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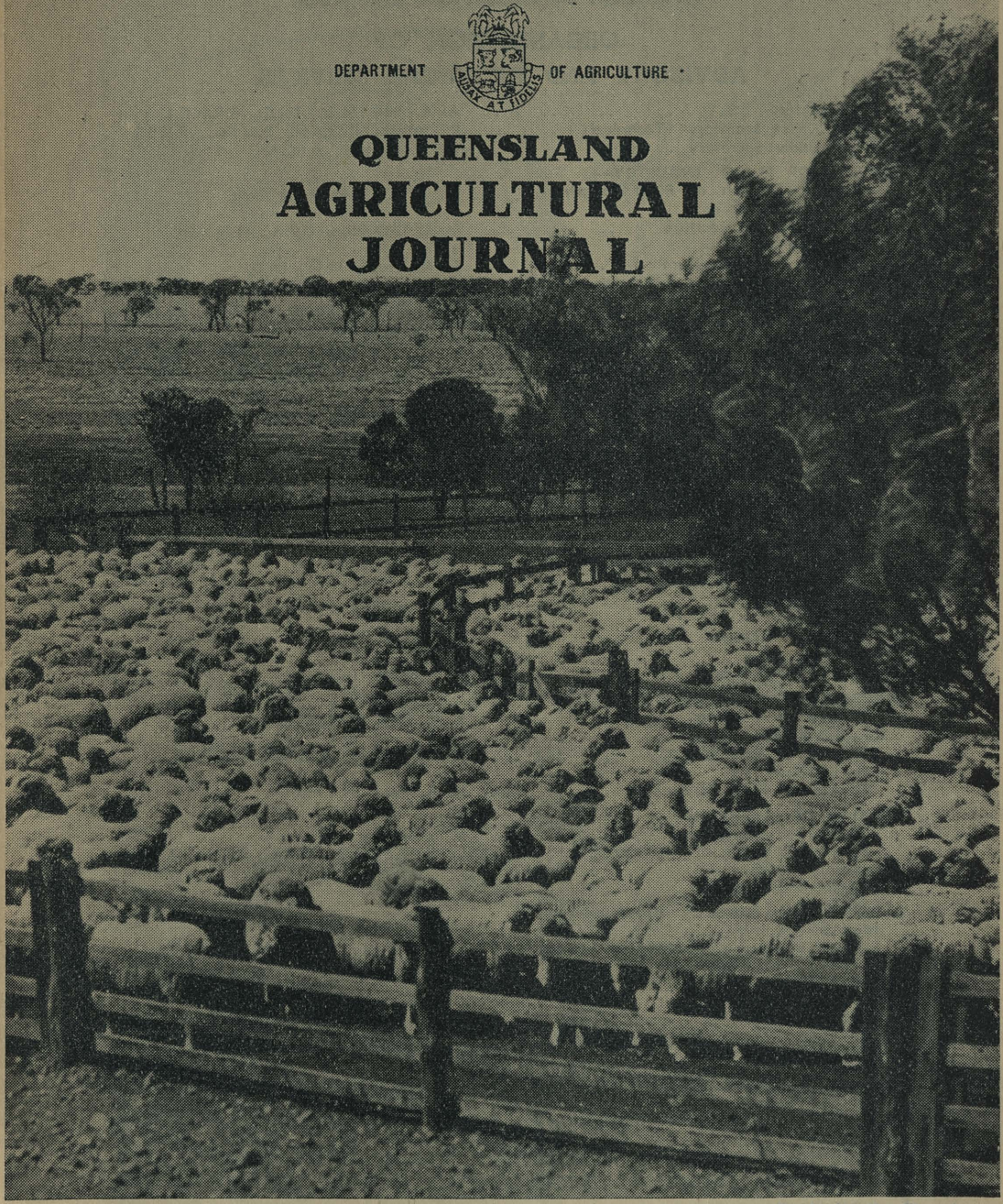

Ready for the Shearing.

LEADING FEATURES

Potato Culture

Russian Knapweed

Banana Packing

Value of Herd Recording

Economics of Milk Production

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Volume 72 Part 6

QUEENSLAND AGRICULTURAL JOURNAL

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11

Contents

Potato Culture in Queensland.*

W. J. CARTMILL (Chief Soil Conservationist†) and
W. H. BECHTEL (Chief Adviser in Agriculture).

POTATOES can be grown successfully in many districts in Queensland, but a close study of local conditions is necessary to ensure success. For best results the crop requires cool growing conditions, an ample supply of moisture, and a fertile, friable soil. Because the rainfall in Queensland is light during the cooler periods of the year the crop is mostly grown under irrigation. With the expansion of irrigation practices in recent years there has been a corresponding expansion in potato production in the State. For example, the average annual production for the 10-year period ending 1937 was 17,150 tons, whereas for the 5-year period ending 1949 the annual average was 29,050 tons. To supply the between-season requirements it is necessary

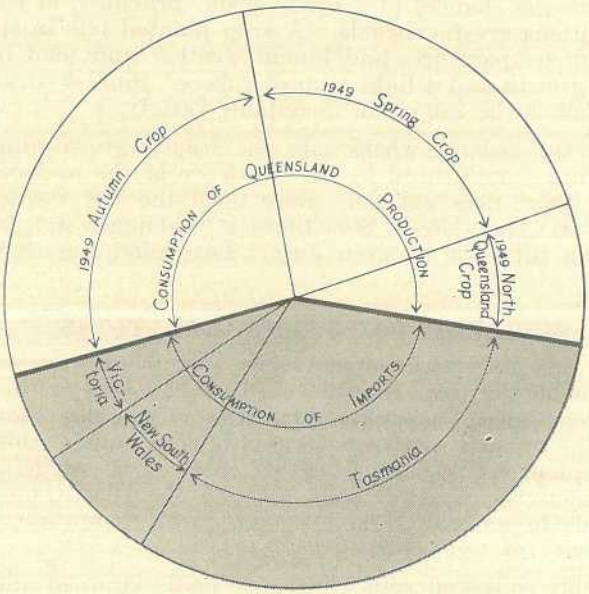


Plate 184

Diagram Showing Commercial Production and Consumption of Potatoes in Queensland for the Year Ended 31st March, 1950.

* This is a revision and enlargement of articles by C. J. McKeon which appeared in this Journal some years ago.

† Formerly Senior Soils Technologist.

to import from other States, and for the 5-year period ending 1949 importations averaged 26,100 tons annually. Commercial production and consumption for 1949-50 are shown diagrammatically in Plate 184.

The main potato growing districts are located in the south-eastern portion of the State. During World War 2, however, considerable expansion occurred in the Lower Burdekin and present production in this area makes a significant contribution to the State's requirements.

Where soil and climatic conditions are suitable, and provided sound cultural methods are adopted, good financial returns can be obtained from potato growing. In Queensland, wholesale marketing of locally grown potatoes is organised by the State Potato Marketing Board acting on behalf of the growers.

TIME OF PLANTING.

Growers in most potato growing districts are fortunate in being able to produce two crops a year. The first of these, commonly known as the spring crop, is planted in August; the second, known as the autumn crop, in February. In some districts which enjoy a partial immunity from frosts, plantings are carried out in July so that the crop can benefit by the cooler temperatures during its growing period. The main spring crop planting, however, is carried out during August, although in districts such as the Darling Downs, planting may be delayed as late as September due to the risk of late frosts injuring earlier plantings.

It is generally recognised that the earlier the spring crop is planted the greater are the chances of a heavy yield, provided, of course, that weather conditions are favourable. A crop planted late in spring may encounter high temperatures and humid weather and tend to produce excessive top growth and a light crop of tubers. Similar unsatisfactory results may follow the use of an unsuitable variety.

In North Queensland, where only one crop is grown annually, the time of planting is influenced by the incidence of the monsoonal rains, and planting there does not take place until the wet warm season is over, usually in April-May. Sometimes a prolonged wet season will delay planting till June or even July. Late plantings, however, are not favoured.

SUITABLE SOILS AND ROTATIONS.

Potatoes can be grown satisfactorily on almost any well-drained soil of reasonable fertility, but the crop thrives best on deep, fertile loamy soils containing adequate quantities of organic matter. The function of the organic matter is to supply soil humus, which, as well as providing plant foods, has a beneficial effect on the structure or tilth of soils, particularly of heavy soils, keeping them loose, open, friable, and permeable to water. Organic matter greatly improves the water-holding capacity of light soils.

Heavy clay soils and soils which are badly drained and liable to become waterlogged should be avoided for potatoes, as not only are the chances of raising a crop very limited on such soils, but tubers of good shape and quality cannot be produced on them. Even on the best soils, high yields cannot be maintained if potatoes are grown continuously for a number of years unless care is taken to preserve the physical condition of the soil by keeping up the supply of humus.

Loss of humus can be minimised by practising a rotation of crops, and the supply in the soil can be maintained to a large extent by regular additions of large quantities of organic matter—for example, by ploughing in bulky green manures and cover crops and by using liberal quantities of farmyard manure where it is available. The green manure crop which should form part of the planned rotation, and preferably precede the potato crop, should be based on a legume such as field pea for winter growth or cowpea for summer growth. The former can be sown mixed with wheat, oats, or barley and the latter with maize, millet, or Sudan grass to increase the bulk of organic matter to be turned under.

Farmyard manure and leguminous green manures possess considerable value as fertilizers in addition to supplying organic matter. It should be realised, however, that green manures alone will not restore the humus to soils depleted by intensive cropping over a number of years or restore the desirable loamy structure or tilth so characteristic of most virgin soils. This condition can only be achieved by turning the area into grassland for a period of preferably not less than two years. A dense, vigorous cover of grass will do much to restore the soil to a state of virgin productivity. The fact that potatoes produce high yielding crops on well prepared friable virgin land, in which there is a good supply of organic matter, is due in large measure to the good physical condition of the soil resulting from the satisfactory humus content.

FERTILIZERS AND LIME.

The purpose of using artificial fertilizers is simply to correct deficiencies of major plant foods in the soil. They do not make up for other deficiencies such as a lack of organic matter or humus, improper preparation or insufficient cultivation of the soil, poor drainage and lack of soil moisture. Nevertheless, the soil must be adequately supplied with the necessary nutrients to obtain satisfactory yields, for the potato is a gross feeder and makes heavy demands on the plant food reserves of the soil.

The three major plant nutrient elements supplied in artificial fertilizers are nitrogen, phosphorus and potassium, and it is only when the soil contains insufficient of one or more of these elements for the adequate nutrition of the potato crop that artificial fertilizers can have any beneficial effect. The kind and amount of fertilizer required vary with the locality because of the differences in composition of the various soil types.

Attention is drawn to the fact that ploughing under a well grown, heavy yielding, leguminous green manure crop some five or six weeks prior to planting potatoes will supply most, if not all, of the additional nitrogen required for the potato crop.

Lockyer and Fassifern Valleys.

In the Lockyer and Fassifern Valleys, potatoes are grown on alluvial soils of inherently high fertility (Plate 185). Nevertheless, beneficial responses are frequently obtained from applications of sulphate of ammonia at the rate of 2-3 cwt. per acre, and on some of the lighter soils up to 4 cwt. per acre may be profitably used. No other fertilizer is required for these soils in general, although some of the heavier soils in the lower Lockyer and Laidley Creek Valleys are deficient in potassium and may benefit by applications of sulphate of potash or muriate of potash at 1-2 cwt. per acre. All the soils have ample supplies of available phosphorus, and phosphatic fertilizers are not required.

Plate 185.

A Field of Potatoes at Minden, in the Lockyer Valley.

Lower Burdekin.

From the evidence of field trials the alluvial soils of the Lower Burdekin appear to be mainly deficient in nitrogen, and applications of sulphate of ammonia to these soils at the rate of 3-4 cwt. per acre can confidently be expected to give a profitable response.

Other Areas.

The alluvial soils of the Logan and Albert River Valleys are fairly fertile but, like the soils of the Lockyer Valley, would probably show responses to sulphate of ammonia at 2-3 cwt. per acre.

Many of the red volcanic soils of the South Burnett and Atherton Tableland districts are deficient in nitrogen and available phosphorus, and frequently also in available potassium. It is advisable to use a complete fertilizer mixture for potatoes on these soils A mixture with the approximate formula 8:10:5 applied at 3-5 cwt. per acre is recommended for general use.

On some of the alluvial flats in the South Burnett, potassium may be the chief plant food deficient in the soil, and in these places it may be necessary to use only sulphate of potash or muriate of potash at 1 cwt. per acre after a leguminous green manure crop has been ploughed under.

For the lighter textured alluvial soils of the Brisbane Valley, a mixture of equal parts of sulphate of ammonia and superphosphate (or a 10:10:0 mixture) at 3-5 cwt. per acre is recommended.

On other areas where the soils are not inherently fertile and are known to require fertilizer, a complete mixture with the approximate formula 8:10:5 should be applied at 3-5 cwt. per acre.

Application of Fertilizers.

The fertilizer is usually applied in the furrow or drill at planting time. The normal method is to drill in the fertilizer prior to planting the seed, but more efficient utilization of the fertilizer can be secured if it is placed in a band a few inches to the side of the seed and covered by the soil without mixing. The potato setts should not be placed in direct contact with the fertilizer because of the risk of injury to the germinating seed.

The greatest benefits from applications of nitrogenous fertilizer, such as sulphate of ammonia, are usually obtained when half the fertilizer is applied at planting time and the remainder put on as a side dressing at the early flowering stage of the crop.

Lime.

Potatoes grow best in slightly to moderately acid soils but can tolerate a fairly wide range of soil acidity. As most of the potato soils in this State are either moderately acid to neutral in reaction, lime is not generally required. Its use may not only decrease the yield but may also increase the incidence of potato scab. Only under very acid conditions, such as occur in peaty soils or in some soils in heavy rainfall areas, would the use of lime be warranted.

PREPARATION OF THE SOIL.

Early and thorough preparation of the soil is essential if the best results are to be obtained from any crop, but to none does this apply more so than to potatoes. Farmers who spend the extra time and labour required to bring the soil into first-class condition will be more than repaid by the improved yields obtained, especially if a dry spell is experienced during the growth of the crop. Under the most favourable conditions, good crops may be produced on land that has received a hurried and rough preparation, but in any district such conditions are likely to occur only at rare intervals, and consequently the necessity for thorough preparation of the land cannot be too strongly stressed.

The first ploughing should be to a depth of at least nine inches, which will ensure that the seed, when planted, will have four inches of worked soil beneath it. The land should be left fallow for at least two months before planting, care being taken during that time to deal with any weed growth which may appear. A fallow period of two months or more is particularly important where a non-leguminous cover crop has been turned under. Sufficient time must be allowed for the cover crop residues to rot adequately, otherwise undecomposed organic matter may cause a temporary shortage of soil nitrogen available for plant growth. This will result in stunting and yellowing of the following potato crop. The use of a spring tooth cultivator or other suitable implement will not only deal with weed growth but will ensure that the surface soil is in good condition.

Land prepared in this way should at planting time be in satisfactory condition to give a good germination if reliable, selected seed is used. If the practice of ploughing in the seed is not adopted, the land should receive a second ploughing, which should be at least three inches shallower than the first, just prior to planting.

TABLE I.

VARIETAL CHARACTERISTICS OF POTATO TUBERS.

Name of Variety.	Maturity.	Shape of Tuber.	Colour of Skin.	Texture of Skin.	Formation of Eyes.	Number of Eyes.	Placement of Eyes.	Colour of Sprouts.
Factor ..	Mid-late ..	Elongated oval	White ..	Fine, smooth	Shallow set. Pronounced eyebrow	Moderate ..	Mostly apical ..	Green
Carman ..	Mid-early..	Oval ..	White ..	Fine, netted	Shallow set. Faint eyebrow	Moderate ..	Evenly distributed	Green
Bismark ..	Early ..	Elongated oval	Creamy white	Fine, smooth	Shallow set. Pronounced eyebrow	Numerous	Evenly distributed	Purple
Katahdin ..	Early ..	Rounded, flat	White ..	Fine, smooth	Shallow set. Faint eyebrow	Few ..	Apical	Green
Delaware ..	Mid-early..	Long, flat..	Creamy white	Fine, smooth	Shallow set. Faint eyebrow	Numerous..	Evenly distributed	Green
Brownell ..	Mid-early	Round ..	Brownish-red	Fine, netted	Deep set. Faint eyebrow	Few ..	Evenly distributed	Pink
Manhattan..	Mid-early	Elongated oval	Purple blotched	Coarse, smooth	Deep set. Very pronounced eyebrow	Numerous..	Evenly distributed	Purple
Early Manhattan	Early ..	Round ..	Purple ..	Coarse, netted	Deep set. No eyebrow ..	Moderate ..	Evenly distributed	Purple
Guyra Blue	Mid-early..	Elongated oval	Purple ..	Fine, smooth	Deep set. Very pronounced eyebrow	Numerous..	Evenly distributed	Purple
Satisfaction	Early ..	Round ..	Pink ..	Fine, smooth	Deep set. Faint eyebrow ..	Few ..	Mostly apical ..	Pink
Sebago ..	Mid-late ..	Flat, oval..	White ..	Fine, smooth	Shallow set. Pronounced eyebrow	Moderate ..	Evenly distributed	Pink
Sequoia ..	Mid-late ..	Flat, oval..	Creamy white	Fine, smooth	Shallow set. Faint eyebrow	Few ..	Mostly apical ..	Green
Saranac ..	Mid-early	Round ..	White ..	Fine, netted	Deep set. Eyebrow absent	Few ..	Mostly apical ..	Green
Adina ..	Late ..	Rounded, oval	White ..	Fine, netted	Shallow set. Pronounced eyebrow	Few ..	Mostly apical ..	Green
Monak ..	Late ..	Round ..	White ..	Fine, netted	Shallow set. Faint eyebrow	Few ..	Mostly apical ..	Green
Moona ..	Mid-late ..	Oval ..	White ..	Fine, smooth	Shallow set. Faint eyebrow	Few ..	Mostly apical ..	Green
Exton ..	Late ..	Rounded, flat	White ..	Fine, smooth	Shallow set. Faint eyebrow	Few ..	Mostly apical ..	Pink
Symington	Early ..	Round ..	Creamy white	Fine, netted	Deep set. Faint eyebrow..	Few ..	Evenly distributed	Red
Gold Coin ..	Early ..	Round ..	Ivory white	Fine, smooth	Deep set. Faint eyebrow..	Few ..	Evenly distributed	Pink
Pontiac ..	Very early	Round ..	Brown ..	Fine, smooth	Shallow set	Moderate ..	Evenly distributed	Red
Dakota Red	Early ..	Round ..	Reddish brown	Fine, netted	Deep set. Faint eyebrow..	Moderate ..	Evenly distributed	Red

NOTE.—The potato responds readily to the influence of environmental conditions; consequently there is much variability in many characters.

VARIETIES.

The question of the most suitable variety to grow is one which the farmer will have to decide for himself, either as the result of his district's experience of potato varieties or after consultation with an appropriate Departmental officer.

The general characters of the better known varieties grown in this State are set out in Table 1. Of these the first eight—Factor, Carman, Bismark, Katahdin, Delaware, Brownell and Manhattan types—are older varieties. Among the newer varieties are Sebago, Sequoia, Saranac, Adina, Monak, Moona and Exton.

Factor (Plate 186) is by far the most widely grown of the white-skinned varieties. It is adaptable to a wide range of soil and climatic conditions and produces a high yield of tubers of good size and quality. Although it is still the standard variety in most districts it is gradually being displaced by varieties less prone to disease and second growth.

Up-to-Date is similar to Factor, which is commonly regarded as a strain of Up-to-Date.

Carman (Plate 187) is a popular variety because of the excellent quality of the tubers. However, it requires specially favourable conditions to give satisfactory yields and has largely been displaced by higher yielding varieties.

Bismark (Plate 188) is a variety which yields well, but its susceptibility to second growth and the tendency to produce a high percentage of misshapen tubers are serious disabilities. It is resistant to the virus causing leaf roll. This variety is in popular demand in the Lower Burdekin.

Katahdin (Plate 190) was bred in America to resist virus diseases generally, but more particularly mosaic. It produces good yields under favourable conditions and does not make second growth. It is fairly resistant to leaf roll.

Delaware (Plate 189) is not a favoured variety in Queensland and its cultivation is mainly confined to small plantings in the South Burnett. It is a creamy white, smooth skinned variety with numerous, shallow-set eyes.

Tasmanian Brownell (Plate 191) has a rough red skin and stores well. It is not widely grown in Queensland. *Satisfaction* (Plate 192) is closely related to Tasmanian Brownell.

Early Manhattan (Plate 194) is a popular purple-skinned potato which possesses hardiness and good keeping qualities, and can be grown over a fairly extensive range of soil and climatic conditions. Its tubers are set deeply and consequently are not very susceptible to moth infestation in the field.

Sebago (Plate 195) is increasing in popularity. It is a good yielding variety and produces a high proportion of marketable tubers. It possesses resistance to Irish blight and is not prone to make second growth.

Sequoia (Plate 196) can tolerate fairly dry conditions and is a suitable variety for non-irrigated areas. It produces a very high percentage of marketable tubers, which under favourable conditions may be very large. It is resistant to Irish blight.

Plate 186.
Factor.

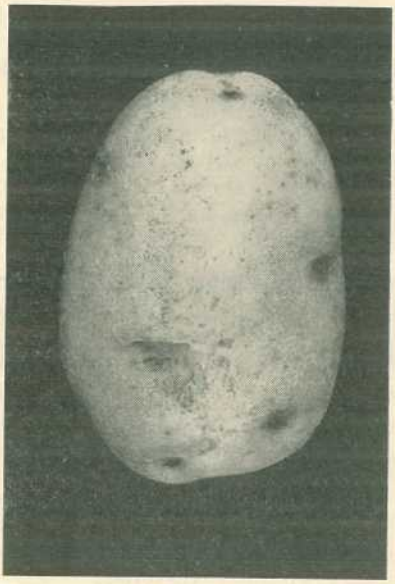


Plate 187.
Carman.

Plate 188.
Bismark.

Plate 189.
Delaware.

Plate 190.
Katahdin.

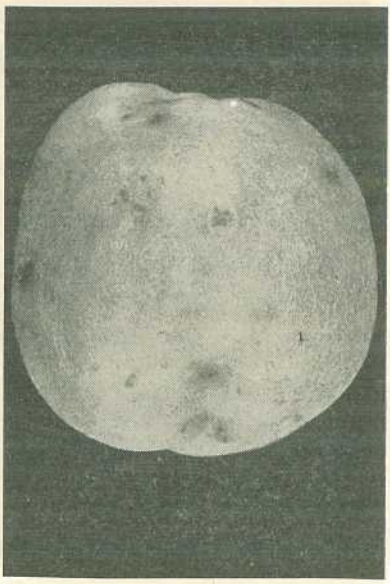


Plate 191.
Brownell.

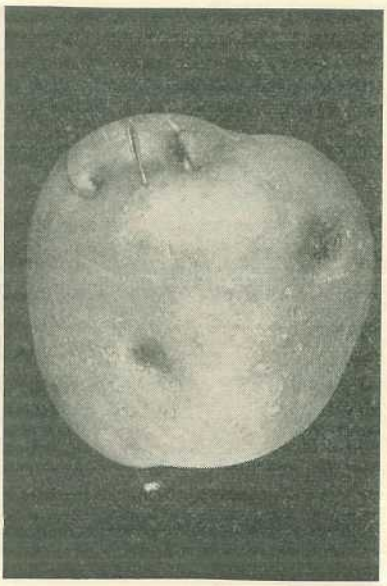


Plate 192.
Satisfaction.

Plate 193.
Manhattan.

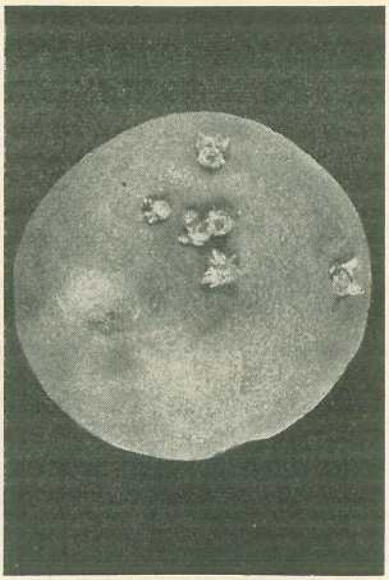


Plate 194.
Early Manhattan.

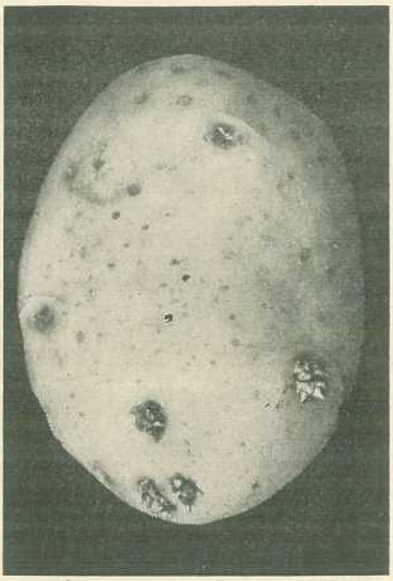


Plate 195.
Sebago.

Plate 196.
Sequoia.

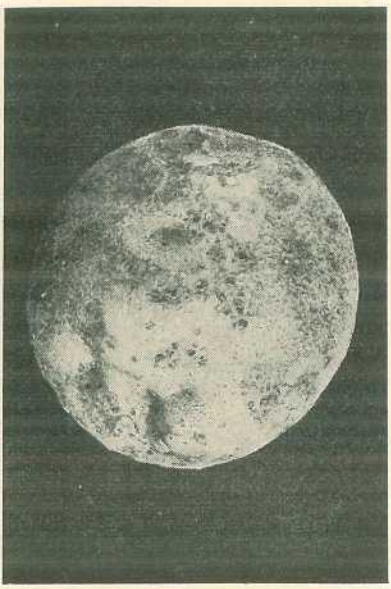


Plate 197.
Saranac.

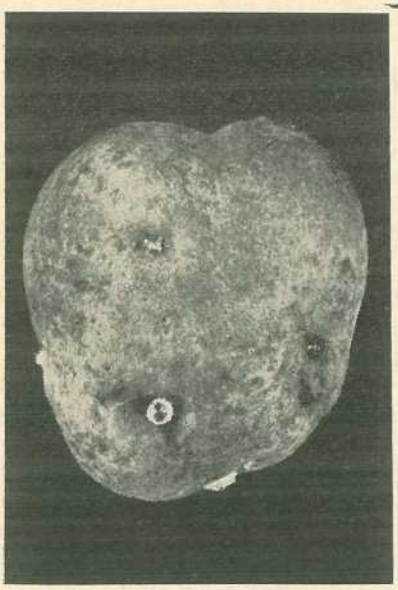


Plate 198.
Monak.

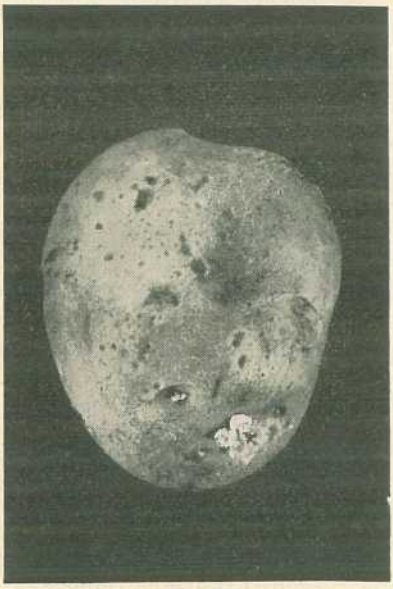


Plate 199.
Moona.

Plate 200.
Adina.

Plate 201
Exton.

Saranac (Plate 197) is not grown extensively, but in field trials has given good yields of first grade tubers.

Monak, Moona and Adina were bred at the New England Experiment Farm, Glen Innes, and released by the New South Wales Department of Agriculture in 1948. In field trials in New South Wales these varieties have consistently outyielded Factor.

Monak (Plate 198) yields a high percentage of first grade tubers of good quality. An important character is its field resistance to Irish blight and target spot. It also has some resistance to virus diseases and scab and appears to be fairly free from second growth.

Moona (Plate 199) produces medium sized tubers set closely under the plant. It has a fair degree of resistance to Irish blight, but is somewhat prone to second growth.

Adina (Plate 200) does best on the New South Wales tablelands and has limited use on the coast. Consequently it may not be adaptable to Queensland coastal areas. It has field resistance to Irish blight and target spot and is fairly free from second growth.

Exton (Plate 201) is a new variety from Victoria, where it was selected from a patch of Katahdin. It resembles the parent but is later maturing. It has been tested over a few years in Victoria and there have been favourable reports on its performance from New South Wales and South Australia. It possesses a fair degree of resistance to Irish blight.

SEED.

Seed has to be imported from the southern States for the spring planting in Queensland, as locally grown seed is unavailable for that crop. Every effort should be made to secure imported seed supplies which are certified as being produced from a disease free crop. It is far better to obtain first class seed, true to the name of the variety which is known to suit the locality in which the crop is to be grown, even though it may cost a little more, rather than to obtain a cheaper line of poor seed which may turn out to be anything but the desired variety. Certified seed should therefore be obtained if possible.

Provided the spring crop is planted early, seed can be obtained from it for planting the autumn crop in February. The grower should carefully select the tubers to be reserved for that purpose. Unfortunately, it is a common practice to use tubers which are the remains or culls from the crop after all marketable table tubers have been sold. Although they may be of a desirable size for planting the autumn crop, for which whole seed is generally used, it is an undesirable practice to use them and one which has the effect of reducing yields. Many of the tubers so selected for planting will almost certainly have been produced by weak or diseased plants which did not produce tubers of marketable size.

The general practice in the case of other important crops is to select seed only from the most desirable plants and the same care should be devoted to the selection of seed potatoes. Growers will be fully compensated for the extra time and labour involved in selecting their seed requirements only from healthy plants which produced a reasonable number of tubers, the majority of which were of good type and of marketable size. The tubers selected for seed purposes should be stored in a cool, well-ventilated room, and should be spread out in shallow

Plate 202.
Guyra Blue.

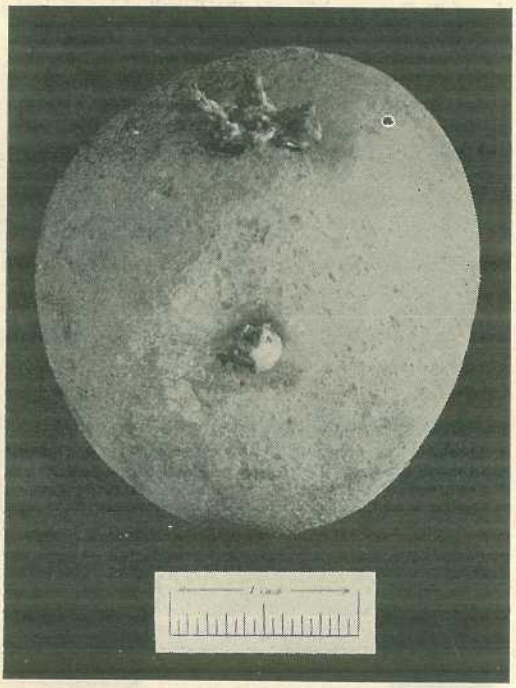


Plate 203.
Short, Sturdy Shoots, the Result of Exposure to Light.

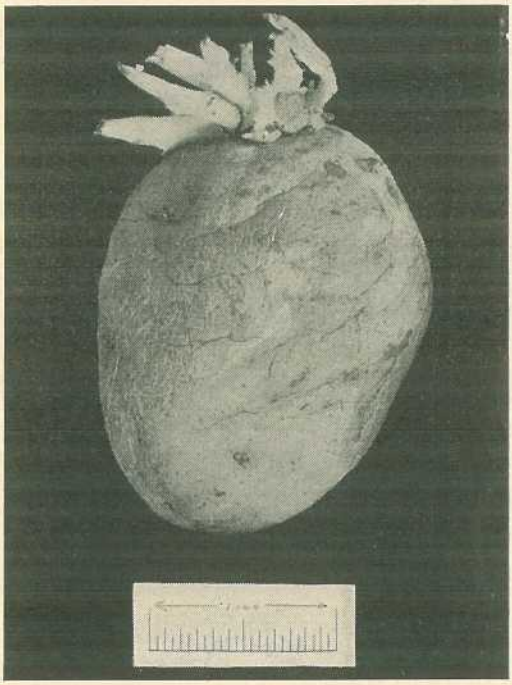


Plate 204.

Weak, easily Damaged Shoots, the Result of Insufficient Light.

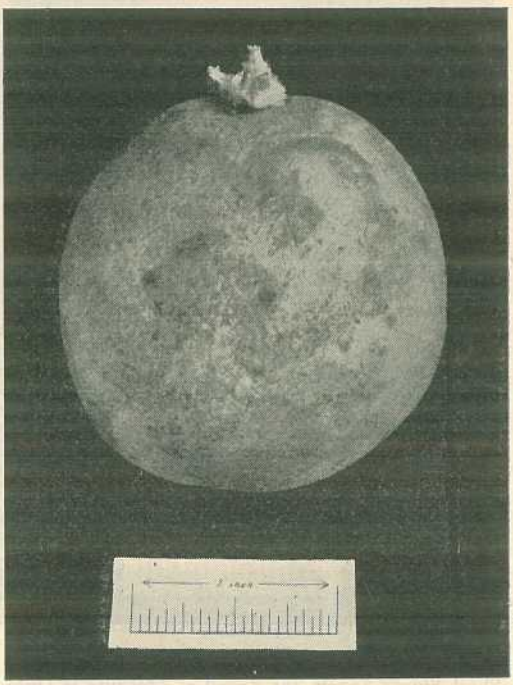


Plate 205.

An Ideal Single Sett.

layers to promote the development of short, sturdy shoots which will not rub off readily when handled and which will produce strong, healthy plants (see Plates 203-208). A further advantage of storing in this way is that the tubers are less likely to rot than when stored in heaps or deep layers and any which show signs of disease can readily be detected and immediately removed. Much greater difficulty is experienced in storing potatoes from the spring crop than is the case with the autumn crop owing to the fact that they require to be stored during the warmer months of the year when the potato tuber moth is likely to cause serious loss. Only sound, dry, unblemished potatoes should be stored, and these should be treated with a reliable insecticide before being set aside for storage.

Seed for the spring crop may be cut, but this practice is not advisable in the case of the autumn crop, as hot, wet weather is frequently experienced during February and consequently cut seed is likely to rot in the ground. When cut seed is used, the seed should be cut a day or two before planting in order to allow the cut surfaces to dry.

The best manner in which to cut seed potatoes will, in large measure, depend on their size, but as a general rule the smaller tubers should be cut in half lengthwise (Plate 206), and in the case of somewhat larger tubers the stem end should be cut off at about a third of the length of the tuber, the remaining portion being cut through the centre lengthwise, thus making three portions for planting (Plate 207). Still larger tubers should be cut into four setts of approximately equal size (Plate 208). Very large tubers may be cut into as many as six or eight setts. It is considered, however, that yields may be prejudiced if sett weight is reduced below 1½-2 oz. Any tubers which are not perfectly sound, or which, on being cut, show a suspicious looking discolouration, should be rejected.

Whether cut or whole seed is used, it is very desirable to plant only "shot" seed—that is, seed which has developed short, sturdy shoots. The planting of "unshot" seed is often responsible for uneven stands, irregular growth and low yields.

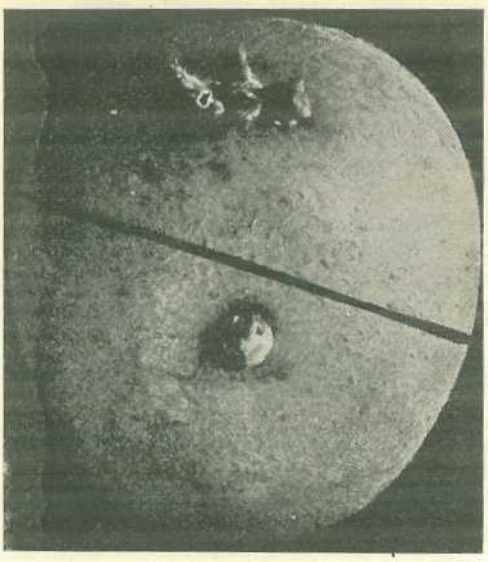


Plate 206.

12 **Tuber Suitable for Cutting into Two Setts as Shown.**

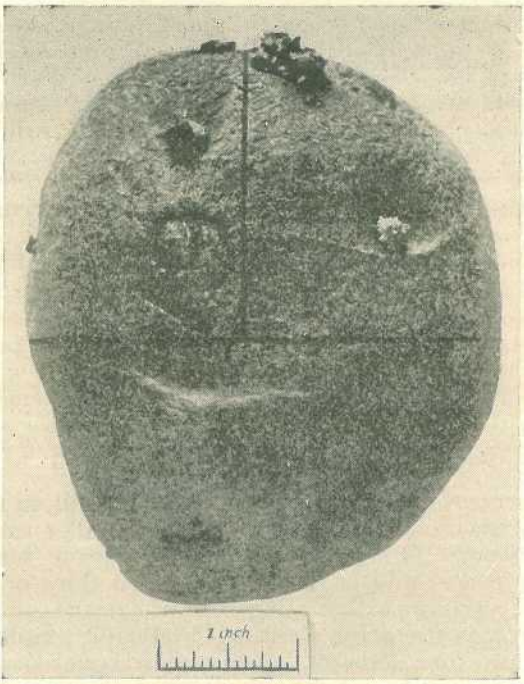


Plate 207.
Tuber Suitable for Cutting into Three Setts.

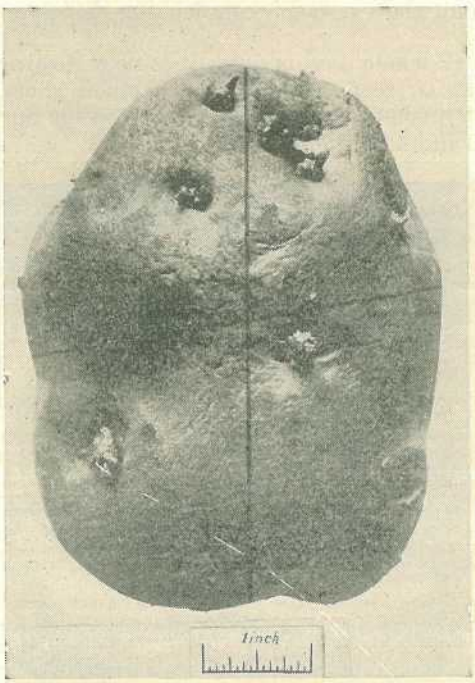


Plate 208.
Tuber Suitable for Cutting into Four Setts.

The quantity of seed required to plant an acre depends on the size of the seed and on whether whole or cut seed is used. On the average 7-10 cwt. of seed potatoes will suffice.

BREAKING THE DORMANCY OF POTATOES.

Various chemicals are known to be capable of breaking dormancy in potatoes but the cost of most of them would be prohibitive under commercial conditions. The use of acetylene gas, however, offers a method which is reasonably cheap and has been claimed to be effective. No investigations along these lines have been carried out in Queensland and the method has not been widely used here. For interested farmers the following is a summary of the details involved in the acetylene method of inducing sprouting in potatoes. With a little modification the method can be adopted for commercial usage.

Half fill a container with water and add gradually, over a period of a quarter of an hour, small pieces of commercial calcium carbide. The object of adding the carbide slowly is to keep the bubbles of acetylene gas passing through the water so that it becomes saturated. Approximately half a pound of commercial calcium carbide will produce enough acetylene gas to saturate 11 gallons of water. This is sufficient to treat 1 cwt. of potatoes at a time, but to do this the container would need to have a capacity of not less than 16 gallons.

The uncut potatoes are left in the acetylene solution for 4-5 hours. The potatoes must be whole at treatment, since if they are cut just before or just after treatment, losses due to soft rots may be excessive.

If the tubers do not need cutting into setts they can be planted immediately after treatment, provided the soil is warm and moist. Alternatively, if planting conditions are unsuitable, or the tubers need to be cut into setts, keep the tubers moist between bags or layers of damp straw in a warm place for about a week and then plant as seed tubers or cut into setts as the case may be. If the tubers are cut they should be kept in a warm moist place for 48 hours after cutting and before planting in order to obtain best results.

Some precautions are necessary. Calcium carbide must be kept dry in a tightly closed container, otherwise it deteriorates rapidly. The acetylene gas is inflammable and so naked lights should not be allowed near the place of treatment.

Varieties apparently differ in their sensitivity to dormancy breaking. Those which are fairly responsive to treatment include Factor, Sebago, Katahdin, Bismark, Carman and Delaware.

If it is necessary to treat seed potatoes for Rhizoctonia scab it is advisable to use the acid corrosive sublimate before the acetylene treatment. The treatment has the added advantage of killing potato moth grubs which may be present.

PLANTING.

Although machines are available for planting potatoes, a common practice is to plough the seed in, the field being reploughed for that purpose and the seed planted in every third or fourth furrow according to the width of the plough out. This practice has much to recommend it, as the soil and the seed in the planting furrow are not allowed to remain uncovered for any length of time, the planting and covering of the seed being practically simultaneous operations.

A practical method now often used is to drop the potatoes down a chute arranged on the frame of a three-furrow mouldboard plough, so that the potatoes fall into the middle furrow. A seat is fitted to the plough frame and the boxes containing the setts are placed on one or both sides of the chute. The method can be modified to drop fertilizer directly into the furrow, if so desired.

The seed potatoes are spaced at an even depth and distance apart, the usual distance between them in a furrow being 12-15 inches with a planting depth of five inches. The usual distance between rows is 30-36 inches. As soon as possible after planting, the potatoes should be covered to the correct depth with soil to prevent loss of soil moisture from around the seed. With modern planting machinery, planting and covering are carried out in the one operation.

In the Lower Burdekin area, planting is rarely done during the ploughing but instead the land is prepared and drilled out to the required row spacing. After planting, a small ridge is thrown over the line of the seed potatoes, it being claimed that the ridge gives some protection to the tubers by assuring ample drainage should heavy rain occur. Wide row spacings up to 42 inches are used, the purpose being to allow ample room between the rows for hilling-up operations. The normal sett spacing in this area is 10-12 inches.

CULTIVATION.

The first cultivation should be carried out as soon as the plants appear above the ground. A light tine harrow, preferably a lever type with the tines set slightly back, is the most suitable implement for the purpose. Such cultivation will not only break up the surface soil which may have become slightly caked as a result of rain or irrigation following planting, but it will also destroy any weed growth which may have sprung up between the plants. This is the best opportunity for eradicating such weed growth, as all subsequent cultivations can be carried out only between the rows. The number of inter-row cultivations will depend on seasonal conditions, and, in the case of irrigated fields, on the number of irrigations and the method used, whether spray or furrow. Cultivations should be sufficient, however, to keep weed growth in check and at the same time keep the surface soil in a friable condition. Care should be taken to adjust the scuffler so that the tines do not damage the roots of the plants.

As the plants approach the flowering stage they should be hilled; an effective and popular way of doing this is by fitting hilling attachments to an ordinary scuffler (Plate 209). It should be the practice with each successive hilling operation to gradually hill up the soil about the plants to an apex formation. The main advantages to be derived from hilling are that it prevents tubers, which might otherwise have been exposed, from being discoloured, and it also affords some measure of protection against the potato tuber moth.

Modern light tractors can be fitted with various sets of implements for cultivating and hilling potatoes speedily and efficiently.

During growth a regular spraying schedule should be carried out to control insect pests, and when there is a likelihood of Irish blight occurring in cool showery weather, appropriate preventive measures should be taken.

Plate 209.
Hilling Potatoes with a Scuffler.

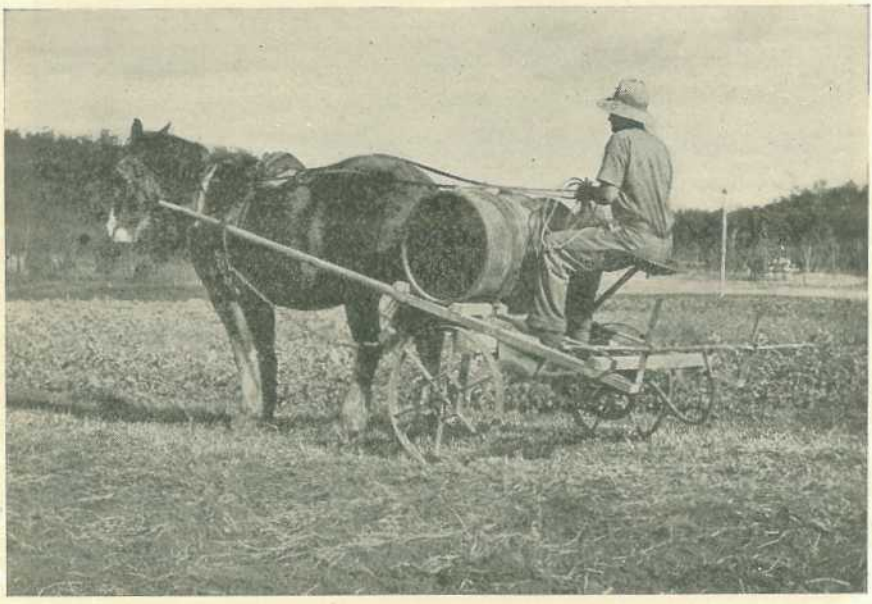


Plate 210.
A Useful Potato Spraying Machine.

IRRIGATION.

Potatoes require ample moisture for satisfactory growth and in most potato growing districts respond well to irrigation. Irrigated crops produce higher yields and give tubers more uniform in size and quality. The water should be applied in sufficient quantities to keep the crop growing evenly without stress periods. The water requirements are greatest during the period of tuber development, which is from the flowering stage until near maturity. During this period the soil should be kept moist, for if it is allowed to dry out and then watered, the tubers are likely to sprout and develop second growth.

The amount of water to apply at each watering and the number of waterings will vary with soil type and seasonal conditions. Light textured soils require light waterings at fairly frequent intervals during dry periods; heavier soils can absorb more water and may be irrigated more heavily at less frequent intervals. The amount of water applied should always be sufficient to wet the soil within the root zone of the

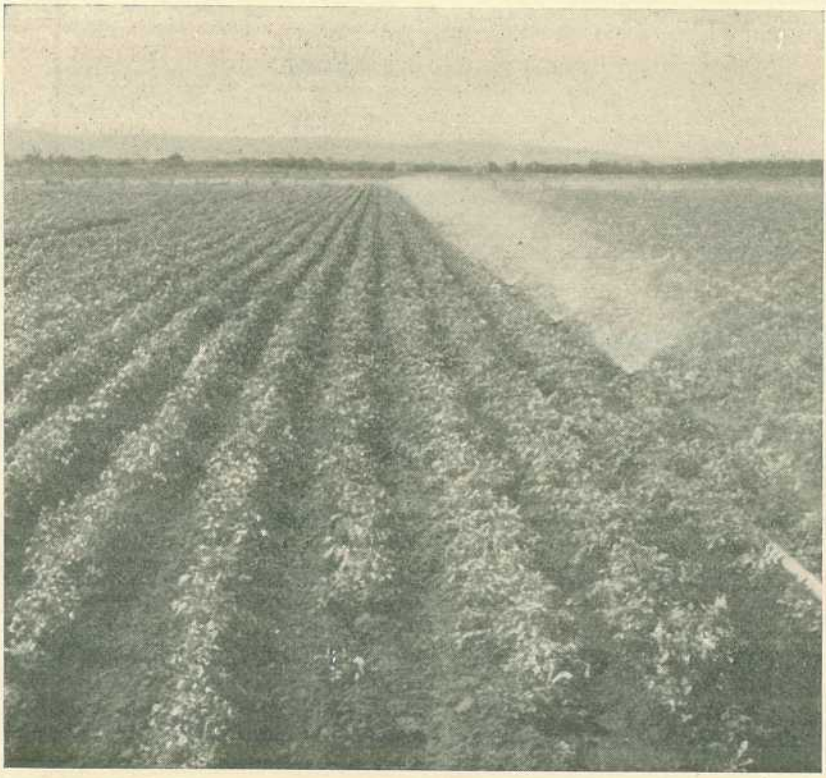


Plate 211.

Spray Irrigation of Potatoes.

plant. One to two inches per application is usually sufficient for light soils while two to three inches may be required for soils in the clay loam class.

Heavy soils, where bad drainage and ponding of water are likely to be serious risks, should be avoided. Rain immediately after irrigation in such cases is likely to cause waterlogging of the soil and heavy losses of potatoes due to disease. It is recommended that soils of this type be not used for growing irrigated potato crops.

Either spray or furrow irrigation may be used, the choice of method being influenced mainly by local circumstances. Spray irrigation (Plate 211) makes more economical use of water but entails considerable initial expense in the provision of equipment. Where ample supplies of water are available the furrow method is easier to operate. However, on fields of uneven surface topography grading is necessary before furrow irrigation can be applied to the best advantage. This problem may be of sufficient importance on some farms to warrant the adoption of spray irrigation in preference to the furrow technique. Occasionally, a combination of both methods is found to fit in satisfactorily with farm routine and the grower's labour supply. In this case, the common practice is to use spray irrigation for the establishment and early growth of the crop and carry out furrow irrigation in the later stages.

In the Lockyer and Fassifern Valleys, spray irrigation is favoured, but in the Lower Burdekin, where large supplies of irrigation water are available, the furrow technique is mainly adopted.

HARVESTING.

Harvesting, in the case of the spring crop, is usually carried out as soon as it can be undertaken safely. The hot, stormy weather which normally prevails when the spring crop is due for harvesting, and the risk of damage by the potato tuber moth, which is then particularly prevalent, make it necessary to harvest the crop as expeditiously as possible. It is not advisable, however, to dig the potatoes before the skins are firm, as immature potatoes are likely to arrive on the market in a badly rubbed and damaged condition. As the autumn crop ripens during the cooler months of the year the tubers may be left much longer in the ground after the crop has ripened than is the case with the spring crop, and, if desired, digging need not be carried out until the tops have completely dried out.

Harvesting is carried out either with a plough or with a mechanical digger. Single furrow ploughs are frequently used. These raise the potatoes and spread them on the surface, but some are always left buried in the ground. Mechanical diggers are more efficient and are rapidly replacing the plough. Both the spinner and the elevator types are used. These do good work on clean crops and on loose friable soils, but do not perform so satisfactorily on heavy soils. Farmers on the alluvial soils of the Lockyer Valley favour the elevator type diggers over the spinner type. Most mechanical diggers leave the potatoes on the surface of the ground, but recent adaptations designed to pick up and bag the potatoes aim at complete mechanization of potato harvesting.

The tubers, after being dug, should not be left exposed to the hot sun for any length of time, and they should be bagged and removed from the field as quickly as possible. Furthermore, the bagged tubers should on no account be covered with the tops while standing in the field, as this is one of the surest ways of introducing the tuber-moth pest to the bagged tubers. The harvested tubers can be protected from infestation by this pest by treatment with insecticidal dusts.

The average yield per acre in Queensland is approximately 2½ tons of first grade tubers, which is the lowest figure for any Australian State. However, yields of 6 tons of first grade tubers per acre are commonly reported, and under ideal conditions yields of 10-12 tons have been obtained in south-eastern Queensland. More attention to the selection of soil, more care in the maintenance of its physical structure and fertility, the use of certified seed and more extensive application of pest and disease control measures are considered to be essential for raising the average acre yield in Queensland.

GRADING AND MARKETING.

When preparing tubers for market they should be carefully graded to conform with regulation standards as regards maturity, size and freedom from blemishes. Care should be taken to reject any tubers which are damaged or show signs of potato tuber moth infestation, and on no account should bruised tubers or tubers with dirt adhering to them be included when bagging. The tubers should be packed firmly in the bags, but not too tightly, as such tight packing is likely to cause bruising, which will be followed by decay. Too loose packing is equally objectionable for the same reason.

Grading of potatoes is now compulsory and no person may sell or offer for sale in Queensland any potatoes which do not comply with the grade standards prescribed under the regulations of "The Fruit and Vegetables Act." Copies of the grade standards may be obtained on application to the Department of Agriculture and Stock.

The following clause in the constitution of the Potato Marketing Board in relation to the treatment of potatoes before forwarding to the Board, is quoted for the guidance of growers:—

"The Board may at any time and from time to time, by notice given by the Board in such manner as the Board may see fit, require that during such period as shall be fixed by the Board every grower delivering any of the commodity to the Board or its authorised agents shall before delivery thereof properly dust the whole of the commodity so intended to be delivered with any 'Pest Destroyer' within the meaning of '*The Pest Destroyers Act of* 1939' (or any Act or Acts in amendment or modification thereof or substitution therefor) specified by the Board."

PESTS AND DISEASES.

Losses due to pests and diseases can be a severe handicap to the potato grower and careful attention to all practical control measures is required if high yields of first grade potatoes are to be obtained.

Common diseases include various wilts, Irish blight, target spot, viruses and scab. The use of certified, disease-free seed potatoes, crop rotation and seed treatment are essential control measures. In selecting varieties for planting the use of disease resistant types should be kept in mind. Breeding programmes in southern States from which Queensland secures its seed are paying particular attention to the development of disease resistant varieties. Some are already available, and as more are released for general planting, growers should make use of those which are adaptable to local conditions.

The main pest is the potato tuber moth, but recent advances in the use of new insecticides have done much towards the solution of this problem.

Full details on the habits and control of these and other potato pests and diseases may be obtained on application to the Science Branch of the Department of Agriculture and Stock.

Brucellosis Testing of Swine.

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

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

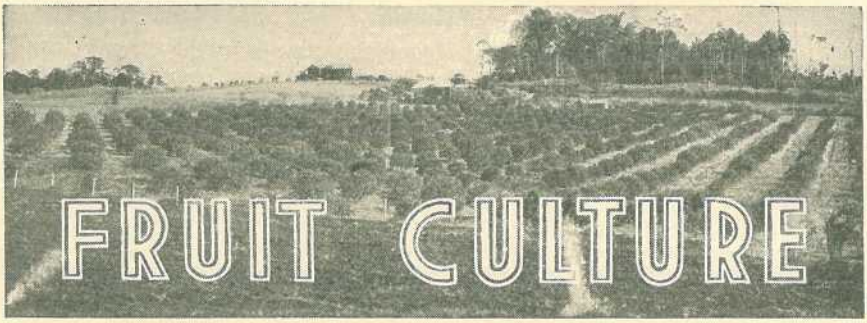
In order for a herd to be retained on the list of Tested Herds, a semi-annual or annual re-test of the herd, as determined by the Director, is required. If at a re-test any animal gives a positive reaction to the test the herd is removed from the list; it is not listed again until subsequest tests, as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

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

TESTED HERDS.

(AS AT 15th MAY, 1951.)

Breed.	Owner's Name and Address of Stud.
Berkshire	S. S. Ashton, " Scotia " Stud, Pittsworth
	J. J. Bailey, " Lucydale " Stud, East Greenmount
	S. Cochrane, " Stanroy " Stud, Felton
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	G. Handley, " Handleigh " Stud, Murphy's Creek
	J. L. Handley, " Meadow Vale " Stud, Lockyer
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	H. V. Littleton, " Wongalea " Stud, Crow's Nest
	O'Brien and Hickey, " Kildurham " Stud, Jandowae East
	E. Pukallus, " Plainby " Stud, Crow's Nest
	G. C. Traves, " Wynwood " Stud, Oakey
	E. Tumbridge, " Bidwell " Stud, Oakey
	Westbrook Farm Home for Boys, Westbrook
	H. W. Wyatte, Rocky Creek, Yarraman
	H. M. State Farm, " Palen Creek," Palen Creek
	A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
	H. H. Sellars, " Tabooba " Stud, Beaudesert
Large White	H. J. Franke and Sons, " Delvue " Stud, Cawdor
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	F. L. Hayward, " Curyo," Jandowae
	J. A. Heading, " Highfields," Murgon
	K. B. Jones, " Cefn " Stud, Pilton
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	R. Postle, " Yaralla " Stud, Pittsworth
	E. C. Smith, " Smithfield " Stud, Coomera
	E. J. Bell, " Dorne " Stud, Chinchilla
	A. G. Fry, " Birubi " Stud, Dalby
	M. E. Meyers, Halpine Plantation, Kallangur
	L. C. Lobegeiger, " Bremer Valley " Stud, Moorang, *via* Rosewood
Tamworth	S. Kanowski, " Miecho " Stud, Pinelands
	N. R. Potter, " Actonvale " Stud, Wellcamp
	D. F. L. Skerman, " Waverley " Stud, Kaimkillenbun
	A. C. Fletcher, " Myola " Stud, Jimbour
	L. C. Lobegeiger, " Bremer Valley " Stud, Moorang, *via* Rosewood
Wessex Saddleback ..	W. S. Douglas, " Greylight " Stud, Goombungee
	D. Kay and P. Hunting, " Kazan " Stud, Goodna
	E. Sirett, " Iona Vale " Stud, Kuraby
	C. R. Smith, " Belton Park " Stud, Nara
	H. H. Sellars, " Tabooba " Stud, Beaudesert
	H. Thomas, " Eurara " Stud, Beaudesert



The Harvesting, Handling, Packing and Marketing of Bananas.

C. G. WILLIAMS, Supervisor (Preparation and Transport), Horticulture Branch.

IN sub-tropical Queensland, the principal commercial varieties of bananas are mostly grown on rugged hillside situations, which makes harvesting and transport conditions difficult. Consequently, the fruit is often unavoidably damaged during transport to the packing shed. Fortunately, the banana has a very efficient protective skin which will withstand a considerable amount of rough treatment. The results of very rough treatment of the fruit become apparent as dark, bruised patches on the skin when the banana ripens. The appearance of such fruit depreciates its sales value. Where it is possible to install an overhead wire transportation system from the plantation to the packing shed for the conveyance of bunch or cased fruit, transport difficulties and associated fruit damage will be considerably reduced.

Bananas are adversely affected by large variations in temperature. It is therefore essential that harvesting should be performed during the cool morning period of the day.

Harvested bunches should be stood vertically in a shaded section of the plantation or loading depot, and if necessary, they should be covered with leaf trash or other additional protection against the direct rays of the sun.

In the packing shed the bunches should be placed in a cool, shaded and well ventilated position. It is important that the fruit be prepared for market and transported with a minimum of delay. The cased or bunched fruit in transit to the market must not be subjected to exposed conditions under the hot sun.

On all occasions, transport and associated arrangements should provide efficient protective conditions against overheating or chilling of the fruit.

It is essential that fruit receive careful handling and that the packing shed and equipment be designed for comfortable, expeditious and hygienic handling, grading, and packing of the fruit. The procedures recommended in this respect are given in this article.

HARVESTING.

Maturity.

The bunches should be cut from the plants with a heavy knife (such as a cane knife) when the fruit is at a green mature stage. In determining this stage of maturity the grower will be guided by local and seasonal conditions applicable to the development of his fruit.

It is recognized that the ideal green mature banana of the Cavendish type is one that is full of substance, almost round in lateral shape and light green in colour. Bananas maturing during late winter and spring may be somewhat angular in lateral appearance, yet, if such fruit is allowed to remain on the plant until it becomes more round or full in substance, the skin may crack and the fruit will ripen and thus become unsuitable or too soft for distant transport. This, in effect, means that the grower must use his own discretion as to when the bananas are at a green mature stage sufficient to ensure good quality on ripening.

With Lady Finger and plantain types, the green mature fruit is angular but full laterally, not flat.

The Sugar type must be full round in lateral shape when mature.

Cutting the Bunch from the Plant.

If the extended main stem (flower bract) of the bunch has not been cut off, it should be removed by cutting it to about two inches below the bottom hand on the bunch. This protruding two-inch length of main stem will take the weight and shocks in subsequent handling when the bunch is stood in a vertical position, as it always should be. A yoke will be found very useful for transporting the bunches from the plants to the loading centre. The bunches should not be stacked in a horizontal position as this may result in bruised and broken fruit. Clean banana leaf trash is an excellent padding material for bunch protection.

THE PACKING SHED.

The packing shed is usually placed either within the plantation, if the topography of and the road access to the site will permit, or as near as possible thereto. If an overhead wiring system is used the packing shed may be located at a convenient central receiving site or at a wiring station terminal accessible from the main road outlet. At the latter location, a central packing shed would be the receiving centre for bunches conveyed by overhead wires from one or several points in the plantation. An illustrated leaflet relative to a wiring system for banana plantations is available on application to the Department.

The prime productive period for any one area of bananas is relatively short. Therefore, it is not economical, except in a central position served by numerous progressive areas, to construct a packing shed of an elaborate permanent type on any one location. However, the shed should be designed to have:—

(1) Ample ventilation and windows to give good internal lighting.

(2) Sufficient space for storage of bunches and for dehanding the bananas.

(3) Divided benches or floor space for graded fruit.

(4) Space for a lid clamp and nailing down stand.
(5) Space for made-up cases and case timber.
(6) Sufficient room for stacking the cased fruit close to the outlet door.
(7) Accessibility from an all-weather road outlet.

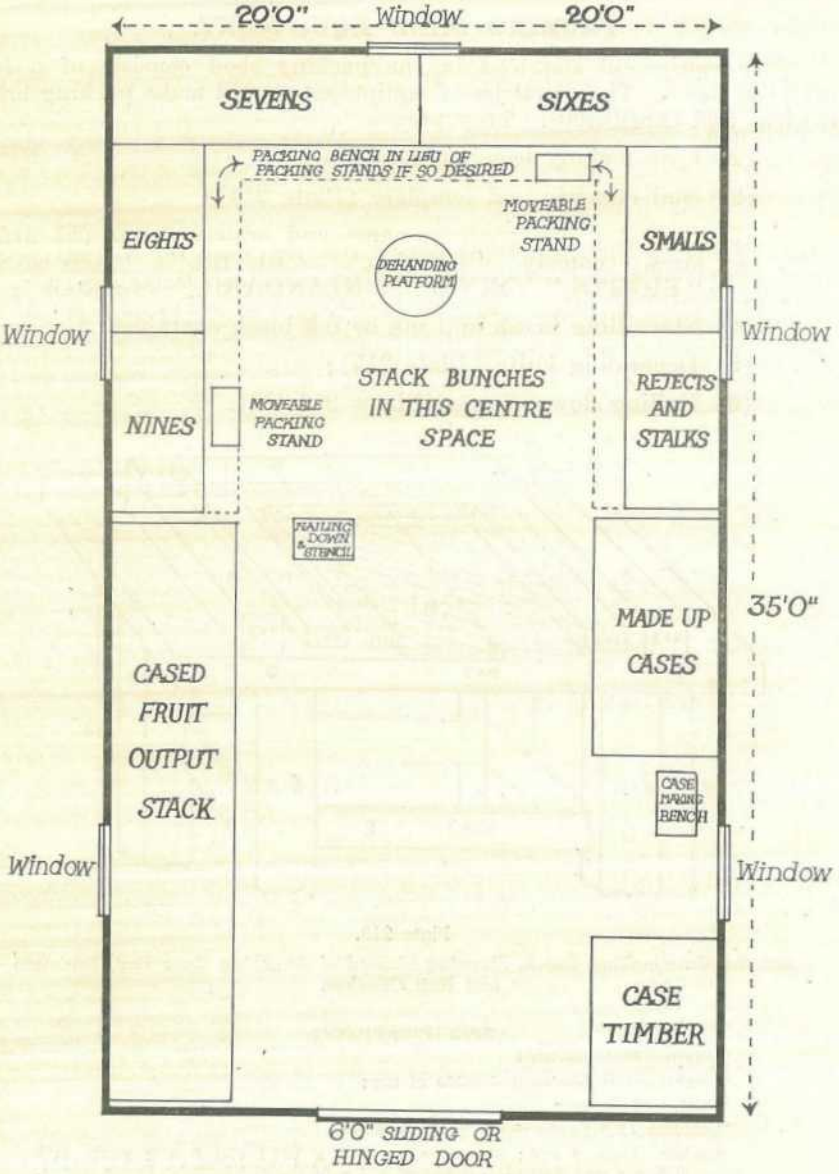


Plate 212.

Floor Plan of Banana Packing Shed.—The bins containing the fruit should be constructed to stand 3 ft. 6 in. at the back and 3 ft. 3in. at the front from floor level. The dehanding stand should be a raised, circular, moveable platform of sufficient size for bunch dehanding and the breaking of the hands into grade size groups. The grade groups from each bunch should be transferred to the respective grade bins.

A floor plan of a banana packing shed is shown in Plate 212. Although this shed may be too large for the average grower, it can, if necessary, be reduced in size as required. The shed need not be elaborate in its structure, but for hygienic reasons it is advisable to have a raised wooden floor. Ample ventilation and good internal lighting are essential.

PACKING SHED EQUIPMENT.

The equipment required in the packing shed consists of a few essential items. These articles of equipment should make packing more efficient and expeditious. They are:—

(1) Case making bench (Plate 213);

(2) Nail clincher and template (Plate 214);

(3) Stencils: (*a*) grower's name and address; and (*b*) grade sizes, namely "SMALL," "SIXES," "SEVENS," "EIGHTS," "NINES," "STANDARD," "LARGE";

(4) Stencilling brush and ink or ink block container;

(5) Dehanding knife (Plate 215);

(6) Nailing down clamp (Plates 216-220).

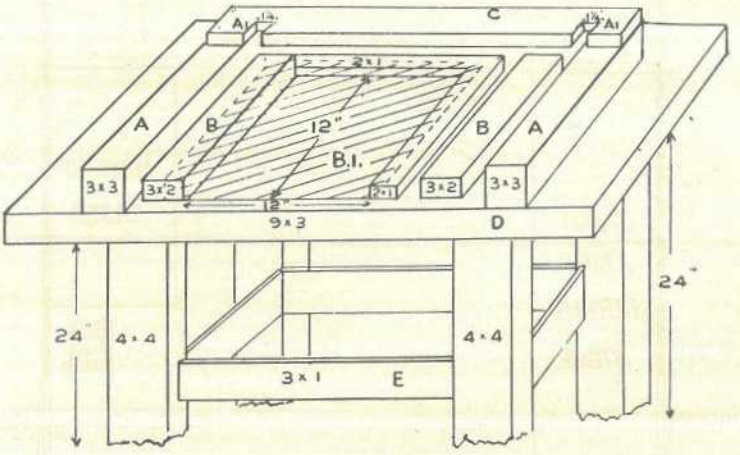


Plate 213.

Banana Case-making Bench, Showing Method of Attaching Case End, Template and Nail Clincher.

SPECIFICATIONS:

Length—42-50 inches;

Height—24 inches to underside of top;

Width—24 inches;

Template (B.1.)—As shown in Plate 214;

Timber—Legs, 4 x 4; Stops, (A) 3 x 3 x 13½; (B) 3 x 2 x 12, (C) 3 x 1 x 34; Top (D), 3 pieces 8 x 3 of desired length; Stays, 3 x 1.

DESCRIPTION:

The Stops A and B are placed approximately 1½ inches apart, with C placed across the back ends of A and B. A cut 1 inch deep and 1½ inches wide is made in the back stop to correspond with the slot between A and B. The back end of this cut should be 12 inches from the front of the bench. B is placed ½ inch from the front edge.

Template and Nail Clincher.

Many growers find difficulty in making up two-piece ends for fruit cases into correct widths; this is due often to the badly-cut timber. This can be easily overcome by attaching a template, in the form of a three-sided wooden frame, to the shed bench (Plates 213-214). A piece of flat sheet iron is placed to cover the space enclosed by the sides of the template. This acts as a nail clincher, turning the ends of the nails when the cleats used for joining the two pieces making the end are hammered on.

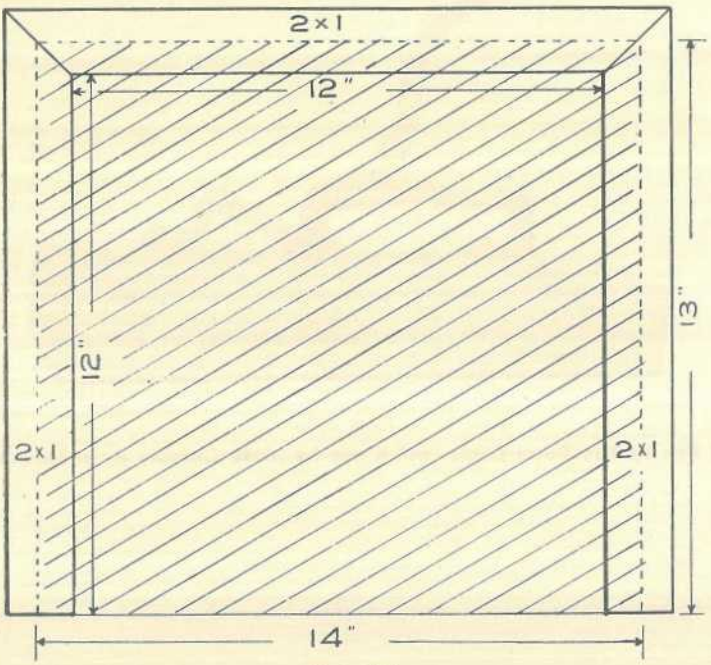


Plate 214.

Plan of Nail Clincher and Template.—This can be made separately or fitted to the case-making bench. The dotted line enclosing the shaded portion shows the shape of the piece of sheet iron, which is valuable for joining two-piece ends. The materials required are 2 pieces of 2 x 2 14 inches long, 1 piece of 2 x 1 16 inches long, 1 piece of sheet iron 14 x 13 x $\frac{1}{8}$ inch, and necessary nails.

Dehanding Knife.

A good dehanding knife is an essential tool. Much time will be saved with this tool. A long tapered sharp blade is ideal, permitting the operator to make the semi-circular cut with ease. Wide-ended blades of the carving knife pattern are slow and unsatisfactory.

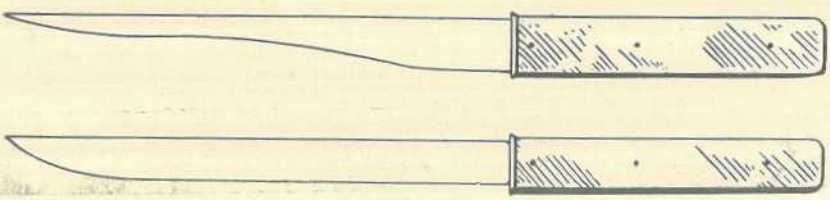


Plate 215.

Suitable Dehanding Knife (top).—The thin blade makes the necessary semi-circular cut easy. The other knife is unsuitable.

Nailing Down Clamps.

On account of the height of the finished pack above the top of the case, it is necessary that an efficient type of lid clamp be used. Plates 216-220 show two types of clamps and their mode of operation.

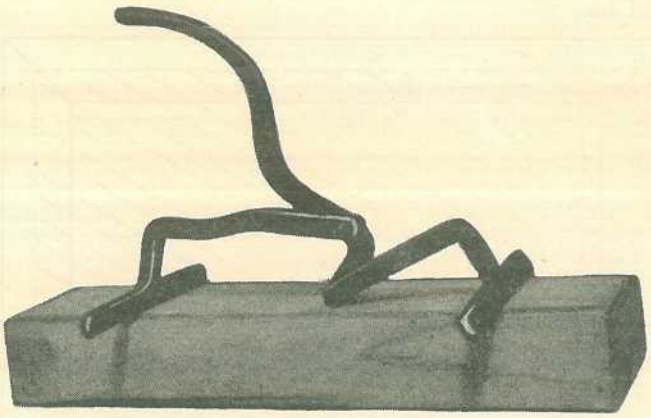


Plate 216.

An Iron Nailing Down Clamp which can be Made Cheaply by a Blacksmith.

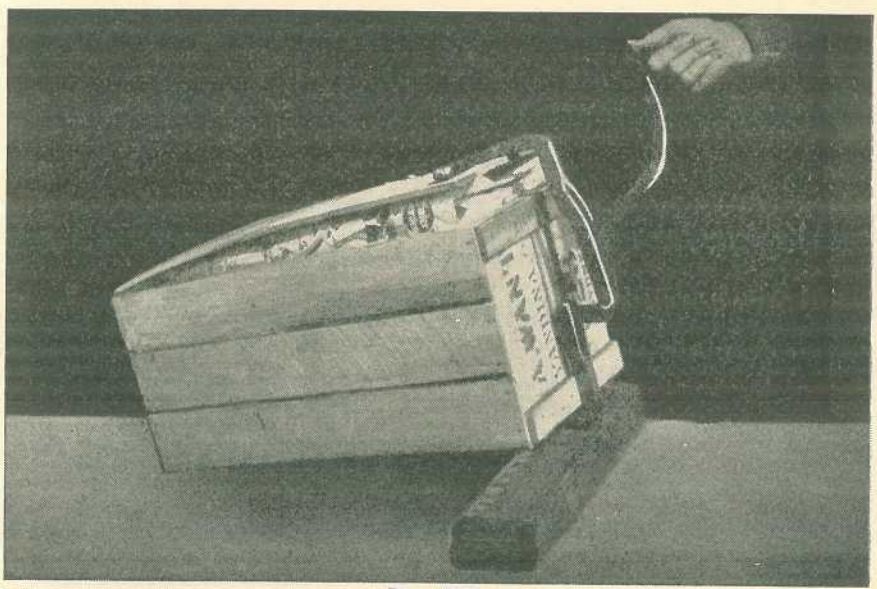


Plate 217.

The Clamp in Position Before Applying Pressure.

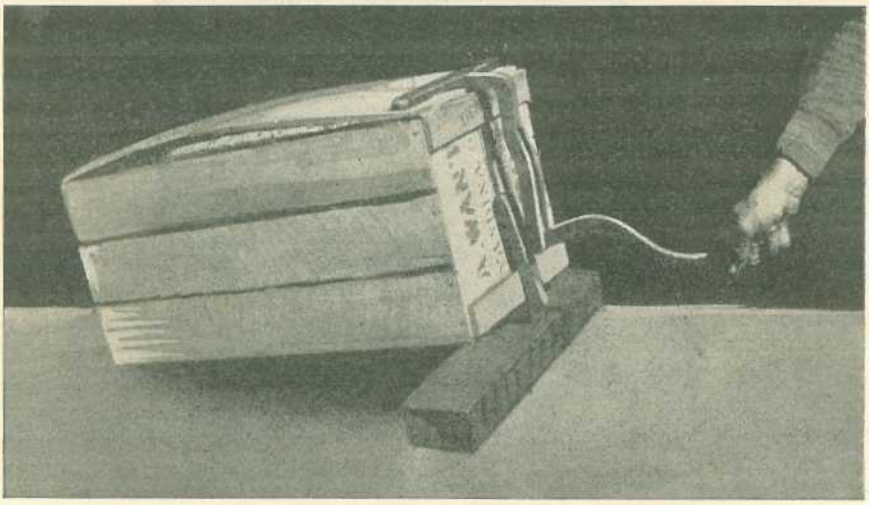


Plate 218.

Pressure Applied to Bring the Lid into Position Ready for Nailing.

Plate 219

Another Type of Iron Clamp Ready for Pressure to be Applied.

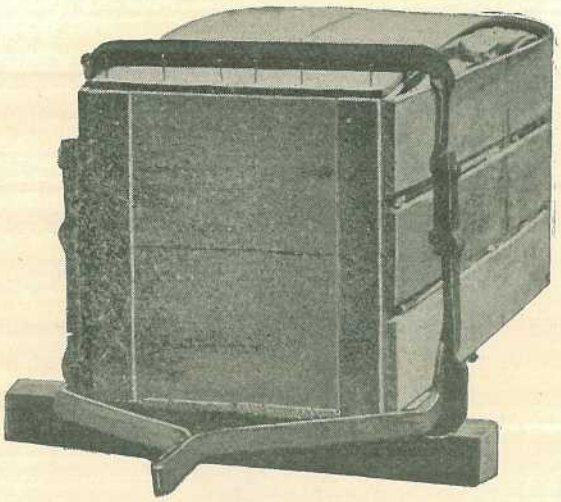


Plate 220.
Pressure Applied and the Lid Ready for Nailing.

MARKETING IN THE BUNCH.

In some instances, growers near market centres forward their fruit in the bunch. The Lady Finger variety is usually despatched in this manner. Bananas marketed in the bunch should be trimmed in the plantation packing shed, all undeveloped, broken, bruised, deformed and ripe bananas being cut out with a sharp thin-bladed knife.

As previously mentioned, all bunched fruit should be stood in a vertical position. Banana leaf trash or any other suitable material should be used as padding under and between the bunches. When this practice is not adopted the fruit is invariably skin damaged, and the percentage of waste from bruised and broken fruit is high. When bananas are marketed in the bunch, the weight of fruit in each bunch should be legibly impressed or branded on the top end of the stalk. The bunch should be weighed after all undersized or unsound fruit has been removed from the bunch and the bunch stalk has been cut so that it does not extend more than six inches from the junction of the stalk and the first hand of bananas.

MARKETING IN THE CASE.

Bananas for distant markets are despatched from the plantation in cases. The trade prefers the fruit in packs known as singles. This, as the pack implies, means that each fruit has to be detached from the hands of the bunch.

Dehanding.

To remove the fruit from the bunch, a cut is made through the flange or joining-piece along the raised brown ridge (4 in Plate 221). Occasionally a slight variation in the placing of this cut may have to be made owing to some hands differing slightly in the way they are attached to the stalk. Notwithstanding any slight difference as mentioned, the cut should always be made at least a quarter of an inch from the girdle (3) around the shank of the fruit, leaving a small piece of the wood attached to the shank (Plate 222). It may be necessary with awkwardly shaped bunches to avoid damage to adjoining hands by making two cuts, one to remove the hand, and a second to trim away

any surplus wood before breaking for packing. Hands removed from the bunch in this manner will easily break into part hands or singles, leaving a small length of the corky wood attached at the end of the shank to dry out. This assists in protecting the fruit from black-end, squirter, and other infections, also leaving the shank full and well-shapen after ripening.

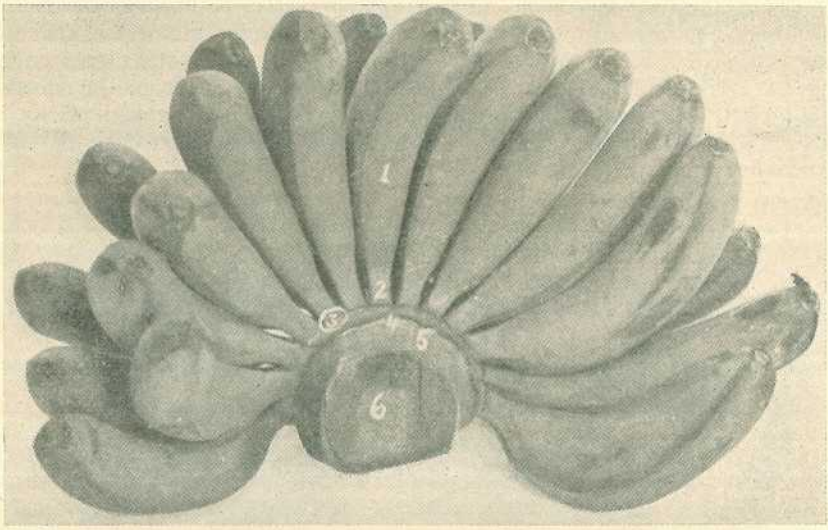


Plate 221.

A Full Hand of Bananas Cut Through the Stalk of the Bunch.—1, the fruit; 2, the shank or neck of the banana; 3, the raised girdle around the neck of the banana where the fruit is joined to the flange; 4, the raised brown ridge running round the flange or piece joining the fruit to the stalk; 5, the joining-piece or flange; 6, cross section of the bunch stalk.

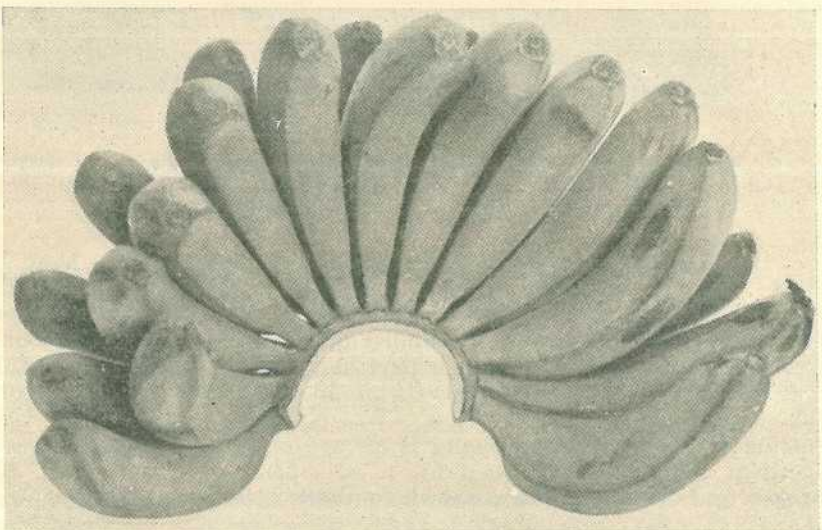


Plate 222.

Hand Removed from the Bunch.—Note the absence of excessive wood. If in doubt it is better to leave too much wood, as a second cut can always be made if necessary to complete the operation.

Cutting the hand from the stalk and leaving too much wood on the hand makes it difficult to break the fruit from the hand. This may cause the shanks or stalks to become wrenched, and, in some cases, torn.

Breaking the Hands.

Breaking the hands into clusters or singles will present no difficulties if the dehanding has been carried out correctly. The easiest method of breaking is to support the full hand of bananas along the arm with the operator's hand spread beneath one end and the other end resting on the wrist and forearm. The fruit is then broken from the hand by being gripped firmly by the shank (Plate 223) and broken off by the use of a semi-circular motion. On no account should fruit be pulled or wrenched from the hand.

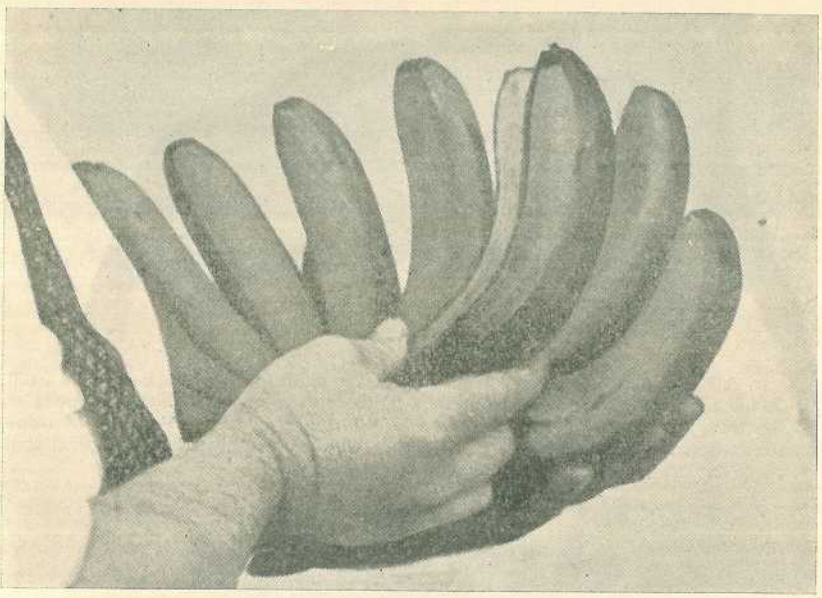


Plate 223.

Method of Holding the Hand of Bananas for Breaking.—The weight of the fruit is supported by the arm, preventing any possibility of strain on the shanks of the fruit. Note how the fruit is held by the shank.

Handling by the shank only, so far as the shape of the hand will allow, is of the utmost importance. Some operators hold the hands by the flower end of the bananas when breaking. This must cause damage to the fruit and increase the possibility of transit and ripening troubles. Cutting the hands into singles or part hands is to be recommended, but it is doubtful whether most growers would consider it economical to do this when banana prices are low. When prices are at payable levels, cutting the fruit from the hand is always payable. Cutting gives an excellent appearance to the fruit after ripening. Example of well-broken and cut bananas are shown in Plate 224.

Care in handling and cleanliness in the packing shed are necessary in order to eliminate chances of fungal infections which lead to squirter and black-end.

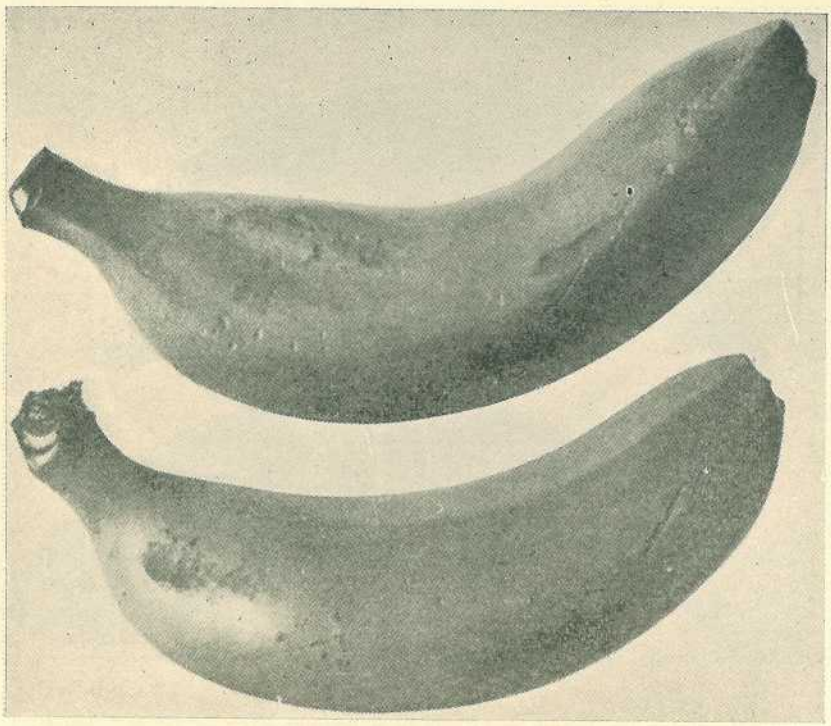


Plate 224.

Good Single Fruit.—Top, a fruit cut from the hand; bottom, a fruit broken from the hand, leaving some wood adhering to the end of the shank.

GRADING.

After the hands have been cut the bananas should be graded for size into either "Small," "Sixes," "Sevens," "Eights," or "Nines." Grade specifications are as follow:—

"Small" shall consist of bananas not less than five inches but less than six inches in length and not less than four inches in circumference.

"Sixes" shall consist of bananas not less than six inches but less than six-and-a-half inches in length and not less than four inches in circumference.

"Sevens" shall consist of bananas not less than six-and-a-half inches but less than seven-and-a-half inches in length and not less than four inches in circumference.

"Eights" shall consist of bananas not less than seven-and-a-half inches but less than eight-and-a-half inches in length and not less than four-and-a-quarter inches in circumference.

"Nines" shall consist of bananas not less than eight-and-a-half inches in length and not less than four-and-three-quarter inches in circumference.

The method of grading bananas for size is demonstrated in Plate 225.

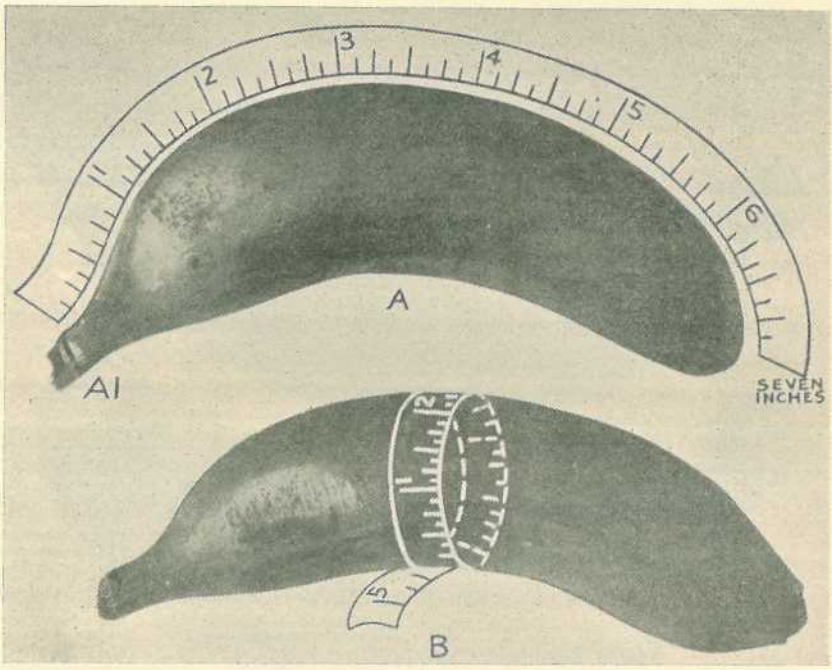


Plate 225.

Measuring the Length and Girth of a Banana.—The length is taken from the raised girdle (A1) to the centre of the end; measurement for girth is made at the middle of the fruit.

PACKING CAVENDISH AND SIMILAR TYPES.

The singles pack is most commonly used in the cased banana trade for Cavendish and varieties of similar type. Other packs, such as clusters or full hands, are not generally favoured by the trade.

Bananas in full hands or clusters, if packed firmly, will carry much better to distant markets than singles, which are more subject to breakdown and mould wastage than hands or clusters. With singles, a greater weight per case is obtained in comparison with the cluster or full hand packs.

The time taken in packing each type of pack is approximately 10-15 minutes per case for singles, 6-10 minutes for clusters, and 2½-5 minutes for full hands.

The Singles Pack.

The case should be fully lined with plain white paper or newspaper.

To commence the singles pack, two rows of evenly sized graded bananas are placed in line on the bottom of the case as shown in Plate 226. It will be noted that the stalk ends of the fruit are placed against the side of the case.

The second and successive layers of bananas are placed as far as possible in the spaces between the fruit in the previous layer concave downwards. The space between the two rows of bananas in the layers should be filled in with the fruit in the manner shown in Plate 227. This vertical arrangement of placing the fill-in bananas in the centre spaces may be varied by arranging the fruit into a flat and firm position progressively with the pack.

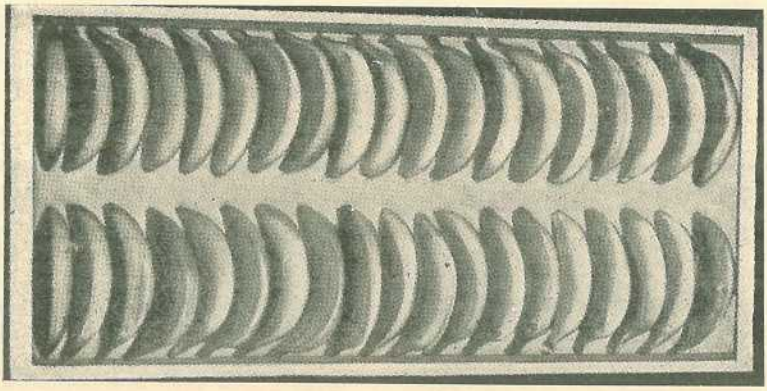


Plate 226.

Singles Pack.—The first layer of "sixes," "sevens" and small "eights" is placed as shown; the centre space varies in width according to the size of the fruit.

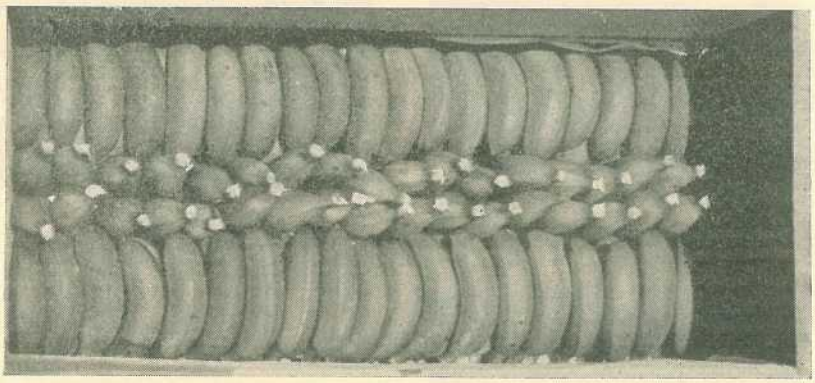


Plate 227.

Singles Pack.—Method of placing the second layer. Note the vertical method of placing the centre fruit when pegging.

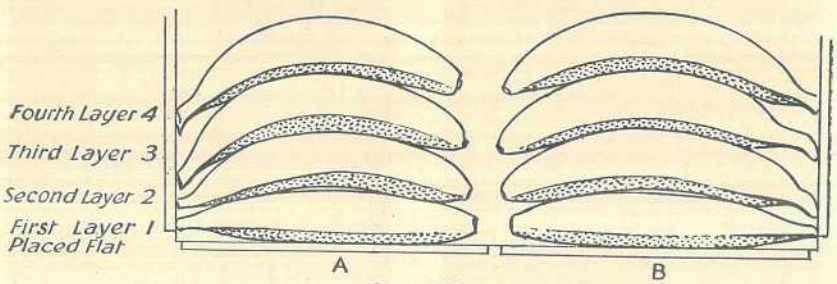


Plate 228.

Singles Pack.—Diagram showing correct and incorrect methods of placing the fruit. A, correct method, with shanks of fruit placed well down the side of the box. B, incorrect method, showing layers of fruit packed without placing the shanks well down the side of the box. Care should be taken not to place the shanks of the fruit too far over, as skin marking will develop on the soft shoulders of the fruit.

When packing the successive layers, the shank end of the bananas should be placed well down the side of the case as shown in Plate 228. In the building up of successive layers the pack should be kept firm. The bananas should be placed into appropriate spaces between the fruit in the layer underneath (Plates 229-231).

Plate 229.
Singles Pack—"Sixes."

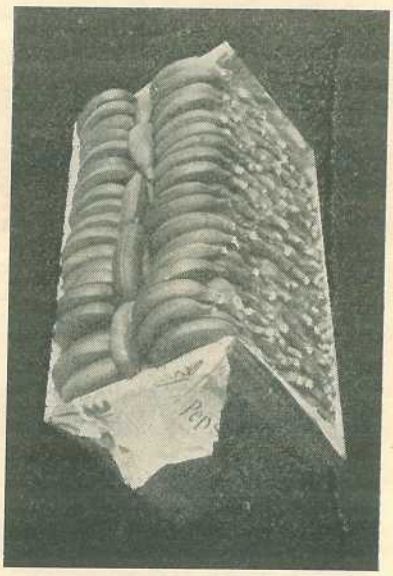


Plate 230.
Singles Pack—"Sevens."

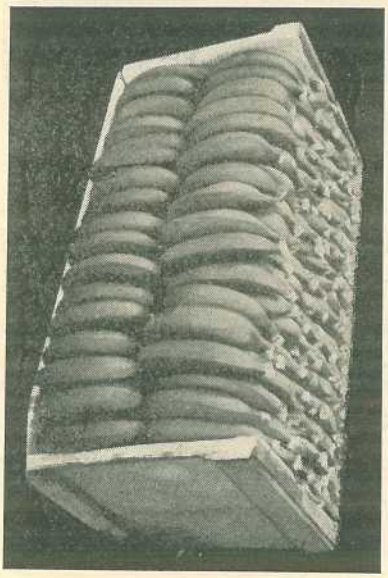


Plate 231.
Singles Pack—"Eights" or "Nines."

Plate 232.
Stacking Cases—The Right Way (left) and the wrong.

If the pack is not done in a systematic manner with evenly graded bananas, it will not be possible to obtain the required weight of fruit per case (approximately 75 to 80 lb.). Further, a badly packed case will arrive at its destination with the fruit in a loose condition and bruised.

The finished pack should be 2½ inches above the top of the case at the centre and about one inch above at each end. This top bulge will be pressed evenly into position when the lid is applied by means of the lidding clamp.

All packed cases should be placed on their sides (see Plate 232). If the cases are stacked on the bulge, the fruit will be bruised, particularly on the top and bottom layers.

Cluster and Full Hand Packs.

Bananas packed in clusters or hands are graded into one or other of three sizes, namely, "Small," "Standard," and "Large," the specifications of which are as follows:—

"*Small*" shall consist of bananas not less than five inches but less than six inches in length and not less than four inches in circumference.

"*Standard*" shall consist of bananas not less than six inches but less than seven-and-one-half inches in length and not less than four inches in circumference.

"*Large*" shall consist of bananas not less than seven-and-one-half inches in length and not less than four-and-one-half inches in circumference.

A case packed with clusters shall contain not less than 90 per cent. by number of bananas combined in clusters.

A case packed with hands shall contain not less than 80 per cent. by number of bananas combined in hands.

The Cluster Pack.

In this type of pack (Plates 233-238), the bananas are combined on a section of the flange of the hands in units of two to six bananas. The combination of clusters may vary throughout the pack, but it should be confined within the limits of two and six.

With the cluster pack, the bananas in combination should be as close and evenly fitting as possible. A hand that contains an even type of fruit (Plate 233) can easily be broken into clusters containing up to six bananas which will fit together firmly (Plate 284). An uneven type of hand (Plate 235) may need to be broken into smaller clusters of three or four bananas to ensure that the clusters fit snugly together when packed.

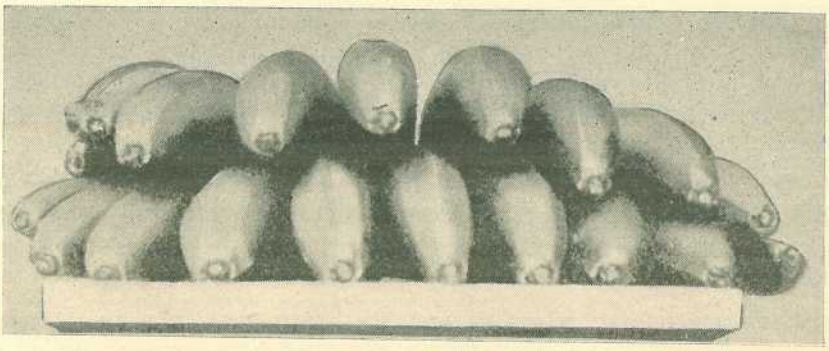


Plate 233.

Cluster Pack.—A hand of green fruit which is very suitable for breaking into clusters.

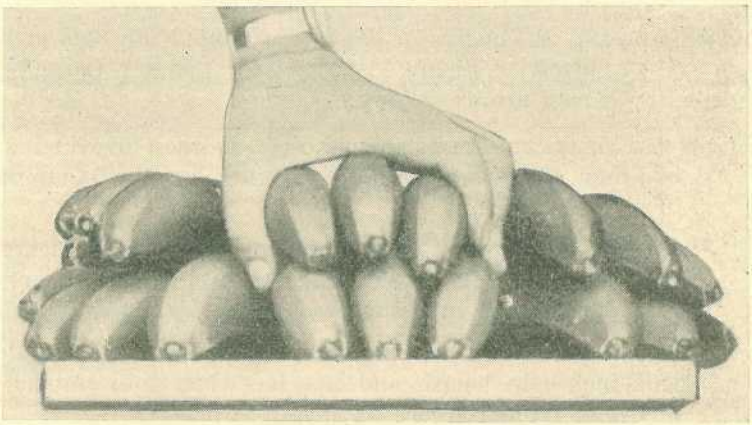


Plate 234.

Cluster Pack.—The same hand of fruit as in Plate 228, showing how the fruit will fit together when pressure is applied.

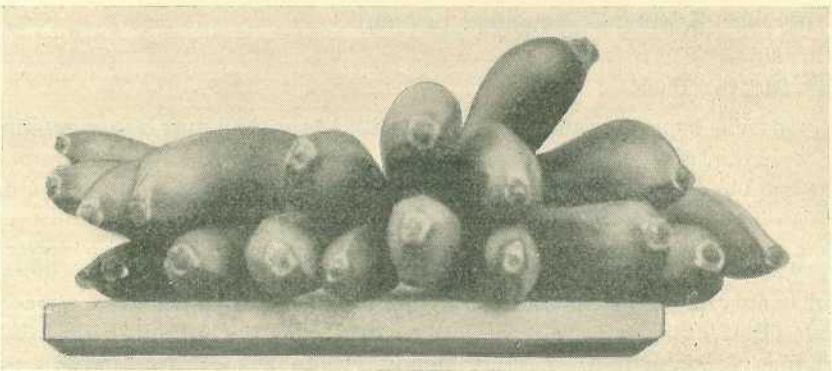


Plate 235.

Cluster Pack.—An uneven hand which would require breaking into smaller clusters of two or four.

In the placement of the bottom layer, careful attention should be given to the selection of clusters of even size in order to obtain a firm and straight line foundation for the neat and orderly construction of

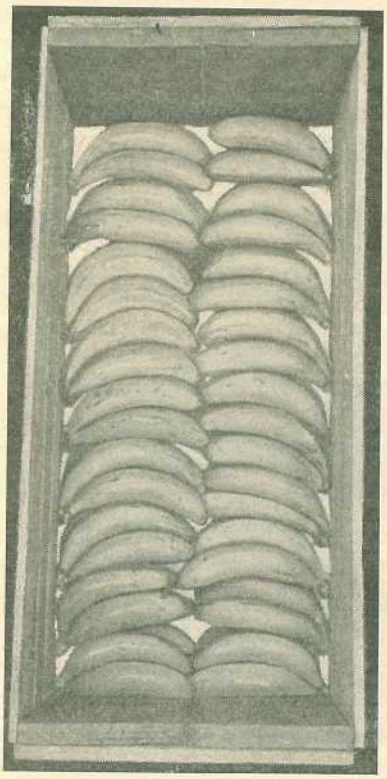


Plate 236.
Cluster Pack.—Showing how the fruit is placed for the first layer.

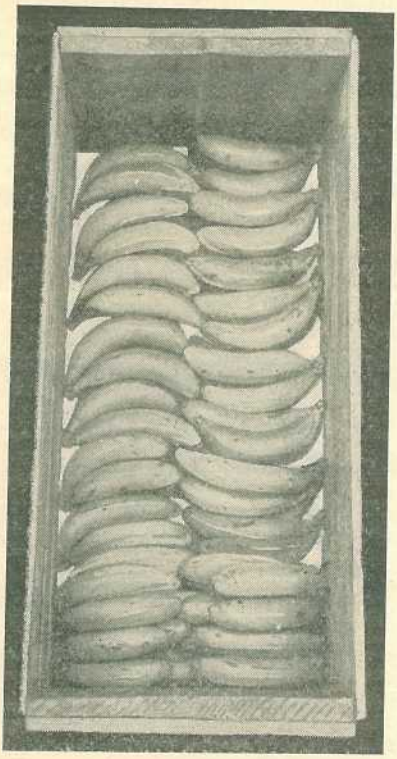


Plate 237.
Cluster Pack.—Starting the second layer.

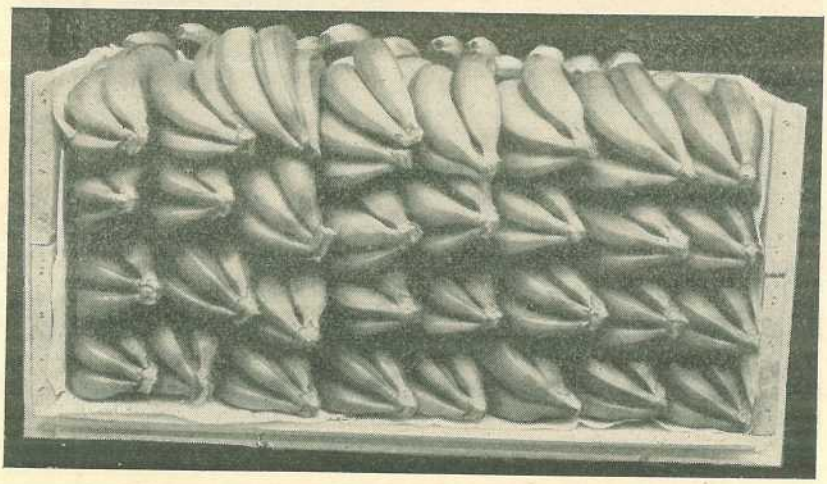


Plate 238.
Cluster Pack.—A completed pack. Owing to the large clusters used, this pack would be light in weight.

subsequent layers. With the first layer, the clusters are placed on their sides in two lines with the stalk ends against the sides of the case (Plate 236). The second and following layers are placed over the bottom layers with the concave side of the fruit downwards, and stalk ends must be placed well down the sides of the case as in the singles pack (Plates 237 and 238).

With small fruit, the central space should be filled in with small clusters of even-sized bananas placed in a vertical position.

Single bananas may be used to a very limited extent in finishing off the pack at the top of the case.

The cluster pack is approximately 5 lb. per case lighter than the singles pack, but bananas packed in clusters are not affected to the same extent with stalk end rots as are single fruits. Furthermore, the time taken in dehanding and packing clusters is less than half that required for the singles pack.

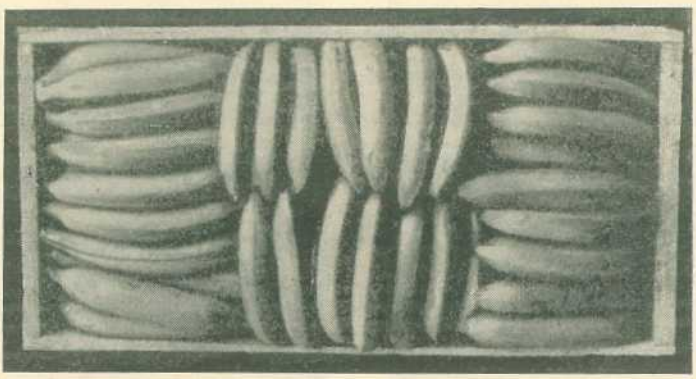


Plate 239.

Cluster Pack of Long Fruit.—Case with top removed.

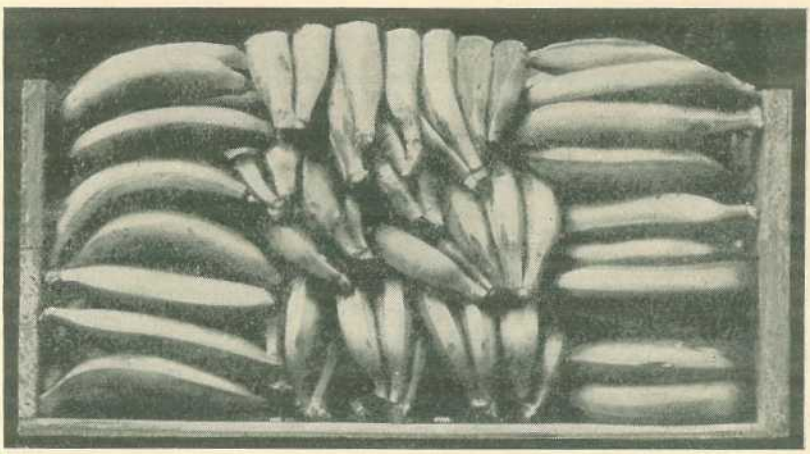


Plate 240.

Cluster Pack of Long Fruit.—Case with top and side removed.

Cluster Packs for Straight and Oversized Fruit.

Large long and straight long fruit present difficulties in packing. Experiments have shown that the easiest method is to pack the long clusters lengthwise in the case and fill in the middle (Plates 239 and 240). As far as possible, the better-shaped curved fruit are used for the centre, the straight being kept for the two ends.

The Full Hand Pack.

Bananas packed in full hands are presented to the consumer in better condition than is possible with singles and cluster packs.

The full hand pack is approximately 10 lb. lighter than the singles pack. The lighter weight is the main reason why this pack is not favoured by the trade.

In order to obtain a satisfactory full hand pack of reasonable weight, the method known as the flat pack is recommended (Plates 241-244). The hands should first be graded into groups of uniform size, and all broken, ripe, blemished and undersized bananas must be removed.

When cutting the hand from the bunch, a greater portion of the stem joining flange must be left on the hand than is the case for the singles pack (Plate 245). If a thin flange is left, the fruits will break off under pressure and the pack will then become a mixture of single, clusters, and part hand fruits.

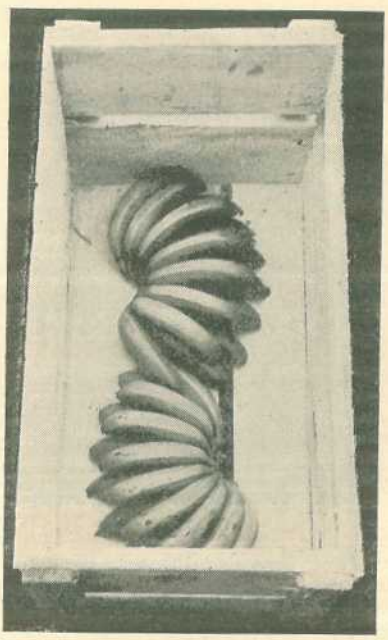


Plate 241.
Full Hand Pack.—First layer.

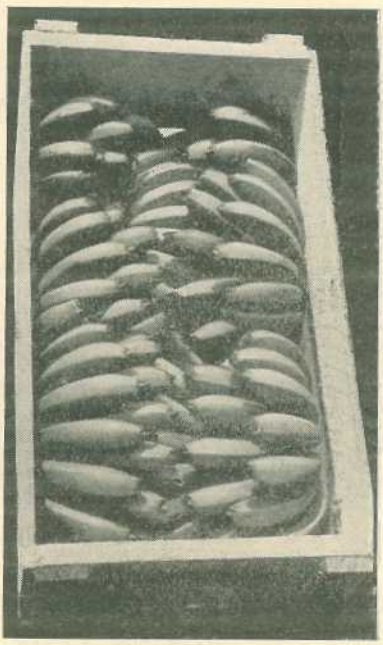


Plate 242.
Full Hand Pack.—Second layer.

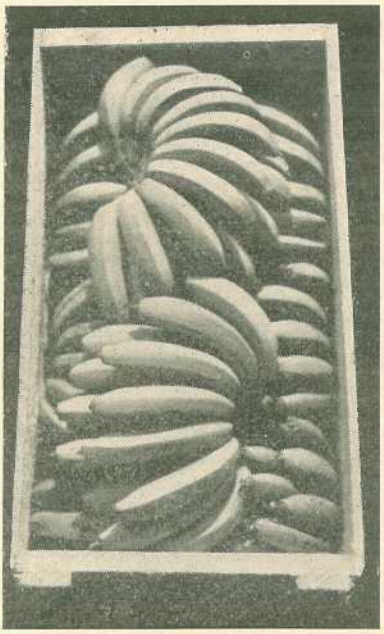


Plate 243.

Full Hand Pack.—Third layer.

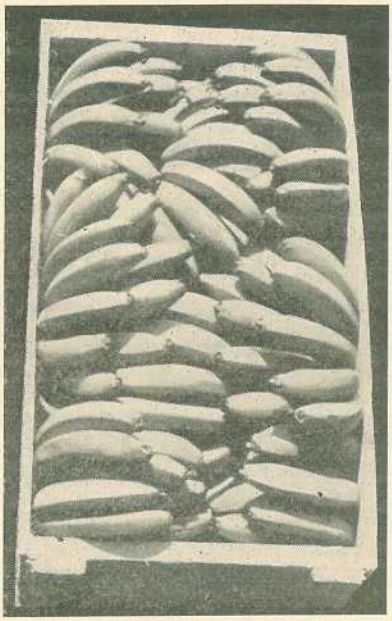


Plate 244.

Full Hand Pack.—Fourth layer. Fill-in clusters may be used where spaces occur in the pack, particularly on the top layer.

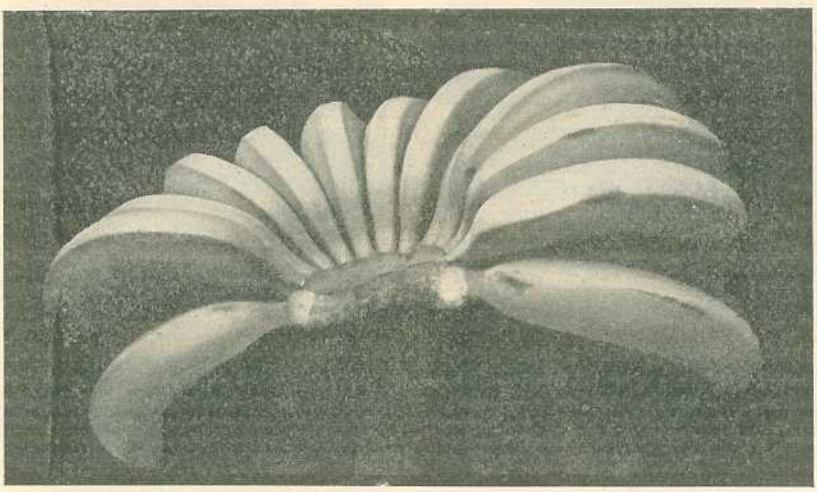


Plate 245.

Full Hand Pack.—Hand cut from the bunch stem, showing the thick flange necessary for the full hand pack.

PACKING LADY FINGER BANANAS.

The Lady Finger banana has increased considerably in popularity and the demand for this variety is becoming more extensive in southern States.

In the Brisbane and South Coast areas, where at present most Lady Fingers are grown, the fruit is invariably marketed in the bunch. For distant locations, the fruit is marketed in the standard banana case.

Owing to the comparatively small size, straight formation and somewhat angular shape of the Lady Finger banana, the fruit should be packed in full or part hands. The method of packing the fruit should be the same as for the Cavendish full hand flat pack.

In many instances, it will be found that the hands of bananas are uneven in the spacing between the fruits. This irregular arrangement of the bananas does not allow for compact placement in packing. Where this difficulty arises, it is advisable to divide the hand and separate the irregularly spaced fruit. These divided fruits may be packed into suitable compact positions within the main full hand arrangement.

THE STANDARD BANANA CASE.

Bananas are packed in the standard banana case with specifications as follows:—

Internal Measurements:—21 inches long, 12 inches wide, 12 inches deep.

Timber:—Hardwood (preferably flooded gum) or pine.

ENDS: 2 pieces, 6 x $\frac{3}{4}$ x 12 inches.

SIDES: 11 x 5/16 x 22$\frac{1}{2}$ inches, no piece to be under three inches in width.

TOPS and BOTTOMS: 12 x 5/16 x 22$\frac{1}{2}$ inches.

FUNGICIDAL TREATMENT FOR CASED BANANAS CONSIGNED INTERSTATE.

Cased bananas marketed in New South Wales and Western Australia between 1st May and 30th November in any year must be treated or dipped in a fungicide containing salicylanilide sufficient to kill the fungus which causes squirter disease in bananas. The package containing such bananas must be marked with the name of the fungicide followed by the word "treated" or "dipped" as the case may be.

TUBERCULOSIS-FREE CATTLE HERDS.

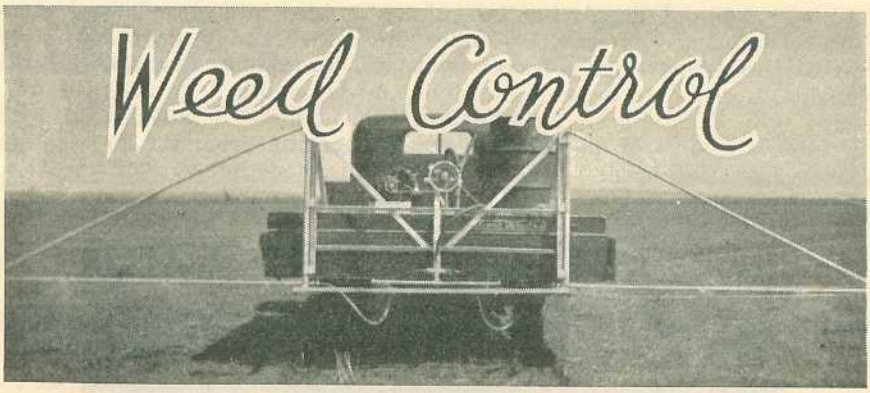
(AS AT 15th MAY, 1951.)

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas F. H. Hutton, " Bingegang," Dingo
A.I.S.	F. B. Sullivan, " Fermanagh," Pittsworth D. Sullivan, " Bantry " Stud, Rossvale, *via* Pittsworth W. Henschell, " Yarranvale," Yarranlea Con. O'Sullivan, " Navillus Stud," Greenmount H. V. Littleton, " Wongalea Stud," Hillview, Crow's Nest J. Phillips and Sons, " Sunny View," Kingaroy Sullivan Bros., " Valera " Stud, Pittsworth Reushle Bros., " Reubydale " Stud, Ravensbourne H. F. Marquardt, " Chelmer," Wondai W. G. Marquardt, " Springlands," Wondai A. C. and C. R. Marquardt, " Cedar Valley," Wondai
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 A. Verrall and Sons, " Coleburn Stud," Walloon R. J. Crawford, ' Inverlaw Jersey Stud," Inverlaw, Kingaroy P. H. F. Gregory, " Carlton," Rosevale, via Rosewood E. A. Matthews, " Yarradale," Yarraman

USE OF ALUMINIUM BUILDING MATERIALS.

During recent months a number of primary producers have made enquiries regarding the corrosive effects of galvanised iron and other materials on aluminium sheets used for roofing purposes. Direct contact between aluminium and other metals, green hardwoods, concrete or mortar should be prevented by the use of bituminous paint or felt. Fixings, if not of aluminium or cadmium-plated steel, should be used only in conjunction with bituminous felt or impregnated fibre washers.

A leaflet entitled "Aluminium in Building" is obtainable free of charge from The Building Research Liaison Service, P.O. Box 2807AA, Melbourne, Victoria.



Russian Knapweed—Declared a Noxious Plant.

S. L. EVERIST, Botanist.

RUSSIAN knapweed (*Centaurea repens*) was recently declared a noxious weed throughout the State. This note is issued to allow those interested to identify the plant.

Description.

Perennial with many woody underground stems and roots which are almost black in colour; leaves and stems silvery grey becoming dull grey-green with age; rosette leaves (Plate 246) 2-3 inches long,

Plate 246.

Russian Knapweed Plant in the Rosette Stage.

1-2 inches broad, deeply but irregularly divided into blunt lobes; stems erect from centre of rosette, slender and rather woody, branched freely in the upper part; stem-leaves alternate, lower ones like those of the rosette, upper ones becoming smaller and less toothed towards the top; each branch ending in an oval flower head about ½ inch broad with a tuft of mauve or pale pink flowers emerging from the top; flower heads like small spear thistles in shape and colour but without prickles; ripe seed heads tightly closed and seeds not shed.

Plate 247.

Russian Knapweed in the Pre-flowering Stage.

Distribution.

Russian knapweed, sometimes called creeping knapweed, is a native of Turkestan in southern Russia. It is a serious weed pest in many countries but in Queensland so far has been found only in several places on the Darling Downs, growing in soils ranging from light brown loam to heavy clay.

Properties.

In Canada the weed is reported to grow very rapidly, one root having produced a patch with a diameter of 61 feet in two years. Observations indicate that under Queensland conditions the rate of spread is not so rapid and mostly takes place in years with wet winter and spring months. The plant is dormant during the winter, but in the early spring new shoots come up from the old roots. Because of its extensive system of underground runners, the plant retards growth of summer crops such as Sudan grass and if infestation is thick practically suppresses them altogether.

Control.

Eradication of Russian knapweed is difficult. Cultivation appears to encourage its growth. It also has the disadvantage that pieces of the roots break off and are carried on implements to clean areas. Overseas, acid arsenicals have been used to control it, but arsenical preparations have not been successful here. Sodium chlorate kills the tops but regrowth is often considerable. Preliminary experiments indicate that it may be possible to control the weed by cultivating in the spring, then spraying the rosettes with 2,4-D or 2,4-D/2,4,5-T mixtures at the rate of 2 lb. active ingredient per acre. Further work is needed to confirm this.

CATTLE ADVISERS IN CENTRAL DISTRICT.

The cattle industry in Central Queensland should gain considerably by a recent extension of the Department's services to producers in that area, the Minister for Agriculture and Stock (Honourable H. H. Collins) said recently.

Realising the importance of the Central District as a cattle producing centre, the Department had transferred Mr. J. G. Young (Husbandry Officer, Cattle Husbandry Branch) from Departmental headquarters in Brisbane to the Central District, with headquarters at Emerald. Mr. Young, in addition to carrying out important research and advisory work for the further improvement of the beef cattle industry, would supervise the work of other Branch officers in the district.

Another recent appointment had been that of Mr. J. Arbuckle (Adviser in Cattle Husbandry) to Rockhampton. His chief work would be to advise beef and dairy cattle producers on the Central Coast on husbandry problems and he would also be associated with experimental work being carried out by the Branch in the area. Mr. Collins said that Mr. Arbuckle had just had two years' practical experience of the industry on Spring Creek station, Mt. Surprise, followed by a period at the Bureau of Tropical Agriculture, South Johnstone, where he gained knowledge of cattle production problems on the tropical coast. Another adviser (Mr. J. J. Sullivan) has been stationed at Clermont for some time.

Yet another transfer has been that of Mr. K. Howard (Field Assistant, Cattle Husbandry Branch) from Brisbane to Cullin-la-ringo to supervise the beef cattle feeding trials being jointly carried out there by the Department and the Queensland-British Food Corporation.

Mr. Collins said that in addition to the staff at headquarters in Brisbane the Cattle Husbandry Branch now had eight officers stationed in various parts of the State.

Improved Herd Production as Shown by Herd Recording.

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

NUMEROUS instances have been noted of improvement in production of herds being recorded in the Group Herd Recording Scheme of the Department. This improved production emphasises the fact that farmers are making intelligent use of the information provided by herd recording.

The following is a summary of the information supplied to members of the scheme.

Herd Record Sheet.

The herd record sheet is handed to the member by the herd recorder as soon as he has recorded the production of the cows in the herd at each monthly visit. This sheet gives for each cow in the herd the amount of milk produced in the evening and the morning, the total yield of milk and butterfat for the day, the percentage of fat in the milk, and the estimated amounts of milk and butterfat produced in a 30-day period.

The information on this sheet enables the herd owner to ascertain the progressive production month by month of each cow in the herd and her response to the system of management. It is particularly useful to a farmer who is practising supplementary feeding, as it enables him to make better use of the available foodstuffs by feeding each cow according to her production.

The Monthly Summary.

On receipt of the herd record sheet at the Department's Head Office, the total daily amount of milk and butterfat produced by the herd and the average daily production per cow are compiled.

At the end of each calendar month the average production per cow for each herd recorded is entered on a monthly summary sheet for each group, together with the average production for all the cows recorded in the group during the month, and the results forwarded to each member of the group.

The anonymity of each member is preserved by allocating an index letter to each herd. This letter is altered each month.

The monthly summary allows the member to compare the production of his herd with that of others in the same district, as well as with the average for the district. If the average production of the herd is below the average for the district, the interested owner would be expected to seek the reason for the low production.

Lactation Returns.

As cows dry off the production of each for the lactation period is forwarded to the member. This allows him to compare the productive capacity of the various cows in the herd.

Herd Average.

At the end of the herd recording year, each member is given the average production of cows in various age groups in his herd, as well as the average of the whole herd. On the same form is given similar information regarding the average production for the whole group, thus allowing him to form a comparison.

Example of Herd Improvement.

The foregoing information has stimulated interest among many farmers in better farming methods, which have led to increased production per cow and per acre.

From many such instances noted, one herd has been taken as an example, and in Table 1 the average daily production of butterfat per cow per month since the herd was first recorded, the number of cows milked each month and the total production of butterfat for each month are given.

TABLE 1.

PRODUCTION RECORDS FOR A SELECTED HERD.

Month.	1948.			1949.			1950.		
	No. of Cows.	Butterfat Production.		No. of Cows.	Butterfat Production.		No. of Cows.	Butterfat Production.	
		Average Daily per Cow.	Total.		Average Daily per Cow.	Total.		Average Daily per Cow.	Total.
		Lb.	Lb.		Lb.	Lb.		Lb.	Lb.
January ..	..	..	..	79	·502	1,190	81	·703	1,709
February ..	60	·792	1,426	82	·518	1,275	83	·790	1,966
March ..	71	·602	1,282	84	·695	1,752	88	·723	1,908
April ..	75	·519	1,168	88	·595	1,568	91	·755	2,063
May ..	76	·373	850	84	·526	1,327	84	·749	1,888
June ..	88	·508	1,007	88	·539	1,424	88	·698	1,843
July ..	92	·434	1,198	92	·602	1,660	86	·613	1,582
August ..	61	·561	1,027	92	·651	1,796	79	·624	1,479
September..	66	·508	1,007	95	·619	1,765	93	·722	2,014
October ..	69	·534	1,105	84	·656	1,653	88	·717	1,893
November	72	·469	1,013	92	·777	2,144	81	·836	2,031
December ..	76	·548	1,250	88	·749	1,977	85	·900	2,296
Total ..	..	..	12,333 (11 months)	..	..	19,531	..	..	22,672
Average ..	73·3	..	1,121	87·3	..	1,628	85·5	..	1,889

This farm consists of 350 acres, of which an area is cultivated for fodder for the milking cows and the remainder used for depasturing the milking cows and calves. The dry cows are run on a separate area of 200 acres, giving a total area of 550 acres.

1948.—It will be noted that for the 11 months to 31st December, 1948, the total amount of butterfat produced was 12,333 lb., or an average of 1,121 lb. per month. The average production per acre per year was 24.46 lb. butterfat, the average production per cow 183.5 lb. and the average number of cows milked per month 73.3.

1949.—For the 12 months to 31st December, 1949, a total of 19,531 lb. butterfat was produced, with a monthly average production of 1,628 lb. The average butterfat production per acre for the year was 35.51 lb., the average production per cow 223.7 lb., and the average number of cows milked per month 87.3.

1950.—The total production again increased for the 12 months to 31st December, 1950, when it was 22,672 lb. butterfat with an average monthly production of 1,889 lb. The average production per acre rose to 40.13 lb. butterfat, and the average production per cow to 265.2 lb., with an average of 85.5 cows being milked each month.

The increase in the average production per acre for 1950 over that in 1948 was 15.67 lb. butterfat, an increase of 64 per cent. At 3s. per lb. this represents an increased yearly income of £1,292 14s. During the same period the average production per cow increased from 183.5 lb. butterfat to 265.2 lb., an increase of 44.5 per cent.

It is realised that seasonal conditions could have played some part in this increased production, but the greater part is probably due to an increasing interest in improved farming and husbandry methods following on the production recording of the herd.

From the foregoing it can be concluded that some farms at least are capable of greatly increasing production per acre, per cow and per year, and that the information provided by the Group Herd Recording Scheme greatly assists members to achieve these increases.

Herd improvement is a long-range project which should be approached by farmers in the following manner:—

The first year's results test the methods of the farmer.

The second year's results test the herd.

The third year's results cull the herd.

The fourth year's results build the herd.

The fifth and succeeding year's prove the bull.

Some Aspects of the Economics of Milk Production.

R. W. HEWETSON and R. D. CHESTER, Cattle Husbandry Branch.

THE rational approach to the feeding of cows for milk production is to attempt to supply a ration balanced in energy, protein and mineral content for the volume of milk produced.

A farmer's ability as an efficient feeder is measured by his capacity to adjust the cost of feeds in relation to the value of milk produced so that the difference between costs and returns will be as great as possible. This means striking a balance between not feeding supplements at all, on the one hand, and feeding cows to the maximum of their production capacity on the other. Generally, it will be necessary to feed a variety of feeds, most of which are home-grown, to cows selected for their production ability so that each cow produces a fairly high yield of milk.

To make the most effective use of feed, the farmer must get a large amount of milk from each of his cows. The high-producing cow is more efficient and therefore more economical as a converter of feed to milk than is the low producer. Maintenance requirements for both the high producer and the low producer are the same, but in the case of the high producer, maintenance costs are relatively cheaper because of the greater overall returns.

When planning a programme of heavy supplementary feeding, the farmer should also embark on a programme of breeding for high production and be prepared to cull out low producers from the herd. Each cow's capacity to produce milk is limited by certain inherited factors. Feeding for production above the inherited maximum will not result in increased output of milk and the extra feed will therefore be wasted.

The Importance of Home-grown Roughage.

Under Queensland conditions, production of milk or other dairy produce depends largely on the roughage feeds and profits will be large or small according to the ability of the farmer to himself produce suitable home-grown roughages and to supplement them with such concentrates as can be obtained reasonably cheaply.

Good results will most often be obtained when the value of large amounts of good quality roughages is realised. Generally, cows should have available as much good quality roughage as they can eat. It is not sound thinking to hope that cows getting insufficient roughage to fill the paunch can be made to produce profitably by the addition of a few pounds of concentrate to the ration. However, high producers are incapable of eating sufficient roughage for maximum production and some supplementary feeding with concentrates may be necessary if the most profitable level of production is the aim of the farmer.

All dairy cows therefore should be fed all the hay and/or silage, plus grazing, that they can eat.

The best grazing is young green crops or fresh green pastures. Cows will eat up to 150 lb. of green matter a day but limited access will greatly reduce this amount and allowance must be made for this

fact in computing rations. As crops and pastures mature, their feeding value decreases and it becomes increasingly important to feed concentrates containing more protein.

With a gross shortage of protein in Queensland, every effort should be made to produce as much protein as possible on the farm.

Protein rich crops include lucerne, field peas, cowpeas and summer and winter grazing crops such as Sudan grass, millets, oats, wheat and canary seed.

Good quality legume hay is the best type of hay to use. It contains the same energy equivalent as good cereal or grass hay, but is richer in minerals and in protein, this latter quality being of particular importance in Queensland, where frequently protein intake limits production. However, cereal hays are quite suitable for dairy cows provided they are supplemented by the right type of protein-rich concentrate.

Silage is an excellent roughage feed, but it should not be used as the only source of roughage. However, if fed at the rate of about 3 lb. per day for each 100 lb. bodyweight it forms a very good supplement for feeding with pasture or hay. Silage may taint milk if fed immediately before milking. If this occurs, an alteration in the feeding routine should be made to ensure that all silage is fed at least two hours before the cows are milked.

If milking cows are likely to be fed on milk tainting fodders it is a good practice to allow access to these feeds immediately after milking only and not before.

Choosing Concentrates to Supplement Roughage.

The roughage supplied will usually be that most easily and most economically grown on the farm. Having supplied cows with adequate roughage, the farmer must then turn his attention to the concentrate supplement to be fed in order to maintain a good milk yield. It is necessary to decide just what ingredients will be incorporated in the concentrate mixture. Having done this, it is then time to assess the rate at which to feed the mixture. These decisions will be guided by:—

(*a*) Kind and quality of roughage fed.

(*b*) Milk production of each cow.

(*c*) Costs of various concentrate feeds.

(*d*) Price obtained for dairy produce.

The protein content of the concentrate will be determined by the type of roughage fed. Having decided the protein requirements, the farmer then must seek the cheapest combination of ingredients which will give a final concentrate mixture of the required protein content.

The character of the cow and her feed capacity should be studied. Some cows have the ability to eat larger quantities of feed than others and so will make use of more home-grown roughage and require less purchased concentrate. Feeding too much grain and sudden changes from roughage to grain feeding should be avoided, as they will cause serious "feed sickness" and a corresponding reduction in yield.

Changing Feed.

From time to time difficulty will be experienced with unpalatability of certain feeds, such as bloodmeal and meatmeal. Unpalatable feeds should be introduced slowly so that cows gradually become used to them.

Mixtures containing a large number of ingredients have a small advantage because of the fact that ingredients can be included or excluded without affecting the palatability of the mixture.

In order to feed with some degree of accuracy, it is necessary firstly to know within fairly accurate limits just what is the production of individual cows. It is then necessary to feed cows individually or in groups of cows of about the same production.

It is wasteful to feed a whole herd on the same basis. By this method, the higher producer gets too little feed and as a result her production is reduced, and the low producer gets too much feed, for which there is no compensating lift in production.

It is convenient to keep a chart in the dairy with each cow's name, her approximate daily production and the amount of concentrate to be fed:—

Name.	Production. Lb. of Milk.	Concentrate. Lb. per Day.
Belle	15	2
Beatrice	20	4
Buttercup	25	6

Provided roughage can be produced on the farm, it will be a cheap form of feed, and in these circumstances should be fed to the maximum possible limit. On the other hand, in dairies where roughage is purchased on the open market, it will frequently be more expensive per food unit than are concentrate foods. In such cases a different approach to rationing is necessary and the amount of roughages must be decreased and concentrates increased according to prices. Roughage should not be dropped below the equivalent of 10 lb. of hay daily because of the possibility of indigestion when large quantities of concentrate are fed with little roughage.

Where roughage is cheap, therefore, cows should be given constant access to this class of food.

TABLE 1.

Type of Roughage.	Percentage of Protein Necessary in Concentrate.	Typical Concentrate Mixture.
Lucerne Hay	10—12	Grain alone, or grain plus mill offals
Other Legume Hay of Choice Quality	10—12	Grain alone, or grain plus mill offals
Young Green Cereals, Choice Pasture	10—12	Grain alone, or grain plus mill offals
Mixture of Legume and Cereal Hay	14—16	Grain .. 3 parts Pollard .. 1 part Bran .. 1 part Linseed Meal .. 1 part
Legume Hay and Sorghum Silage	14—16	
More Mature Green Crops (Cereal or Sudan Grass or Millet)	14—16	
Good Quality Pasture	14—16	
Cereal Hay	18—20	Grain .. 3 parts Bran .. 2 parts Linseed Meal .. 4 parts
Fair Quality Pasture	18—20	
Mature Green Crops	18—20	
Mature Pasture	24	Grain .. 3 parts Bran .. 2 parts Meatmeal .. 2 parts
Cowcane	24	
Sorghum Silage	24	

Table 1 sets out the protein percentage required in the concentrate mixture for feeding with various forms of roughage. This table is an adaptation of one by T. E. Woodward in the United States Department of Agriculture Year Book for 1939.

Because the protein content of the roughages will vary somewhat according to their stage of development at harvesting and according to the efficiency with which the original crops are conserved, the table should be interpreted liberally and adjustments made according to the quality as well as the type of roughage.

Suggested Concentrate Mixtures.

The following meals are given as suitable concentrate mixtures of the correct protein content for the various roughages as set out in Table 1.

Mixtures containing 14 *to* 16 *per cent. protein.*

(1)	Crushed oats	4 parts	(3)	Crushed sorghum	3 parts
	Cracked corn	4 „		Crushed corn	3 „
	Meatmeal	1 „		Cottonseed meal	1 „
(2)	Crushed oats	1 part	(4)	Crushed oats	2 parts
	Crushed sorghum	2 „		Crushed corn	2 „
	Linseed meal	1 „		Crushed sorghum	2 „
				Peanut meal	1 „

Mixtures containing 18 *to* 20 *per cent. protein.*

(1)	Crushed corn	2 parts	(3)	Crushed oats	1 part
	Crushed sorghum	1 „		Crushed corn	2 „
	Bran	1 „		Linseed meal	2 „
	Pollard	1 „	(4)	Crushed sorghum	5 parts
	Peanut meal	2 „		Crushed maize	5 „
(2)	Crushed sorghum	3 parts		Linseed meal	3 „
	Crushed oats	2 „		Peanut meal	2 „
	Crushed corn	2 „			
	Meatmeal	2 „			

Mixtures containing 24 *per cent. protein.*

(1)	Crushed corn	1 part	(3)	Crushed corn	6 parts
	Crushed Oats	1 „		Crushed sorghum	6 „
	Bran	2 „		Crushed oats	3 „
	Peanut meal	2 „		Bran	5 „
	Linseed meal	4 „		Pollard	5 „
(2)	Crushed corn	9 parts		Peanut meal	6 „
	Crushed oats	4 „		Meatmeal	8 „
	Meatmeal	7 „	(4)	Crushed corn	4 parts
				Crushed sorghum	4 „
				Cottonseed meal	7 „

Estimating Amount of Concentrate to Feed.

In feeding the concentrate, it is convenient to estimate the amount to be fed on a per-gallon-of-milk-produced basis. That is, if concentrate is to be fed at 1 lb. per gallon, the cow producing three gallons of milk will receive 3 lb. of concentrate, and so on.

However, some adjustment should be made for the butterfat content of milk. More energy and protein are required to produce milk with a high butterfat test. Milk can be adjusted to 4 per cent. fat or a breed allowance can be made. Those breeds having a higher average test, such as Jerseys and Guernseys, may be fed at a higher rate per gallon than the lower testing Australian Illawarra Shorthorn, Ayrshire and Friesian breeds.

Selection of Concentrate and Grain to Feed.

By consulting Table 2, which sets out the average food unit value and digestible crude protein content of the commonly available concentrates, the farmer should be able to substitute one concentrate for another in any of the mixtures given, if the constituents for the original meal are not readily available.

TABLE 2.

FODDER VALUES OF COMMONLY USED CONCENTRATES.

—	Average Food Units per 100 Lb. (Starch Equivalent).	Digestible Crude Protein per 100 Lb.
Protein-rich Concentrates.		
Blood Meal	63 (say 65)	68
Meatmeal	77 (say 75)	54
Peanut Meal	78 (say 80)	43
Cottonseed Meal	67 (say 65)	33
Linseed Meal	72 (say 70)	25
Carbohydrate-rich Concentrates.		
Maize Grain	77 (say 75)	8
Wheat Grain	72 (say 70)	8
Oat Grain	61 (say 60)	8
Sorghum Grain	76 (say 75)	7
Bran	56 (say 55)	10
Pollard	66 (say 65)	10
Molasses	50 (say 50)	Nil

In any case, these mixtures should only be taken as guides and alterations must be made according to the price of the various ingredients if the most profitable level of feeding is sought.

Generally, price per food unit and price per pound of protein will determine the particular concentrate to be used, though factors of palatability and texture must be considered.

It is, where possible, preferable to feed a mixture of grains rather than one particular grain, but this general rule may be ignored if one type of grain is very much cheaper than others. For instance, if a farmer can produce sorghum grain on the farm at a low price it would be unwise for him to purchase other grains on the open market to mix with his sorghum grain just for the sake of feeding a better balanced grain mixture.

In selecting grains, therefore, the choice should be made according to cost per food unit.

In selecting protein-rich concentrates, the choice will be determined by the cost per pound of protein rather than the cost per food unit, as generally these concentrates are fed in order to build up the protein percentage of the ration, though of course, at the same time, they do replace part of the energy-rich concentrate in the ration.

Estimating Cost of Grain.

The following is suggested by H. J. Geddes of the Sydney University as a convenient method of estimating the cost per food unit of each grain from the price per bushel.

The Cost per Food Unit is equivalent to—

$$\frac{\text{Cost per bushel}}{\text{Weight per bushel}} \times \frac{100}{\text{Starch Equivalent of Grain}}$$

The factors "weight per bushel" and "starch equivalent" of any particular grain are constant. Therefore, the factor

$$\frac{100}{\text{Weight per bushel} \times \text{Starch Equivalent of Grain}}$$

is constant for a particular grain and may be expressed as a constant figure, namely:—

Sorghum .. .. 1/46 (that is $\frac{100}{60 \times 76}$)

Wheat .. .. 1/43 (that is $\frac{100}{60 \times 72}$)

Maize .. .. 1/43 (that is $\frac{100}{56 \times 77}$)

Barley .. .. 1/36 (that is $\frac{100}{50 \times 71}$)

Oats .. .. 1/24 (that is $\frac{100}{40 \times 61}$)

The following is an illustration of the use of this method using hypothetical bushel prices:—

Grain.	Cost per Bushel.	Constant Factor.	Cost per Food Unit.
	s. d.		*d.*
Sorghum	5 9	46	1·5
Wheat	7 2	43	2·0
Maize	9 0	43	2·5
Barley	4 6	36	1·75
Oats	6 0	24	3·0

Thus, at the prices per bushel given, the farmer would feed as much sorghum as possible and avoid the use of maize and oats.

Most protein-rich concentrates are sold on a per ton basis. In order to work out the cost per pound of protein, it is necessary to know the protein percentage and to estimate the price per 100 lb. from the price per ton. Then divide the cost per 100 lb. by the protein percentage. Thus peanut meal with a protein content of 45 per cent. at 15s. per 100 lb. costs 4d. per lb. protein.

Mineral Requirements.

Some consideration should be given to the mineral content of the concentrate ration. The chief minerals which require attention are lime, phosphate and salt.

For milking cows, it is desirable to add 1 per cent. of salt to all mixtures in order to avoid the risk of deficiency.

Most concentrate mixtures, especially those containing a high proportion of grain, are low in lime and relatively rich in phosphates, and in cases where the lime content of the roughage is not likely to be high 2 per cent. of ground limestone should be added to the mixture. However, where large amounts of legume roughage are fed, adequate lime will be available from that source and there will be no need for addition of limestone to the concentrate portion of the ration.

In many parts of Queensland, pastures are deficient in phosphate and in most cases farmers cannot afford to feed concentrates except in limited quantities; in such cases, bonemeal should be added to the concentrate mixture to ensure that cows take from 1½ to 2 oz. of bonemeal per day. Bonemeal, fed in this way, is to be preferred to cattle licks.

Phosphorus can also be supplied to cattle by making use of superphosphate. This should be prepared by adding 2 lb. of superphosphate to one gallon of water, stirring well and allowing the residue to settle, only the clear fluid portion being used. This quantity can be added to 100 gallons of drinking water where cattle are watered by trough or it can be added to the daily feed at the rate of half a pint per cow if cattle are hand fed.

VALUE OF OUR BIRDS.

Most Queensland birds have a value in controlling insect pests which far outweighs the occasional economic losses they cause to farmers.

This is one of the main reasons for legislation which protects birds from indiscriminate destruction, for field, orchard and forest pests could be very much more serious if they were not subjected to bird attack.

The Science Branch of the Department of Agriculture and Stock has listed a number of particularly useful birds, such as the ibis, which eats white grubs, locusts and armyworms, and the magpie lark or "peewee," which is often seen searching newly ploughed land for the pupae of cutworms and armyworms, wireworms and other insects which live in the soil.

The flycatchers eat mainly flies and small beetles, which fall easy prey to these darting foragers. One member of this family is the willie wagtail, so often perched on cattle, from which it ranges to catch many insect enemies of man and beast. Many other small birds feed on aphids, others favour scale insects, while most of them destroy small insects.

Of the larger birds which are helpful in pest control, the owls (including the mopoke) generally prey on mice and large insects. Hawks and kestrels prefer a diet of cicadas, locusts, mice and lizards.

Other species of economic importance include frogmouths, wood swallows, cuckoo shrikes, currawongs, magpies, kingfishers and honeyeaters.

The few birds which have undesirable habits do not on the whole occasion much damage, and opposition to bird protection based on these few birds is quite unjustifiable.

Large areas in Queensland are sanctuaries in which no bird or other animal life, apart from pests, may be taken, but the Department wishes it to be more widely known that even outside sanctuary areas many birds are protected.

THE FARM HOME.

Treating a Cold.

A COLD in a baby or young child may lead to a serious illness and the most effective way to prevent this is to guard baby against the risk of catching colds.

If in spite of all your precautions baby develops a cold it must be treated at once. All colds are infectious and so a child with a cold should be isolated as much as possible from the rest of the family. Babies and young children react to infection by a cold differently from adults, and in most cases have some degree of fever. For this reason they should be put to bed and kept comfortably warm. The bedclothes should be light as well as warm and if a hot water bag is used on very cold nights great care must be taken that the stopper is fixed on tightly and the bag is well protected with a thick woollen cover.

There is no known "cure" for the common cold and no certain means of shortening its course. Therefore it is not recommended that medicines be given. The use of sulpha drugs and the common practice of dosing with "opening medicines" are mentioned only to be condemned. They cannot do any good. Anti-histamine drugs have been tried and have proved disappointing in both prevention and treatment of colds.

Rubbing a young baby's chest with some volatile substance is of doubtful benefit and sometimes produces a rash, especially on sensitive skins.

The most we can do in the treatment of colds is to protect the child from the risk of complications such as bronchitis and pneumonia, and to relieve as much as possible the discomfort a cold causes.

In young babies the cold takes the form of a "running nose" rather than a cough, although, of course, both can occur together. Some simple nasal drops are often all that is necessary. Soft old cotton rags should be used for handkerchiefs and then burnt and a little cold cream or vaseline smeared round the nose may prevent soreness. Blocking of the nose due to nasal discharge creates a problem when the child is sucking and *gentle* attempts should be made to clear the nasal passages with a pledget of cotton wool slightly moistened with warm water before starting to feed baby. If the cold makes baby very restless a small dose of aspirin may be helpful. Care should be taken not to exceed the recommended dose.

Some loss of appetite often accompanies a cold, and although it is necessary to give baby sufficient nourishment, no attempt should be made to force him to take food, as this will often start a feeding difficulty.

The toddler will only require a simple diet such as milk, hot or cold as preferred, well cooked cereals with milk, boiled or poached eggs, soft vegetables mashed through a strainer, simple puddings and fruit drinks at regular intervals.

The old-fashioned remedy of a warm lemon drink sweetened with honey does help to soothe the dry throat passages in the case of a toddler and is particularly useful at night.

A slightly higher pillow may be useful if the child has any difficulty in breathing.

A baby or child with a cold needs plenty of fresh air but direct draughts should be avoided. The windows should be open, but if necessary an improvised screen should be used at the top of the bed. When the child sits up in bed the upper part of his body should be protected with an additional woolly. A quick, warm sponge should be given daily.

If baby screams and puts his hands to the side of his head and rolls his head from side to side or pulls at his ear he may have earache, which is a common complication of a cold. The doctor should be called without delay and the same applies if the child continues to have a high fever or complains of pain in his chest or upper abdomen. A watchful mother soon knows if her baby has become really ill and will wisely seek medical help at once.

Any further information on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic," Brisbane. These letters need not be stamped.

ASTRONOMICAL DATA FOR QUEENSLAND.

JULY.

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

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6·39	5·03	Cairns ..	9	49	Longreach	27	43
6	6·39	5·05	Charleville ..	25	29	Quilpie	37	33
11	6·39	5·07	Cloncurry	37	63	Rockhampton ..	1	19
16	6·38	5·10	Cunnamulla ..	32	27	Roma	15	19
21	6·36	5·12	Dirranbandi ..	22	16	Townsville ..	8	41
26	6·34	5·15	Emerald	12	28	Winton	29	51
31	6·31	5·17	Hughenden ..	21	49	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	3·55	2·20
2	4·51	3·05
3	5·45	3·55
4	6·35	4·48
5	7·21	5·44
6	8·02	6·41
7	8·38	7·38
8	9·11	8·33
9	9·41	9·28
10	10·10	10·24
11	10·39	11·21
12	11·10	..
		a.m.
13	11·45	12·21
	p.m.	
14	12·24	1·25
15	1·11	2·33
16	2·07	3·44
17	3·13	4·53
18	4·24	5·57
19	5·38	6·54
20	6·49	7·42
21	7·56	8·23
22	8·59	8·58
23	9·59	9·30
24	10·57	10·01
25	11·55	10·32
26	..	11·04
	a.m.	
27	12·52	11·39
		p.m.
28	1·49	12·18
29	2·45	1·02
30	3·40	1·50
31	4·32	2·42

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	10	30	26	44	0	20	28	53
6	11	28	26	43	1	19	29	51
11	20	17	36	32	11	8	42	37
16	30	9	46	24	21	0	54	26
21	23	14	39	29	14	4	45	33
26	12	25	27	41	2	17	30	49
31	9	30	25	45	0	21	26	54

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	6	53	35	66	20	51	6	44
3	2	56	33	67	17	53	3	46
5	5	52	35	65	19	50	5	44
7	12	44	38	60	23	46	11	37
9	21	34	44	54	29	39	18	29
11	32	24	52	46	36	31	26	21
13	43	17	59	42	44	27	36	16
15	53	7	67	35	50	21	44	8
17	56	2	68	32	52	17	46	3
19	50	6	64	34	48	20	41	7
21	39	16	56	41	41	26	33	15
23	27	28	48	49	33	34	22	24
25	16	39	41	57	26	42	14	34
27	11	50	38	63	23	49	10	42
29	3	55	34	67	18	52	4	45
31	2	56	33	67	17	53	3	46

Phases of the Moon.—New Moon, 4th July, 5.48 p.m.; First Quarter, 12th July, 2.56 p.m.; Full Moon, 19th July, 5.17 a.m.; Last Quarter, 26th July, 4.59 a.m.

On July 15th the sun will rise and set about 25 degrees north of true east and true west respectively and on the 4th the distance of the sun from the earth will be its greatest (94,600,000 miles). On the 10th and 23rd the Moon will rise and set approximately at true east and true west respectively.

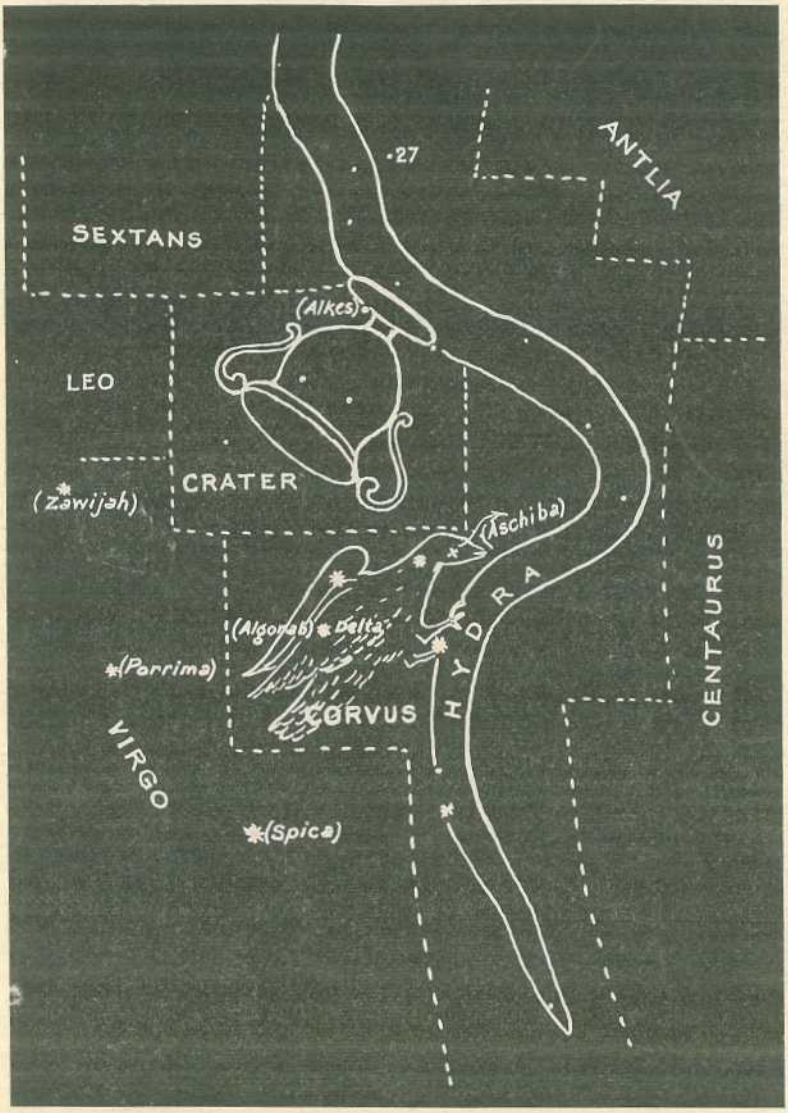
Mercury.—An evening object all this month. On the 1st, in the constellation of Gemini, will set 26 minutes after the sun. After passing through the constellation of Cancer, about the 27th it will pass close to Regulus in the constellation of Leo. By the 31st it will set about 2 hours after sunset.

Venus.—A most conspicuous object in the western evening sky, setting about 3½ hours after the sun at the beginning of the month and 3 hours after sunset at the end of the month. On the 7th it will pass close to Regulus, and on the 8th the four-day-old moon will pass very close; from Europe, Russia, China, and Japan the moon will actually pass in front of Venus. It will reach greatest brilliancy on the 29th and towards the end of the month will be situated between Mercury and Saturn, Mercury being nearest to the horizon.

Mars.—Too close in line with the sun for observation at the beginning of the month but towards the end of July may be seen low in the east during morning twilight in the constellation of Gemini.

Jupiter.—A brilliant object, in the constellation of Pisces, rising soon after midnight at the beginning of July and between 10.15 p.m. and 11.30 p.m. at the end of the month.

Saturn.—Now seen in the west during evening twilight in the constellation of Virgo. On the 1st will set about 1 hour before midnight and on the 31st between 9 p.m. and 10.30 p.m.



THE CONSTELLATIONS.

Between Virgo (described last month) and Centaurus (described in the September, 1950, journal) lie the constellations of Corvus, the Crow, and Hydra, the Water Snake.

Corvus lies directly north of the Southern Cross, the long axis indicating the direction; and in the middle of July the group will be found in the western sky during early evening. It too shows up somewhat as a "cross" or as an irregular trapezium of 4 stars of second or third magnitude. Delta Corvi, nearest Spica, is a double star, one star being of 3rd magnitude and the other 8.5 magnitude; they are separated by 24 seconds of arc.

Hydra is a long, narrow, straggling constellation starting near the constellation of Cancer and Canis Minor and stretching generally in an E.S.E. direction to pass Corvus and end between the constellations of Virgo and Centaurus. It covers almost 100 degrees of the sky in an east and west direction. The constellation is so long that some part of it is on the Meridian at 8 p.m. from the end of March to the beginning of July.

27 Hydra is a planetary nebula. This particular type of nebulae is more or less circular in form. They are called planetary because in a small telescope they resemble the disc of a planet. Only a few have a bright central condensation but all have a central star of small mass and high temperature to which the visibility of the nebula is due.

To the west of Corvus is Crater, the cup, a rather inconspicuous group which has no object of interest to the amateur observer.