	880	810	650	650

TABLE 6.

COMPARATIVE FREIGHT CHARGES (TO THE NEAREST £) ON VARIOUS FOODSTUFFS FOR 1,000 SHEEP FOR ONE WEEK CARRIED VARIOUS DISTANCES.*

Foodstuff.	Pounds per 1,000 Sheep per Week.	Number of Hours of Flight and Corresponding Cost of Trip.						
		2 £100	3 £150	4 £200	5 £250	6 £300	7 £350	8 £400
Concentrates—		COST PER 1,000 SHEEP PER WEEK. (£)						
Maize	3,500	54	81	114	155	204	297	339
Wheat ..	3,500	54	81	114	155	204	297	339
Grain sorghum	3,500	54	81	114	155	204	297	339
Oats	4,375	67	101	142	195	254	368	421
Nuts	4,156	61	91	128	176	231	333	381
Roughages—								
Lucerne hay ..	6,781	98	147	206	284	370	538	615
Cereal chaff ..	6,781	98	147	206	284	370	538	615

* Based on a speed of 160 m.p.h. and £50 per hour flying for charter.

example, the case of a woolgrower who wished to feed 5,000 young ewes marooned on a small part of a flooded property in the Dirranbandi district about 320 air miles from Brisbane. This would involve a non-stop return journey of about 640 miles, which would mean a minimum of four hours' flying. In addition, depending on the winds, the plane may have to make a circuit or two over the airport, both on taking off and before landing. It may also have to remain over the "target area," where the fodder is dropped, for between 45 and 60 minutes, depending on the rate at which the feed can be "unloaded." This means that a single flight may take between 5 and 5½ hours.

If maize is fed, sufficient to feed 1,610 sheep for 1 week (see Table 5) could be carried on one flight. Thus three flights would have to be made to carry the 17,500 lb. of maize required to feed 5,000 sheep for a week. Supposing this would take a total of 16 hours' flying time, the cost of the aerial transport would be £800. In addition, the purchase price of the maize would probably be about £240, making the total cost about £1,040.

If lucerne hay is fed, 33,900 lb. would have to be carried to give the sheep a ration equal in food value to that provided by 8 oz. of maize per head per day. This would necessitate six flights, involving about 32 hours' flying time, and transport alone would cost about £1,600. When the purchase price of the lucerne hay, which would approximate £275, is added, the overall cost of feeding lucerne hay would be £1,875. These calculations show a balance of £835 in favour of maize. If the work had to be continued for three weeks, about £2,500 would be saved by feeding maize, or some comparable concentrate, instead of lucerne.

A comparison of the costs per head per week for feeding a maintenance ration of a concentrate grain against those incurred for feeding a maintenance ration of lucerne is as follows:—

	s.	*d.*
Cost of purchase* and aerial transport of maize per head per week	4	2
Cost of purchase* and aerial transport of lucerne hay per head per week	7	6
Excess cost of lucerne hay over maize per head per week	3	4

* The ruling market prices at the time were accepted as the purchase price.

The majority of woolgrowers fed lucerne to their sheep during the recent floods. Although there are probably particular reasons for this associated with the difficulties of packing and distribution of the maize, over £8,000 would have been saved had maize or some comparable grain been used.

Plate 70.

Loading Baled Lucerne Hay Into a Freight Plane.

PACKING OF THE FEED.

It must be recognised that an important principle in the aerial transport of stock feed is to reduce the weight of the containers to a minimum, so that the maximum amount of foodstuffs can be carried. The planes spend very little time over the actual target area where the food is dropped. During the drop they fly at about 110 m.p.h. and would pass over a target area 10 chains long in about 4 seconds. This means that the staff responsible for pushing the fodder out of an open doorway have very little time in which to work. After each drop, the plane has to climb to make its circuit before coming in again to make its next drop. This may take almost five minutes, and unless a large quantity of feed can be dropped each time the plane is over the target area the cost of the actual unloading becomes quite high.

Plate 71.

Unloading Baled Lucerne Hay from a Freight Plane.

This suggests that it is preferable to make each pack of feed as heavy as possible, so that the maximum amount can be pushed out each time the plane makes its run over the target. However, there is a drawback in doing this. The force with which a bag of feed strikes the ground depends upon its weight and the speed at which it is travelling. The speed depends largely upon the height from which it is dropped. In practice the pilots found that 150 feet was the best height at which to fly the planes for accurate dropping. Often there was only a very small area of dry land on which to drop the bags. If pilots were lower than 150 feet they passed over the target too quickly; if they were higher, accurate dropping was more difficult because of the unwieldy shape of the pack, its forward velocity, and the greater effect of the wind. In addition, when flying high the bags gained too much speed in their fall and burst more easily.

Bags are used when grains are being transported and the relationship between the weight of the bags and their contents has been determined for packs of different types and weights. In these calculations, double bagging (one cornsack and one chaff bag) was allowed for packs of up to and including 60 lb., and treble bagging (two cornsacks and one chaff bag) was allowed for packs of over 60 lb. Allowing 2½ lb. for the weight of a cornsack and 1½ lb. for the weight of a chaff bag, the relationships are as follows:—

Net Weight of the Pack.	Number of Packs per ton.	Bags Used Per Ton of Grain.	Weight of Bags Per Ton of Grain.
Lb.			Lb.
40	56	112	224
50	45	90	180
60	37·5	75	150
70	32	96	208
80	28	84	182
90	25	75	162½

Some difficulty was experienced in dropping maize during the operations, because a large number of bags burst and their contents were so scattered over the boggy ground that the sheep were unable to recover the grain. Investigations revealed that the packs were too heavy, and in an experiment conducted by the Department of Agriculture and Stock in conjunction with Australian National Airways Pty. Ltd., it was found that very little maize was lost if 60 lb. was placed in double bags—that is, in a cornsack and a chaff bag. Almost half the maize was lost through bags bursting if 70 lb. was packed similarly.

Because 60 lb. packs will land safely if correctly packed, and because the relationship between the weight of the bags and their contents is economical, it is recommended that they should be used in the event of further drops being made. On striking the ground the grain tends to behave somewhat like a liquid and it is necessary to pack it loosely to allow it to spread. When making 60 lb. packs, room for a little under two bushels of maize should be left in the cornsack. The cornsack is then put inside a chaff bag, the mouth of which is sewn in the usual fashion. The inner bags may burst when the pack strikes the ground, but the outer chaff bags prevent the maize from spilling.

Baled lucerne hay has an advantage over maize in that it is easy to pack. Double baling, with the second pair of wires a little looser than the first pair, is all that is required. Lucerne hay maintains a very favourable relationship between the weight of the feedstuff and the weight of its containers, but owing to the high freight charges in relation to the low food value it is the most expensive feed to use.

GROUND ORGANISATION FOR FEEDING FLOODBOUND SHEEP.

The ground organisation is greatly simplified if the sheep are "in hand" and under good control. The easiest way of feeding concentrate grains is in troughs, and suitable ones can be made by stretching bags on two wires. The hardest dry place available should be selected for feeding and it should be as near as possible to the place where the feed can be dropped.

The dropping areas should be indicated by fires, which also provide a smoke drift to indicate the direction and force of the wind. It is preferable to select as large a dry patch as possible for the dropping area. The drops are made into the wind, and a long, narrow strip of dry land is only suitable if the wind is blowing the right way.

It is often difficult to control the food intake of the sheep when trough feeding animals that are marooned well away from yards. Good dogs are of considerable assistance and some sheep can be worked onto the troughing, and moved off to another "camp" after they have fed. The most satisfactory way of arranging this work is to place sufficient feed in the troughs for the number of animals that can eat at them conveniently, allowing one running foot of trough length for each animal. If the troughs are 60 feet long there would be 120 running feet of troughing and 120 sheep could feed at them conveniently at one time. If a ration of 8 oz. of maize per head, or its equivalent, were fed each day, 60 lb. of maize could be put in the trough and 120 sheep allowed on to it. When they have eaten the allotted food they can be moved off, more food put out, and more sheep brought in. Care should be taken to bring the sheep on to the end of the trough and not up to the side. By doing this, the animals distribute themselves along each side of the trough, and do not crowd on one side.

Trough feeding makes a great deal of work, and, provided the sheep are not within a couple of months of lambing, it can be overcome by weekly or by bi-weekly feeding. Sufficient feed to last all the sheep a week or half a week is put out in the troughs and the animals are allowed to eat what they require when they like. This method has proved eminently successful with drought feeding, but if wheat is being fed under these conditions, it is preferable "to roll" it.

Plate 72.

A Typical Dropping Area. Note the small area and the bales lying on the ground.

Lucerne hay has a distinct advantage over the concentrate grains for feeding under these conditions. The bales can be put out easily and the animals allowed to eat as they wish. This is likely to be an important aspect in the choice between lucerne and the more concentrated feeds where labour is short and/or the conditions particularly difficult. Even if lucerne hay is preferable for these reasons, it is still expensive.

If it is hard to get the sheep in hand, and if there is a large enough area of bare hard ground, the feeding of nuts from the air is worthy of consideration. Because of their larger size, the nuts can be picked up more easily by the sheep even if the ground is damp. They constitute an admirable food for sheep which are unattended and for this purpose they are most suitably packed in large paper or hempen bags which burst on striking the ground and allow the nuts to scatter.

Plate 73.

A Typical Dropping Area on which 60 lb. Packs of Grain Have Been Dropped.

The age and class of the sheep which are floodbound influence the method of feeding. It is sufficient to keep dry or young sheep alive, whereas ewes which are heavy in lamb must be fed a ration sufficient to prevent the occurrence of pregnancy toxaemia. It is well known that dry sheep will not be seriously affected by 72 to 96 hours of starvation and that they can live for a considerable time even after their food intake has been greatly reduced. In drought feeding it is possible to keep sheep alive on 8 to 9 oz. of maize (or its equivalent) per head per day. When the sheep are entering the drought, 6 oz. per head per day is usually sufficient, as the animals live to some extent on their body reserves, which can also be utilised when feeding floodbound sheep. Because of the high cost of transporting feed, it is cheaper to let the dry sheep lose some weight while they are being fed, rather than attempt to maintain their weight. This means it would be advisable when

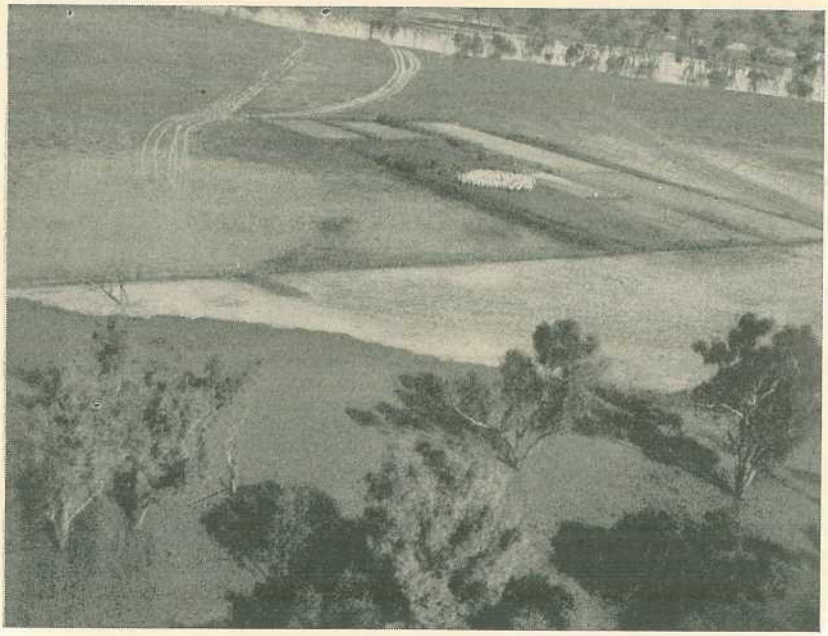


Plate 74.

A Dropping Area Near a Set of Sheep Yards Where Floodbound Sheep and Horses are being Fed.

Plate 75.

Sheep Confined on the Banks of a Dam, Close to a Homestead. There are about 10,000 sheep in the mob. Some of them have been driven into the water to make sufficient room for the dropping of fodder. The name on the homestead roof permits immediate identification.

Plate 76.

A Dirranbandi Homestead Surrounded by Flood Water. The dropping area is in the top right hand corner of the picture.

handling dry sheep to find the minimum ration which will keep the sheep alive. This may be as low as 6 oz. of maize (or its equivalent) per head per day, and could be increased to 8 or 9 oz. per head per day if necessary. Ewes which are heavy in lamb should be fed at the rate of 12 oz. of maize (or its equivalent) per head per day from the commencement. Finely ground limestone (1 per cent. by weight) should be added to grains.

Table 7 shows the weights of various foodstuffs equivalent to various amounts of maize.

TABLE 7.

WEIGHTS OF VARIOUS FOODSTUFFS EQUIVALENT TO VARIOUS AMOUNTS OF MAIZE.

	Oz.	Oz.	Oz.	Oz.	Oz.
Concentrates—					
Maize	3·0	6·0	8·0	9·0	12·0
Wheat	3·0	6·0	8·0	9·0	12·0
Grain sorghum ..	3·0	6·0	8·0	9·0	12·0
Oats	4·0	8·0	10·0	12·0	16·0
Nuts	3·75	7·5	9·5	11·25	15·0
Roughages—					
Cereal chaff	6·0	12·0	15·5	18·0	24·0
Lucerne hay ..	6·0	12·0	15·5	18·0	24·0

If the feeding is continued for some time, a definite tail will develop in the flock. This is because some sheep are not getting enough to eat, and as they get weaker the stronger ones crowd them out more and more. It may be advisable to draft these animals off and feed them a little

extra. Maize is one of the best feeds for strengthening weak sheep quickly, but because of the high fibre content of oats they are useful as a source of warmth during cold weather.

It is far better to feed a limited number of flocks properly than to try to feed too many. In the latter case the sheep would be improperly fed and may still die of starvation.

Station homesteads are often difficult to locate and to identify from the air. During severe floods many of the natural landmarks are submerged. While houses are often easy to see from planes flying at a fair height, they can be difficult to detect if surrounded by timber and if the plane is only a few hundred feet above the ground. For these reasons it is advisable to have the name of the property painted on the roof of the woolshed or some other conspicuous building.

A lot of time, trouble, and expense can be saved if woolgrowers in a neighbourhood co-ordinate their orders so that all the properties in one area can be served by one airline company. Failure to do this often means unnecessary duplication of planes and flights, and throws an extra burden on the freight sections of air transport companies which are already meeting additional demands upon their services as a result of the floods.

ACKNOWLEDGMENTS.

The assistance of Australian National Airways, who made facilities available for and co-operated in trial observations, is gratefully acknowledged. The original suggestion that floodbound sheep might be fed from the air was made by Messrs. John Hayne and Earl Loughlan. Gibbs Bright and Co. and Winchcombe Carson Ltd. assisted greatly in the packing trials.

Dr. M. C. Franklin, of the McMaster Laboratory, who is conducting trials on the drought feeding of sheep, kindly supplied information on the weekly feeding of sheep.

The courtesy of "Queensland Country Life," "The Courier-Mail," "The Brisbane Telegraph," and "Air Travel" in making photographs available for publication is also acknowledged.

[*Continued from page* 93.]

1951 SHOW DATES.

May—continued.

Biloela	24, 25 and 26
Crow's Nest	25 and 26
Kalbar	26
Maryborough	31, June 1 and 2
Wowan	31, June 1 and 2

June.

Boonah	1 and 2
Childers	4 and 5
Bundaberg	6 to 9
Mt. Morgan	7, 8 and 9
Lowood	8, 9 and 11
Gin Gin	11 and 12
Gladstone	14, 15 and 16
Toogoolawah	15 and 16
Rockhampton	20 to 23
Kilcoy	22 and 23
Mackay	26, 27 and 28
Esk	29 and 30
Proserpine	29 and 30

July.

Bowen	4 and 5
Nambour	5, 6 and 7

July—continued.

Rosewood	6 and 7
Ayr	6 and 7
Townsville	9 to 12
Laidley	13 and 14
Redlands	13 and 14
Ingham	13 and 14
Gatton	19, 20 and 21
Innisfail	20 and 21
Woodford	20 and 21
Cairns	24, 25, 26 and 27
Pine Rivers	30
Atherton	30, 31 & August 1

August.

Tully	3 and 4
Brisbane	4 to 11
Redcliffe	17 and 18
Wondai	31 & September 1

September.

Canungra	1
Kandanga	3 and 4
Cherbourg	7 and 8
Beenleigh	14 and 15

ANIMAL HEALTH

Milk Fever of Cattle.

Prepared in the Division of Animal Industry.

MILK fever is a disease of dairy cows, especially those on their third or a later calf and still producing at a high level. It occurs at or near the time of calving, the great majority of cases being seen within 12 to 72 hours after that event, though some cases may not occur for up to ten days afterwards. Occasionally cases do occur in cows shortly before or during calving. The disease is not well named as it is not characterized by a rise in body temperature, which in fact may be below normal. The name is a carry-over from the days when the disease was thought to be an udder condition.

Cause.

The commonly accepted theory as to the cause of milk fever is that it is due to grave lack of the mineral calcium in the blood stream at the time of calving. This is indicated by the low level of calcium found in the serum of the blood of cows suffering from milk fever. Even with normal calving there is an appreciable drop in the serum calcium level, but this soon returns to normal. In cases of milk fever, the drop is more pronounced and does not rise again on its own account. The drop in calcium content of the blood stream at calving time is not to be wondered at when it is realized that half a gallon of colostrum (first milk) contains as much calcium as is present in the entire blood stream at any one time.

Symptoms.

The following are the main symptoms noticed in a cow suffering from milk fever: Firstly, there is complete loss of appetite; the cow stands by herself, has a dejected appearance, and shows no interest in her calf. If moved she appears stiff and lacks full control over the hindquarters. Eventually she goes down and is unable to rise again. At first the cow lies on the brisket with legs projecting stiffly, and, if left, will go over on her side and become relaxed and comatose. A very common attitude in which the cow is seen when down is with the head turned round towards the flank. In other cases the head is kept in the forward position but the neck has a pronounced kink. The temperature remains normal or may be slightly sub-normal. Muzzle and eyes are dry and the affected animal does not respond to any stimulus.

In typical milk fever, the overall picture is one of depression of consciousness with muscular paralysis. There may be a brief period early in the course of the case during which the animal shows excitement, but what may be likened to sleep sets in fairly quickly thereafter. Cases of milk fever which are complicated by a low level of blood magnesium do occur. Here the picture may be one of excitement and restlessness, but such cases are rare.

The mortality rate in untreated cases is very high, death occurring in from a few hours up to two or three days. The closer to calving that symptoms appear, the more acute is the disease. With treatment, the mortality rate is very low and then deaths are usually due to complications. For best results treatment should be carried out early, preferably within 6 to 8 hours of the first appearance of symptoms.

Treatment.

Treatment is aimed at correcting the deficiency of calcium in the blood stream by one of two methods—

(1) The actual addition of calcium as calcium salts by injection;

(2) The prevention of further loss of calcium from the blood stream to the milk by udder inflation.

The inflation treatment was much used until recent years, but has now been largely superseded by the injection treatment. Before commencing to inflate the udder it should be wiped with a clean damp rag, and then a fresh towel should be placed under the udder to prevent contamination from the soil. The beast should then be propped up on its breastbone in as natural a position as possible, taking care that the hind legs are in a normal position and not causing undue pressure on the udder. In very advanced cases, this may not always be possible, but it should be attempted.

Each quarter is inflated firmly and the teats are tied off at the base with clean tapes to prevent the escape of air. The udder should then be massaged gently to distribute the air throughout its substance. The tapes should be removed about half an hour after they are put on. If no improvement is noted after three hours, inflation should be repeated.

The most undesirable after-effect that may follow treatment by udder inflation is mastitis. To avoid this the following precautions should be observed:—

(1) The teat syphon used should be sterilized thoroughly before use by boiling.

(2) Every precaution against the teat syphon coming into contact with any contamination should be taken during inflation; if that happens the syphon should be immersed in boiling water before being used again, or a spare brought into use.

These precautions are against the possibility of introducing any infection into the healthy udder.

(3) If a quarter of the udder of a cow being treated with milk fever is affected with mastitis, or has been so affected at any time, that quarter should be the last inflated; and, following use on that quarter, the teat syphon must be sterilized thoroughly by boiling before being used again.

The drug used for injection is calcium borogluconate, which is fairly soluble in water and non-irritant. The recommended dose of this drug is 3 oz. added to one pint of water (which makes a 15 per cent. solution). The solution should be brought to the boil and then allowed to cool to blood heat before use. If experienced with injections into the jugular vein of the neck, half of this solution can be injected into the vein and the remaining half under the loose skin at a number of sites on either side of the neck. The injection of all the solution in

one place should not be attempted. Lumps formed under the skin as the result of the injections should be massaged without delay so as to disperse the fluid through the surrounding tissues. If the drug cannot be injected into the vein, a stronger solution may be used (3 oz. to half a pint of water) and injected under the skin in various places. For the more acute and urgent cases, the administration into the vein is preferable, as a much quicker response is obtained.

Care should be taken to sterilize syringes or injection apparatus, needles, &c., and the sites of injection can be swabbed with an antiseptic such as tincture of iodine or methylated spirits.

After injection into the vein in cases of typical milk fever, response is often spectacular, and affected cows may get on their feet within ten minutes. However, cases which have been down a long time may take much longer. Response to administration under the skin usually takes about two to four hours. In most cases the recovery is permanent, but an occasional case may relapse within 12 hours to two days. In such cases the treatment must be repeated.

Some cows are more susceptible to milk fever than others, and, in the case of a known milk fever subject, preventive treatment may be decided upon, the injection of calcium borogluconate being carried out immediately following calving.

There are now on the market several specially prepared outfits for intravenous or subcutaneous injections in the treatment of milk fever. These are obtainable from most chemists or veterinary supply houses. They are readily assembled and sterilized for quick use. They include what is known as a flutter valve apparatus. This type has proved quite efficient and has the advantage of not requiring any very special size or shape of bottle.

Calcium borogluconate is dispensed by chemists in packets of 2½ oz., which was at one time considered a sufficient quantity for treatment of a case of milk fever. The tendency nowadays is to use the larger dose of 3 oz. and even up to 4 oz. The drug is at present available also in the form of a solution which is ready for immediate use, this having obvious advantages.

Whatever the method of treatment adopted, it is advisable to cover the animal with a rug. In no circumstances should the beast be drenched, as, because of the paralysis extending to the throat, the cow is unable to swallow, and the drench may enter the lungs and set up pneumonia.

After the treated cow gets to her feet, it is advisable that she be well cared for during the next day or two. No milk should be withdrawn from the udder for at least 12 hours after the cow has risen, and only small quantities of milk should be drawn off at intervals during the next 24 hours. The diet should be restricted for two to three days with a view to keeping milk production down to a minimum. Management along these lines will do much to safeguard against a relapse.

GULF CATTLE ARTICLE.

The article on "Beef Cattle Production on Some of the Gulf Watersheds," by Mr. J. C. J. Maunder, will be concluded in a subsequent issue of the Journal.

Warts in Cattle.

A. K. SUTHERLAND, Animal Health Station, Yeerongpilly.

WARTS are the result of infection of the skin with an extremely minute organism, known as a virus. The infection causes an excessive growth of skin tissue, and can be responsible for financial loss. This loss is brought about by—

(*a*) loss of condition and stunting of seriously affected calves;

(*b*) reduction in the value of hides;

(*c*) reduced sale value, particularly of pure-bred stock.

Warts are common in calves and yearlings, and occasionally cows are affected on the udder and teats.

The disease is contagious, and infection probably occurs when small abrasions of the skin come in contact with warty animals or with fences, buildings, rubbing posts, or other structures that affected animals have touched. To prevent the disease it is therefore important that affected animals be isolated. This is best accomplished by moving the healthy calves to clean pens or paddocks.

Warts are most common on the head, neck, and shoulders. Other parts of the body are occasionally affected. The infections usually commence as small nodular growths, which later develop rapidly into horny cauliflower-like masses up to several inches in diameter (Plate 77). Some calves develop one or two small warts and are thereafter immune, whereas in other calves the growths enlarge and spread until perhaps most of the head and the neck are covered with large ugly growths. The latter is particularly likely to occur in calves that are overcrowded or suffering from malnutrition or worm infestation.

Treatment.

Calves with warts always eventually clear up even if no treatment is applied. However, natural recovery may take a long time, so some treatment should be given to hasten it.

Many warts can be removed simply by clipping them off close to the skin with clean, sharp, curved scissors. The cut surface bleeds for a time, but this is of no consequence unless the growths are very large. The stump should be treated with tincture of iodine, glacial acetic acid or a caustic pencil.

This method of surgical removal cannot be applied when a large area of the calf's skin is involved. Nevertheless, a surprising number of warts can be cut off without causing any ill effects. It has been stated that when a few large warts are cut off the development of immunity and the tendency to recovery are accelerated, but in view of the fact that, in time, the growths disappear without any treatment, it is difficult to verify this.

Another method of removing warts is to tie a ligature of linen thread or catgut tightly round the base of the wart and tighten it every day or so until the growth sloughs off. This method should be used for large growths.

A third method, which has been used with some success, is to paint the warts daily with castor oil.

If the calves are suffering from malnutrition or worm infestation, their chance of developing immunity and so recovering from warts will be increased if the feeding is improved and worm infestation is treated by drenching with phenothiazine.

Prevention.

It is important to remember that warts are contagious and that every wart contains a virus that can infect another calf. Thus, if only a few calves are affected, they should be isolated and treated as described. Prompt detection of cases and removal of warts will limit the spread of infection.

As with most infectious diseases, some animals have a natural immunity, so in some herds the spread of the disease may be limited. However, it is impossible to know the extent of natural immunity in a herd until an outbreak has run its course, so it is wise to adopt preventive measures.

A vaccine has been used for both treatment and prevention of warts. Remembering the tendency of the disease to clear up spontaneously, the results obtained by subcutaneous injection of formolised vaccine have not been successful and the procedure cannot be recommended as an efficient preventive.

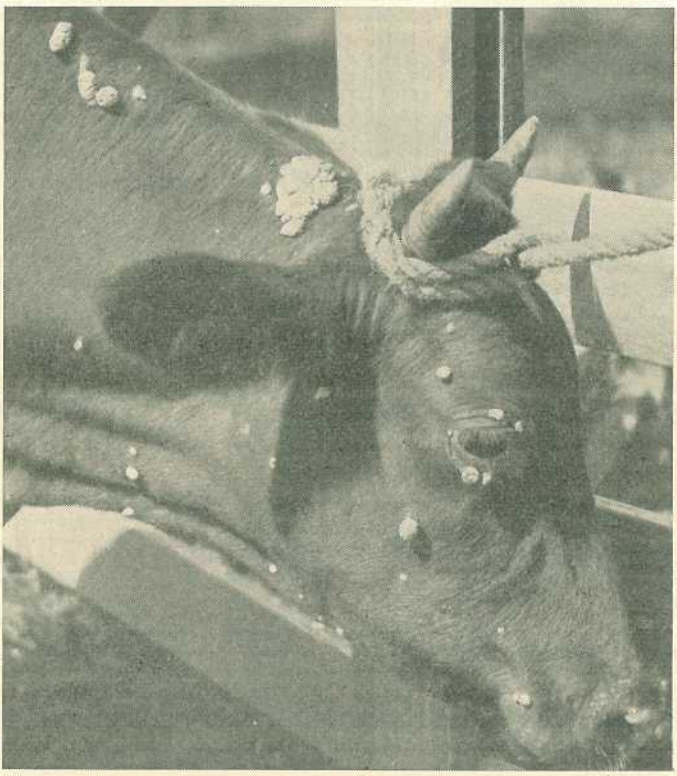
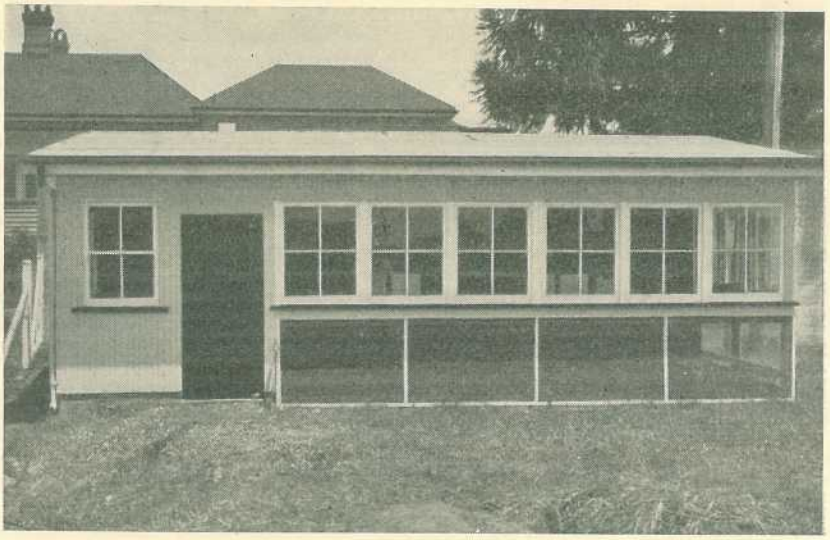


Plate 77.

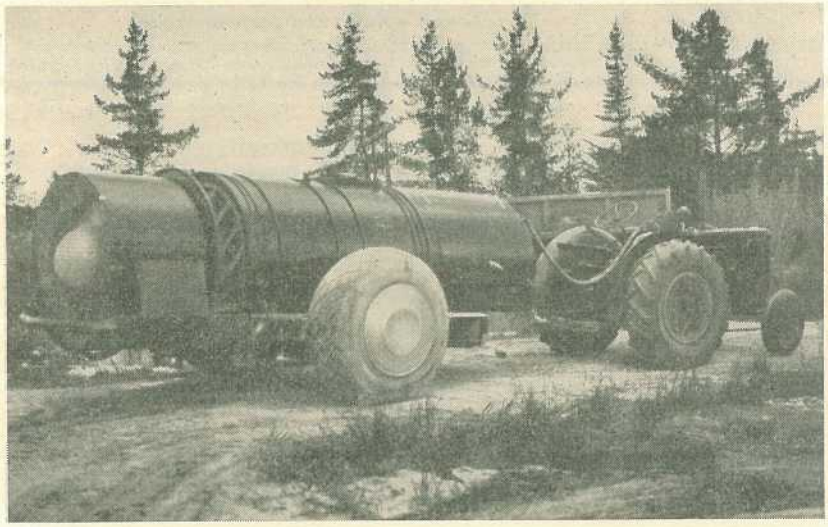
Warts on the Head and Neck of a Calf.

TUBERCULOSIS-FREE CATTLE HERDS (AS AT 15th JANUARY, 1951).

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas
A.I.S.	F. B. Sullivan, "Fermanagh," Pittsworth D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth W. Henschell, "Yarranvale," Yarranlea Con. O'Sullivan, "Navillus Stud," Greenmount H. V. Littleton, "Wongalea Stud," Hillview, Crow's Nest J. Phillips and Sons, "Sunny View," Kingaroy Sullivan Bros., "Valera" Stud, Pittsworth Reushle Bros., "Reubydale" Stud, Ravensbourne
Ayrshire	L. Holmes, "Benbecula," Yarranlea J. N. Scott, "Auchen Eden," Camp Mountain
Friesian	C. H. Naumann, "Yarrabine Stud," Yarraman J. F. Dudley, "Pasadena," Maleny
Jersey	W. E. O. Meier, "Kingsford Stud," Rosevale, *via* Rosewood J. S. McCarthy, "Glen Erin Jersey Stud," Greenmount J. F. Lau, "Rosallen Jersey Stud," Goombungee G. Harley, Hopewell, Childers Toowoomba Mental Hospital, Willowburn Farm Home for Boys, Westbrook F. J. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy Line R. J. Browne, Hill 60, Yangan P. J. L. Bygrave, "The Craigan Farm," Aspley



Fruit Fly Control.—This field insectary recently built at Toowoomba is being used by Departmental entomologists who are making an intensive study of fruit flies.



Orchard Spraying Equipment.—This large unit is shown in operation spraying for pest and disease control in a Stanthorpe orchard.

ASTRONOMICAL DATA FOR QUEENSLAND.

MARCH, 1951.

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

TIMES OF SUNRISE AND SUNSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	5·41	6·20
6	5·44	6·15
11	5·46	6·10
16	5·49	6·04
21	5·52	5·59
26	5·54	5·53
31	5·57	5·48

MINUTES LATER THAN BRISBANE AT OTHER PLACES.

Place.	Rise.	Set.	Place.	Rise.	Set.
Cairns	32	26	Longreach ..	36	34
Charleville	27	27	Quilpie	35	35
Cloncurry	52	47	Rockhampton ..	11	9
Cunnamulla ..	29	29	Roma	17	17
Dirranbandi ..	19	19	Townsville ..	26	22
Emerald	20	18	Winton	42	38
Hughenden ..	36	33	Warwick	20	18

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	p.m.
1	11·16	12·56
2	..	2·02
	a.m.	
3	12·18	3·02
4	1·24	3·35
5	2·33	4·40
6	3·40	5·19
7	4·44	5·53
8	5·45	6·25
9	6·44	6·55
10	7·42	7·25
11	8·39	7·56
12	9·36	8·30
13	10·33	9·07
14	11·30	9·49
	p.m.	
15	12·26	10·35
16	1·19	11·27
17	2·08	..
		a.m.
18	2·53	12·23
19	3·33	1·20
20	4·09	2·20
21	4·43	3·19
22	5·14	4·19
23	5·45	5·18
24	6·18	6·20
25	6·53	7·23
26	7·32	8·29
27	8·18	9·38
28	9·11	10·47
29	10·11	11·55
		p.m.
30	11·17	12·57
31	..	1·52

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

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

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	30	9	46	24	21	0	54	26
6	26	14	42	29	17	4	49	33
11	14	25	30	41	5	16	34	48
16	8	30	24	45	0	21	25	54
21	14	25	30	41	5	16	34	47
26	27	13	43	28	18	3	50	32
31	29	10	44	24	19	0	52	27

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	56	3	68	32	52	18	46	4
3	57	2	69	32	53	17	47	3
5	51	9	65	36	49	22	42	9
7	40	21	57	44	42	29	33	18
9	28	32	50	53	34	38	24	28
11	18	43	42	59	27	45	16	36
13	8	51	36	64	21	50	8	43
15	2	56	33	67	17	53	3	46
17	2	55	33	67	17	52	3	45
19	9	51	37	64	21	50	8	43
21	19	42	42	59	27	44	17	36
23	30	31	51	51	35	36	25	26
25	42	19	58	43	43	28	35	17
27	53	7	67	35	50	21	44	8
29	57	2	69	32	53	17	47	3
31	52	4	66	33	50	19	43	5

Phases of the Moon.—New Moon, 8th March, 6.50 a.m.; First Quarter, 16th March, 3.40 a.m.; Full Moon, 23rd March, 8.50 p.m.; Last Quarter, 30th March, 3.35 p.m.

On 21st March at 8 p.m. the Sun will cross the equator on its apparent journey from south to north (Equinox). On this date the Sun will rise and set at true east and true west, respectively, viewed from all places on earth except from the Poles. At these points the Sun will neither rise nor set but make a complete journey round the horizon. On the 9th and 23rd the Moon will rise and set approximately at true east and true west respectively.

Mercury.—A morning object at the beginning of the month, in the constellation of Aquarius, when it will rise ¾ hour before the Sun. On the 11th it will be in line with the Sun, after which it will pass into the evening sky. By the end of the month, in the constellation of Aries, it will set ¾ hour after sunset.

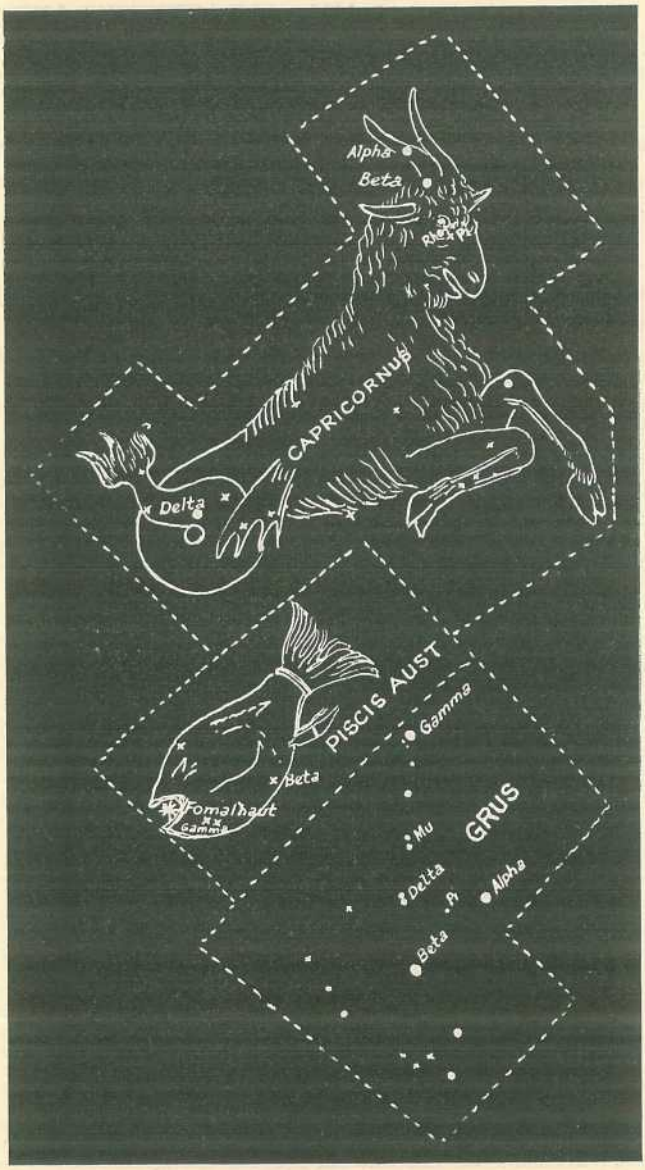
Venus.—At the beginning of the month, in the constellation of Pisces, will set 1¼ hours after the Sun and for the next few months will be a conspicuous object in the western evening sky. By the end of the month, in the constellation of Taurus, will set 1 hour 35 minutes after the Sun.

Mars.—Now passing out of the evening sky. In the constellation of Pisces, at the beginning of the month will set 1 hour after the Sun, but by the end of the month will set only ½ hour after sunset. On the 9th the Moon will pass close to this planet.

Jupiter.—Also rapidly passing out of the evening sky, setting only ½ hour after sunset at the beginning of the month and being in line with the Sun on the 11th.

Saturn.—Reaches a point opposite the Sun on the 20th and is thus favourably placed for observation, being visible approximately from sunset to sunrise. On the 23rd the Moon will pass close to Saturn.

Eclipse.—On 8th March there will be an annular eclipse of the Sun but it will not be visible from Queensland.



THE CONSTELLATIONS.

Capricornus (The Sea-Goat) is a somewhat inconspicuous constellation situated along the Zodiac next to Sagittarius. It is supposed to represent the animal into which Pan was changed to allow him to escape from the Giant Typhon. It is important because it gave the name to the Southern Tropic—The Tropic of Capricorn. When this designation was given the Sun was in the Constellation of Capricorn when it reached its maximum angle south of the equator and shone directly over the Tropic of Capricorn. Owing to precession, however, when the sun reaches its maximum angle south of the equator it is now in the Constellation of Sagittarius. Though there are no bright stars in the group, it nevertheless contains some interesting objects for the amateur astronomer. Alpha is a naked-eye pair—not a binary, but two stars at varying distances almost in line. One star is 1,600 light years away and the other 108 light years. Each star, however, has a companion. Beta is also a double, and a line from Alpha through Beta meets a group of 3 stars—Pi, Omicron and Rho—all of which are doubles.

Greis (The Crane or Stork) is a modern constellation. The resemblance to a long-necked bird is imagined from the line of stars running from Beta to Gamma. Along this line are two naked-eye pairs, Mu and Delta. Pi, which lies in the centre of the triangle formed by Alpha, Beta and Delta, is a double.

Pisces Australis (The Southern Fish) contains the very bright star, Fomalhaut, and the doubles Beta, Gamma and Delta.