Volume 57 Part 6

QUEENSLAND AGRICULTURAL JOURNAL

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DECEMBER, 1943

Issued by Direction of
THE HONOURABLE T. L. WILLIAMS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

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Event and Comment.

Men Who Fight Hunger.

THE greatest benefactors of the human race, humanly speaking, are the men who fight hunger. In every age, man has striven for what are proclaimed to-day as the Four Freedoms of the Atlantic Charter, but none of those freedoms, especially freedom from want, is attainable without the brains, the skill, the will and the industry of the food producer. If it had not been for the men who fought hunger from the days of man's beginnings, the human race could not have survived; and it is the men who are fighting hunger to-day, who are ensuring the continuance of our race.

The men who fight hunger are not only those engaged in actual crop production. With them are others in the laboratory and in the field working on the problems of plant propagation, plant improvement and plant protection. Then there are the craftsmen in the engineering shop, at drafting board and bench, perfecting and producing machinery and implements without which the production of food could not be increased even under the stress of wartime urgency; and also the operators of our transport systems conveying essential supplies to the farm and to the factory. Then there are, too, the investigators who are finding out more nutritional facts, and formulating more efficient food preserving processes.

Men of science are working with the farmer on his No. 1 priority job of food production, and their work is a reminder of the work of other men of our own time, without whose genius and industry the fight against hunger to-day would be all the harder. Included among them are Farrer, Babcock, and a man named Mort. It was Farrer who bred a wheat which converted Australia from a grain-importing country into the third wheat-exporting country of the world. It was Babcock who gave the world, also without fee or

financial reward, the Babcock Test, a key to prosperity, and with it a new direction to the dairy industry. It was Mort who had the vision to investigate the possibilities of sending frozen meat to feed the people of Britain. As a result of his industry, Australia to-day is the second greatest meat exporter and the third greatest butter exporter of the world; in addition, Australia is Britain's largest individual supplier of eggs. These men were true missionaries of science, giving the best that was in them of genius and constructive effort for the benefit of mankind and their achievements are an inspiration to many others who to-day are fighting hunger.

The world's food supply has become a major problem. Demands on Australia's food resources are ever growing and the situation has now arisen that in the coming year, the demands will be very much greater than ever before. Consequently, in spite of practical difficulties in the way of increased production, the Australian food producer will undoubtedly do all he can to keep up essential supplies to the Services, to our own people and to the people of Britain.

After all, Australia, fortunately, is particularly well placed to provide much of the requirements of the Allied Nations, not only during the war, but after the war when the feeding of the starving populations of Europe and Asia will be the world's most urgent need. As far as our population limits will allow us, Australia will be all out in the vital job of essential food production.

With all co-operating in the food drive launched by the Prime Minister this month, Australia should be able to meet all her food commitments. Seasonal shortages may be expected, and more extensive rationing may be necessary among our own people, but the maintenance of a balanced diet for everyone should be assured.

So far in this war Australians have been singularly fortunate. In the main, at no time have we been actually short of nutritious foodstuffs, and, except for some reported difficulties in distribution, our living conditions have not been hard. Because of that, some, perhaps, may not find it easy to appreciate the lot of the hungry people of the lands which in the last four years have known all the horrors of war. For instance, the present diets of Belgium are estimated at 35 per cent. below standard in mere food energy, and the diets of Greece are worse still. The diets of France are listed at 25 per cent. below standard, Netherlands 20 per cent., Italy 15 per cent., and Norway 10 per cent. below standard in mere food energy. The situation in China is worse. There is no need to go into details of the terrible situation in parts of India, which is already being relieved to some extent by shipments of Australian wheat. Possibly, when the war is over, it will be found that the war-wracked and war-wrecked countries are barely sustaining the lives of their peoples. This distressing picture is a direct challenge to our hunger fighters, the food producers of Australia. With the United States and other civilised countries which have been able to maintain their food production capacity, we must shoulder our share of the burden and the duty of feeding a starving world, and the future peace of the world will depend to a large extent on the help which the more fortunate countries are prepared to give to the stricken nations.

Whatever the scale of rationing may be in Australia, there will be no shortage of food as the people of Britain know it, and especially as the peoples of the war-devastated countries know a shortage of food. So out of our comparative abundance, Australia will produce cheerfully and give generously, showing, at the same time, how Democracy works.

Pumpkins, Squashes and Marrows, and Grammas.

W. R. STRAUGHAN, Instructor in Agriculture.

PUMPKINS and grammas are essentially tropical plants and are extensively grown in all the warmer countries of the world. The more rapidly maturing squashes and marrows are, however, capable of being grown during the shorter summer seasons of more temperate regions and their cultivation extends to the northern countries of Europe and also into Southern Canada.

Besides their many culinary uses, these plants, particularly the pumpkins and grammas, are extensively used as stock food. In America certain types are largely grown for canning, and in Asiatic countries the rinds or shells were formerly widely used as carrying vessels.

In Queensland the plants under discussion have only comparatively recently achieved the popularity which they have so long enjoyed in the older countries of the world and where for centuries their nutritive value and relatively low cost of production have long been recognised. Pumpkins are much more extensively grown in this State than either the squashes and marrows or the grammas; a total of some 20,000 to 25,000 acres are now devoted every year to these crops.

Main Producing Districts.

Pumpkins are successfully grown in all the agricultural districts of Queensland but, at present, their production is concentrated in the more densely populated and intensively farmed areas of the south. The Lockyer Valley produces a large proportion of the State's table pumpkin requirements, and production in this locality consists largely of the cultivation of this type. The Fassifern Valley, the South Burnett, the Eastern Downs, the Brisbane Valley, Beaudesert, and the Central and Upper Burnett areas also produce extensive crops of both table and cattle types. In Central Queensland the limited pumpkin production is fairly evenly spread over the main agricultural areas, but Bowen alone has approximately two-thirds of the acreage devoted to the crop in North Queensland. In Western Queensland the low rainfall and other factors confine successful pumpkin production to market gardens. Squashes and marrows are mainly produced close to the larger towns—i.e., within easy reach of the consuming market—and they are usually grown in small, well-fertilized areas, which are frequently irrigated. The very small production of grammas is more or less confined to those areas in which pumpkins are grown.

Climatic and Soil Requirements.

The climatic and soil requirements of these plants are very similar to those of maize. Besides a rainfall sufficient to maintain growth without repeated or undue checks, the plants need warm days and nights, with an absence of frosts, for their optimum development. They are fairly tolerant of a high temperature provided it is not accompanied by a lack of soil moisture. A good friable loam with a high organic matter content is the most suitable soil for these crops, and this is the dominant soil type on which they are grown in the main producing districts. Other soil types may, however, be improved sufficiently by intelligent cultivation and adequate manuring to permit of the successful growth of pumpkins, squashes and marrows, and grammas. Generally speaking, sandy or light soils are the types that are most responsive to such treatment, but some stiff clays, provided their drainage is adequate, are also capable of being made highly productive. These crops will not tolerate badly aerated, wet, or acid soils and such soils must be avoided in their production. The frequently encountered supposition that any soil is good enough for the growth of the crops under discussion is quite erroneous, for they are all most responsive to good soil conditions.

The exceptionally rapidly developing and extensive root system of these crops indicates the necessity for a very high degree of tilth if satisfactory yields are to be obtained. Without such tilth, plant foods already existing in the soil in a natural state or added as fertilizers are of comparatively little value. Improvement in tilth, other than that achieved by cultivation, can be most effectively brought about in both light and heavy soils by the addition of farmyard manure. The alternative would be the ploughing under of a green manure crop, preferably a summer legume such as cowpea, or a combination of the ploughing under of the green manure and the addition of farmyard manure.

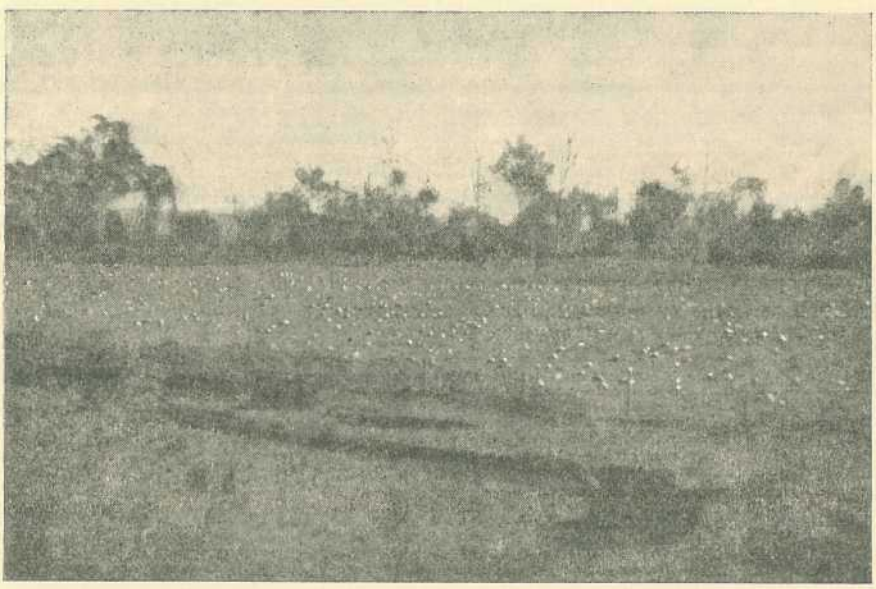


Plate 111.

A PUMPKIN CROP READY FOR HARVESTING.—Note how the foliage has been shed.

Even in highly-productive soils the addition of a green manure crop or farmyard manure is to be commended for, if no appreciable increase in yield is to be expected in the immediately following crops grown on such soils, fertility is maintained and the maintenance of fertility is a much less costly and a less difficult problem than its restoration should it once fall to a low level. Crop yields will usually increase with an increase in the amount of farmyard manure added to the ground but not proportionately. Heavy applications are therefore uneconomic, and since good response is obtained from light applications, dressings above 6 to 8 tons per acre should not be necessary. Where supplies are limited, and such is usually the case, they can be most economically utilized by spreading along the drill, or at the intended site of each hill, according to the method of sowing to be adopted. All farmyard manure should be well mixed with the soil by either ploughing or harrowing.

Liming.

Lime has many well-known desirable influences on the soil, and the crops under discussion are among those which may respond to an application of lime, but there are doubtless many cases in which no such application to these crops is called for. Increased yields of pumpkins, however, have been recorded where applications of as low as 3 cwt. of air-slaked lime per acre have been made. Nevertheless, dressings usually vary from 5 to 10 cwt. per acre according to the nature of the soil. A heavy or acid soil suggests the need of the heavier dressing whilst more friable loams require correspondingly smaller amounts. Lime should be applied two or three weeks prior to sowing and, as in the case of farmyard manure, should be thoroughly incorporated in the soil.

Fertilizers.

Fertilizers are very seldom used in pumpkin and gramma growing in this State, the soils on which these two crops are grown being generally regarded as sufficiently fertile for their requirements. Squashes and marrows are usually grown following some other market garden crop which has been fertilized, and their requirements are generally regarded as being supplied by the residual fertilizer. Furthermore, market garden soils are very frequently enriched by applications of farmyard manure, and the squashes and marrows also participate in residual effects therefrom.

Preparation of the Seed-bed.

As previously mentioned, these crops have a large and quickly developing root system. This is concentrated mainly in the uppermost 6 to 12 inches of the soil. Consequently the surface foot of soil should be loose and moist, and due regard should be paid to this requirement when preparing the land for sowing. The first essential is a deep and thorough ploughing which should be carried out early in the season and preferably before the June rains. Subsequent requirements in the preparation of the seed-bed will be determined by weather conditions and the farmer's individual experience of what is necessary to bring his particular soil to a high state of tilth. If practicable, the ground should remain open and in a rough condition for as long as possible through the winter. This will allow frost and other climatic influences to hasten the weathering of the soil, thus rendering large lumps friable. Then, when sufficient rain has fallen to supply adequate subsoil moisture, harrowing should effectively reduce the surface soil to a fairly fine physical condition. A second ploughing, preferably across and shallower

than the first, followed by the necessary surface harrowings to break all lumps, should then create the desired tilth. Such a tilth is obtained when the top 1 to 2 inches of soil is loose and finely divided and dry except just after rain has fallen. The soil immediately below, besides being sufficiently moist to ensure a quick germination, must be firm but not compacted. It must contain no large or hard lumps, but the soil particles must be associated in small aggregates or masses, giving the whole a rather uniformly granular or crumb-like structure. To obtain the desired condition, heavy soils require longer preparation than loams, and sandy soils need the use of rollers rather than of implements designed to stir the soil.

Sowing.

No definite time of sowing can be set down, but it may be accepted as normally extending from July to December, depending on the seasonal conditions usually experienced in the district in which the crop is to be grown. Since these plants are susceptible to frost, sowing must of necessity be delayed until all reasonable danger from frost is over and preferably until the soil is sufficiently warm to ensure a quick germination, for the seed is subject to decay in cold soils. It is considered that the lowest soil temperature at which the seed will germinate is 52 deg. F. or slightly higher than that required for maize. The most rapid germination is obtained when the soil temperature reaches 90 deg. F. In North Queensland soil temperatures may remain favourable for sowing throughout the year and sowing may therefore take place before July, but under South Queensland conditions sowing before that month is seldom practicable. Occasionally circumstances arise which render very late sowing desirable and such may be successful, for sowings in January and even in February have yielded profitable crops.

Two lb. of seed is usually required to sow an acre, but this rate will vary slightly with the variety to be sown. Large growing, strong running pumpkins and grammas will be sown further apart than the smaller squashes and marrows. Pumpkins and grammas are usually sown in drills 10 to 12 feet apart, seed being dropped singly at distances of 3 to 4 feet apart in the drill, or in hills of two or three seeds every 6 to 8 feet. The smaller squashes and marrows require only 4 to 5 feet between the drills and 2 feet between the plants in the drill. Seed may be sown by machine, but it is usually dropped by hand into open furrows, and later covered to a depth of 1 to 1½ inches. When sowing in hills, two or three seeds may be dropped into a hole made with a hoe or dibble. In hill sowing it is well to remember that two or three plants per hill will produce a greater number of fruit and more marketable fruit from a given area than one or more than three plants per hill. Frequently, sowings are made at much higher rates than these just mentioned in order to allow for loss by insect attack but, in these instances, the excess plants should be thinned out when the risk of such damage has passed.

In fertile districts enjoying a good rainfall pumpkins and grammas are sometimes grown with maize, but this practice is not generally successful in Queensland and is losing favour. When the crops are grown together, pumpkin or gramma seed is substituted for the maize seed in every third or fourth row, being sown either simultaneously with the maize seed or more frequently after the maize has germinated.

Occasionally plants are started in tubes in hot-houses, or in sheltered positions, and later transferred to the field. This practice may be

profitable where high prices can be realized for early-grown produce. The tubes are simply and quickly made from strips of galvanised iron or tin measuring 12 inches by 6 inches. These are formed into cylinders with the edges overlapping and are held in position by bands of string or other suitable material. These tubes are placed on end on a floor and filled with suitable potting soil, five to six seeds being sown in each. Following germination, the stand in each tube is reduced to the sturdiest two or three plants, and when these have developed three to four leaves the tubes are carried to the field and the seedlings transplanted. In handling the seedlings care must, of course, be taken to ensure that soil is not lost through the open lower ends of the tubes; if a light spade or sheet of iron is pushed under each tube before it is moved this danger will be obviated. In transplanting, a hole of suitable size is made at the site where the young plants are to be grown and the tube placed therein. The band of string is removed or cut and, after gently springing, the cylinder is removed. Finally the earth is firmed around the transplanted seedlings.

Cultivation of the Crop.

After the seed has germinated, the plants should be kept moving if heavy yields are to be obtained and inter-row cultivation should be sufficiently frequent to keep down weed growth and to loosen the ground after heavy rain. Under favourable conditions, the lateral root growth of pumpkins and their allied crops is rapid and, although root damage must be avoided, it is necessary to keep the soil beyond the root system well stirred. Consequently, some degree of care and judgment is essential in the inter-row cultivations which should continue until the growth of the vines prevents the use of implements. Generally speaking, spring, or even rigid tine implements will be found the most convenient to use for early cultivation. Diamond harrows are useful for the checking of early weed growth, but if such growth becomes troublesome disc implements may have to be employed. The actual implements used, however, will depend partly on what is available to choose from and partly on the prevailing conditions. The ordinary scuffler is probably all that is required for the final cultivation operations.

Flowering and Setting.

Early flowering depends on the strength and vigour of the young plants, and if growth is rapid flowering is early, with a consequential beneficial influence on yield. Flowering may extend over a period of several weeks, both male and female flowers being produced on the same vine. The male flowers are the first to appear and are borne on long, slender flower stalks not far from the crown of the plant. They are visible above the foliage. The female flowers are carried on short, stout stems towards the end of the runners, and are easily recognised by the ovary or undeveloped fruit which can be seen immediately below the flower itself.

The flowers are open for twenty-four hours, and pollination, which is usually effected by insects, chiefly honey bees, takes place mostly in the early morning, but may occur at any period when the flowers are open. Pollen is carried from the male flowers to the female flowers, and fertilization is thus effected. It is generally claimed that a better setting of fruit is obtained when cross pollination occurs. Setting evidently varies with the variety and to some extent with the strain within the

variety, and may be adversely affected by disease incidence. Only a small proportion of the female flowers set fruit, even though they may be fertilized. The shedding of fruiting flowers is therefore a natural phenomenon and cannot be corrected except by the selection of better strains and varieties in which the phenomenon is less marked than in those that are discarded in the selection. The nipping or cutting-back of vines is not calculated to increase the yield. It can only very slightly increase the size of the fruit set and removes potential fruit-carrying portions of the vine, an important point in view of the fact that all female flowers are borne towards the terminals of the runners.

Selection of Seed.

As has been pointed out, selected varieties or strains of these crops are capable of setting a greater number of fruit per vine than other varieties or strains and, therefore, besides providing higher quality fruit, selections are capable of improving yields. Indeed, selected strains are capable of out-yielding poor strains by over 30 per cent. The selection of individual fruit for seed requirements in the barn is unwise, since the fruit selected may be from low-yielding vines or may be exceptional individuals on a vine of poorly shaped fruit. It is therefore necessary for seed selection to be carried out in the field. This is not as laborious as it may at first appear, since, after the leaves have fallen, individual vines are fairly distinctively traced. Only well-shaped fruit, true to type, and from vines of high-yielding capacity should be selected. Ten lb. of pumpkin will provide approximately 1 lb. of seed, consequently, selections need not be extensive. Contrary to public opinion, the age of seed, provided its germination is not impaired, has no adverse influence on yield, for new season's seed has, by experiment, been shown to bear as heavily as seed of older origin.

Plate 112.
CATTLE PUMPKINS.

Harvesting.

Squashes and marrows are usually harvested before reaching maturity, that is, before the rind or shell commences to harden. A simple test can be applied by pressing the rind with the thumb nail which, if the fruit is at the correct stage for harvesting, should penetrate the rind under only light pressure. If the fruit is allowed to mature, the flesh becomes coarse and fibrous. The scallop type of bush squash is particularly good eating, when it is 2 to 3 inches in diameter and, when grown for home use, it is often picked at that stage in its devlopment; it is harvested, however, at a considerably later stage when required for the ordinary market. Pumpkins and grammas are harvested when mature, usually when the vines have died or been frosted. A short length of stalk should be left attached to the fruit when it is picked. It should not be broken off at the point of junction with the stalk for, if that is done, there will be a scar, which will allow the entry of decay organisms.

Storage.

All fruit to be stored must be mature, carefully handled and free from cuts and bruises which, as already indicated, allow the entry of decay organisms with consequential rapid rotting of the fruit. In storage, it is essential that the fruit be kept dry and as cool as practicable in order to prevent loss of moisture by sweating, for such sweating reduces the quality of the fruit and accentuates loss of weight. If stacked in bulk, one on top of the other, the fruit sweats and, of course, decays. Consequently, storage must be in single layers. Frequently, large haysheds provide sufficient space for the storage of pumpkins and grammas in single layers, but if sufficient floor space is not available to allow storage in that manner, wooden racks, which can be quickly and conveniently constructed, should be provided.

Varieties.

A great deal of confusion exists as to the correct classification of the many varieties of these crops, and the classification generally adopted in Australia differs markedly from that which is accepted in the United States of America. The pumpkins, the squashes and marrows, and the grammas belong to three species in the same genus, the squashes and marrows, as understood in Australia, belonging to one and the same species. These species are not always easily distinguishable one from the other, but distinctive vine and fruit characteristics are usually sufficiently apparent to enable an accurate classification to be made. It is considered that the differences between the species, in the classification adopted in Australia, are more clear-cut than would be the case in any other grouping of the varieties.

The vine, including the leaf stalk and the flower stalk, in the case of the pumpkins, is round or cylindrical and is not grooved and is a strong runner. It is hairy, whereas in the squashes and marrows it is spiny. The pumpkin leaf is rounded or kidney-shaped and is not cut into deep lobes. The fruit stalk is round and is fleshy or soft at maturity. The fruits are of various shapes, but never have crooknecks. They have hard shells, are late-maturing, and mostly store well. The pumpkin species includes the usually recognised table pumpkins, the cattle pumpkins, and the banana and hubbard pumpkins.

The stems of the squashes and marrows are five-sided, grooved, and spiny, and the flower stalks are also five sided. Their leaves are

distinctly lobed, the number of lobes varying from three to seven. The grooved fruit stalk, where it is attached to the fruit is frequently enlarged or flared and the fruit is hard at maturity, but the crop is usually harvested when the fruit is still tender. The squashes and marrows may be of the runner or bush type; usually the latter are the more extensively cultivated. The fruit, which matures early, may be of peculiar shape and does not keep well. This species includes the vegetable marrows, the scallops and bush squashes, the sugar squashes, the fordhook squashes and the crookneck squashes.

The grammas, like the pumpkins, are runners, and their stems may be angular. They are hairy but never spiny. Their leaves are lobed, but not markedly so, and whitish blotches appear at the intersections of the veins. The fruit stalk is angular and swollen where it joins the fruit, and the fruit, which is usually fairly hard-shelled, stores moderately well. The grammas are late-maturing and usually out-yield pumpkins in the warmer districts. The shape and colour of the fruit in the different varieties of grammas cover a wide range, but otherwise the gramma varieties are all very much alike. Many are used for pies and home jam making and all are very suitable as stock food.

The Queensland Blue or Beaudesert is a local table pumpkin that has gained popularity in both this and other States, and is now definitely the most widely grown variety in Queensland. It is of medium size, usually 8 to 10 lb. in weight and has a characteristic bronze-green colour. In shape, it is deep in relation to its width and is moderately deeply ribbed. The flesh is golden-coloured and of a fine firm texture. The seed cavity is small. This variety is usually a good cropper, but unfortunately the type is still variable. Improved strains have been selected, however, and these show much less variability. The Triangle or Triamble is a medium to large pumpkin of characteristic triangular shape. It is grey to grey-green in colour and has a deep golden-coloured flesh of fine and firm texture, but its reputed high flavoured eating qualities are not always present. The Ideal is a slightly ribbed, small, slaty-green table pumpkin. It has a very deep yellow-coloured, dry, and fine textured flesh. It is a fairly recent introduction from New South Wales, and may prove popular for its convenient size. An erstwhile very popular table pumpkin which has now been almost totally replaced by the Queensland Blue or Beaudesert is Ironbark. It is an extremely hard-shelled variety, with a golden-coloured flesh of very fine and firm texture. The Crown is another variety which is still grown fairly extensively. It is a slightly-ribbed, medium-sized pumpkin with a slate-coloured skin and a yellow flesh of good cooking quality. This variety now shows considerable variation in type, particularly as to the size and shape of the crown which appears at the blossom end.

Seed of individual varieties of cattle pumpkins is seldom procurable, cattle pumpkin seed being usually sold in lots of mixed varieties. All these varieties are large in size with large seed cavities and their flesh is usually coarse, pale and soft. The rind or shell is only of medium hardness, and consequently they are not very good keepers, and yields are generally not as heavy as in the case of the table varieties. Mammoth Cattle, Mammoth Yellow, and Mammoth Chili are the principal varieties found in paddocks of mixed cattle pumpkins.

The hubbards are the earliest of the pumpkins to mature, and are very distinctively shaped, being pointed at both ends. Their rind is not as thick as in the table pumpkins, but hubbards store well, and are very popular in America for that reason. The Green Hubbard variety generally has a smooth dark-green skin but it is sometimes slightly warted. Its golden-yellow flesh is of fine texture and is dry and sweet. The Warted Hubbard, as its name indicates, is a larger, heavily warted variety with a dark green skin. Its flesh is orange-yellow and is inclined to be coarse-grained. Another hubbard variety is the Golden Hubbard, which is a small variety of a golden colour. It has a deep orange-coloured flesh and is the earliest maturing of the hubbards. The hubbards are used for table purposes.

The banana pumpkins are somewhat similar to the hubbards in shape, but are usually more elongated. They are generally greyish-green in colour and have a softer rind or skin than the hubbards. They are reputed to have a high flavour, but are not grown to any extent in Queensland. The chief varieties are the Banana and the Plymouth Rock.

The Early White, which is a very small white variety with ridged or scalloped edges, is possibly the most popular scallop marketed. It has a white flesh and is a very prolific and rapid bearer. The Early Golden Bush and the Golden Custard are two other varieties of scallop, but neither of them bear so prolifically as the Early White. The Long White Bush is one of the most popular of the larger marrows and is a long, smooth white variety with a white flesh. The Long Creamy Marrow and the Long Green Bush are two other vegetable marrows somewhat similar to the Long White Bush but, as their names indicate, they are of a cream and green colour respectively. Another type of bush marrow of recent origin is Zucchini, which is a dark green early-maturing variety.

The sugar squashes contain two large varieties usually classed as cattle pumpkins. They are Mammoth Tours, a large variety with rather distinctive mottled green and yellow markings, and Connecticut Field, a large variety very popular in America. A small, dark green, acorn-shaped fordhook squash with deep grooves is known as Table Queen. It possesses a rich orange coloured flesh of good flavour, and is reputed to be a prolific bearer. It is a recent importation from America, where it is claimed to be the most popular variety grown. Yellow Crookneck is a crookneck type usually reputed to be a heavy yielder. The skin is bright yellow in colour and is usually warted. Its flesh is a bright yellow colour.

The Bugle is the most extensively grown of the grammas, and is a long variety with a crooked neck and an enlarged end. It has a golden-coloured skin when mature, and the very sweet flesh is orange-coloured and of a fairly fine texture. It is the most popular variety for the making of jams and pies. A small gramma with slightly grooved papaw-shaped fruit is appropriately known as the Papaw variety. Its skin is at first green in colour, but it changes to a golden shade at maturity. It has a very deep orange-coloured flesh of a fine and fairly firm texture. Another gramma variety is that known as Large Cheese. It has a large, flat, round fruit somewhat similar in shape to an ordinary table pumpkin. Its skin is cream to golden-coloured, and it has a soft pinkish-tinged coarse-grained flesh. In America it is frequently used for canning. Two other large grammas are Mammoth Round and Giant Long, both of which are often found in paddocks of mixed pumpkins.

Cultivation of Cotton.

W. G. WELLS, Director of Cotton Culture.

ATTENTION has already been drawn in an article in the November issue of this Journal to the need of maintaining clean cultivation in the early stages of the growth of a cotton crop. It is equally important to maintain clean cultivation in a cotton crop as long as it is possible for a cultivating machine to pass down the rows without seriously damaging the plants.

Generally speaking, not more than three or four cultivations should be required after the one immediately following the thinning if cotton is grown in rotation with Rhodes grass; on old cultivations as many as ten may be required. At each of these operations it is recommended that the soil be worked to the plants, for not only does this help to control weed and grass growth, but a firm brace is established around the plants, which assists in preventing them from being blown over during severe storms when the soil is wet. Where the rows are planted on the level contour across the slope, this firm bracing of soil around the plants will also assist in retarding the run-off of storm waters.

The general tendency of the cotton growers of this State is to cease cultivating as soon as they see that a few branches are broken by the passage of the cultivator. It is very important, however, that the cultivation be continued until there is danger of serious damage being done to the crop. Cultivation, of course, should cease once the plants are large enough to be seriously damaged by the passage of the machine, but if it ceases before that stage of growth has been reached, then the plants will not be of sufficient size to break much of the force of beating storms. Most of the soils on which cotton is grown are of the heavy loam to clay loam type, and following beating storm rains their surface tends to set into a dry hard crust except in the first or possibly second season of cultivation after the breaking up of grassland. It is necessary, therefore, to cultivate as long as no serious damage is done to the plants, otherwise a crust will soon be formed in the wet season which, when dried out and set hard, will prevent much of the subsequent storms from penetrating efficiently into the subsoils. In addition, weeds and grasses will develop in the centres as a result of ceasing cultivation before the plants are large enough to provide sufficient shade to restrict such growths. These will quickly drain the moisture from the surface soils, thereby robbing the cotton plants.

The greatest efficiency should be obtained in the cultivating operations. This requires that the best type of cultivator equipped with the most suitable cultivating attachments be used at each operation. Unfortunately this phase of cotton growing is not given sufficient attention by many farmers in this State. Broadly speaking, the riding two horse drawn cultivator (Plate 113), which straddles the row of cotton and which the driver steers with his feet on the carriage supporting the tines, rather than depending entirely on guiding the horses, is the most suitable type of machine for cultivating cotton, especially young cotton. With a steady team this machine, of which there are several types manufactured, can be adjusted to cultivate and destroy weed growth very close to the row of plants. If it is used a sufficient number of times, much hand labour, other than thinning the cotton, can be eliminated in most seasons.

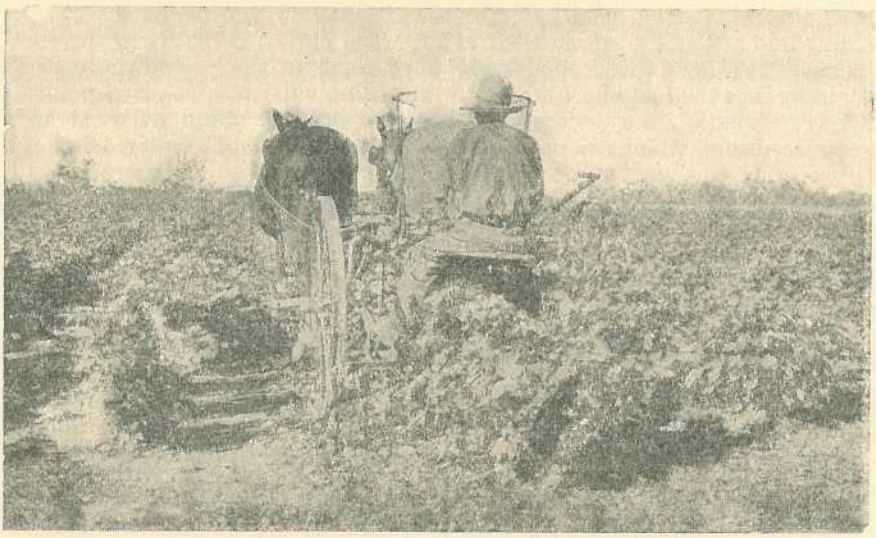


Plate 113.

Don't Neglect the Late Cultivation of a Cotton Crop.—Cultivation should be continued until the passage of the team and machine commences to cause serious breakage of the plants.

It is especially necessary that the cultivator be equipped to do efficient work at each operation. Attachments such as 6-inch sweeps, which are suitable for using in a loose loam in which young weeds are growing, will not be as suitable as long 2¼ or 3 inch wide tines in a heavy clay soil which has recently been subjected to a hard beating storm and therefore requires a deep cultivation to re-establish a satisfactory mulch. On many farms the one set of attachments stays on the cultivator all the season, and often until the set is worn out. Tines, sweeps, duck feet and shovels all require seasonal resetting and sharpening of the cutting edges to make them suitable for performing efficient work, especially in weed-infested fields.

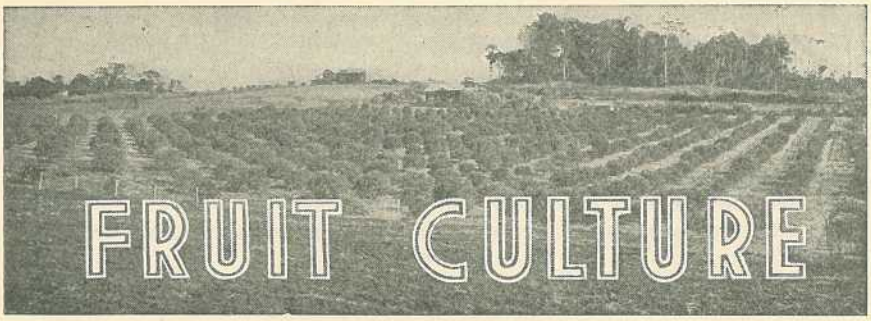
In recent seasons there has been a tendency for growers of large acreages of cotton to install cultivating equipment on light fast moving tractors. This is to be commended, for two rows can be cultivated at

the one trip, and the machine can be operated more continuously than horses, thus ensuring quicker and more economical cultivation. This greater rapidity of cultivation enables the operation to be started after the weed and grass seeds have germinated and to be completed before the weeds and grasses have got out of hand. It has been noted, however, that in an endeavour to cultivate a large acreage a day the tractor is frequently driven at such a speed that the cultivating attachments push the loose soil aside so much that they have to be set well away from the row to prevent covering small cotton plants. This prevents the destruction of weed and grass seedlings close to the plants that can be effected with the straddle row, foot steered cultivator drawn by a steady team of horses. Tractors should therefore be equipped with suitable guards when cultivating small cotton, to prevent the soil covering the plants, in which case efficient work can be done.

In some seasons sufficient rain may be experienced during the normal cultivating period to maintain satisfactory growth of the cotton plants and yet not germinate all of the weed and grass seeds in the soil. In such instances the crop may be kept clean to the point where it is "laid by" as the last operation with the riding cultivator is often named. Showery weather may soon after promote a thick stand of weed and grass seedlings which, if not destroyed, may grow sufficiently to affect appreciably the yield of the cotton crop. It is advisable, therefore, to cultivate the "middles" between the rows of cotton as long as a horse can pass down them without seriously damaging the cotton plants. The walking scuffler without a swingle tree is used for this purpose, very long traces being attached direct to the front hook of the scuffler, with a spreader inserted between them close behind the horse. The ends of the spreader should be wrapped with hessian to prevent their catching and breaking branches spreading away from the plants.

In other seasons prolonged wet weather may occur before the cotton crop is "laid by." In such instances sufficient time may elapse before the surface of a heavy alluvial soil is dry enough for cultivating, to allow of such an extensive development of weeds and grass that cultivating equipment cannot be used unless a riding disc cultivator is available. Under such circumstances the crop is frequently abandoned or ploughed out. It has been demonstrated in several seasons, however, that a badly weed and grass infested cotton crop can be satisfactorily cleaned up by ploughing out the middles and then destroying any big growths of weeds and grass between the plants by means of a heavy chipping hoe. A light pony plough set to plough shallow is used to make two or three rounds, throwing the soil to the centre. After the rows are chipped and the ploughed-out weeds and grass have dried out, the soil is ploughed back to the row to prevent excessive drying out of the soil around the plants. Where favourable growing conditions for the rest of the season are experienced, crops handled in this manner can produce profitable returns.

Undoubtedly the average yield of cotton could be appreciably increased if an improved standard of cultivation was more generally practised. Greater attention is required to such factors as timeliness of each cultivation, and the use of properly adjusted suitable cultivating attachments for each operation. All of these factors can materially increase the efficiency of the cultivating operations and thereby often reduce the amount of labour needed to produce a satisfactory crop of cotton.



Notes on Farm and Orchard Irrigation.

W. G. HANCOCK, Fruit Branch.

IRRIGATION is both a science and an art, and its successful and economic practice depends on a knowledge of a few scientific principles as well as keen observation and experiment on the irrigationist's own soil. These notes are intended to explain the principles of water application and usage, and to draw attention to a number of practical points in irrigation.

Water and the Soil.

The soil-water relationship is an extremely complex one, but it will be sufficient for the purpose of these notes to generalise it under three heads. First, there is the water so intimately associated with the soil particles that it cannot be separated by ordinary means and is quite unavailable to plant roots. It may be called hygroscopic water. Then, secondly, there is the water which soil particles gather around them as a film, and hold against gravity, as does a sponge which is just wet enough not to drip. This is called capillary water. A proportion of this is the water which plant roots obtain from the soil. The amount which a soil will hold as hygroscopic and capillary water is known as its "field capacity." This will vary widely according to the composition of the soil; for instance, the field capacity of sand is very low, while that of clay is very high. Thirdly, when soil is completely saturated, there is the water which has displaced the air and filled up the minute spaces between the particles. This water will more or less quickly drain away when it can, and is called gravitational water. If through faulty drainage this water remains in the soil, the site becomes a swamp in which all but the roots of specialised swamp plants will suffocate and die. Irrigation and good drainage must go together.

When water has been poured on a soil surface and is sinking in amongst the particles, the spaces between those of the first layer are filled and that layer is saturated. As it sinks in further and disappears beneath the surface the first layer of particles, while holding on to the capillary water, passes on the gravitational water to the particles below. The process continues until, given free drainage, there exists a more or less deep layer of soil at field capacity, but with no gravitational water. This is a fundamental point in irrigation—a given quantity of water will only bring a certain quantity of soil to field capacity; it cannot bring double that quantity to half field capacity.

Different types of soil take up hygroscopic water in varying amounts and likewise have different field capacities. Also, the absorption force

exerted by plant roots is not sufficient to overcome the retention force of soil particles beyond a certain point, and different types of soil will retain different proportions of their field capacities. A sandy soil has a small field capacity, but that little is mainly available to roots; a clay soil has a larger field capacity, but the proportion available to roots is smaller. Thus plants can wilt in a clay soil actually holding more water than a sandy soil in which they are still turgid. The point at which the retention force equals the absorption force is called the "wilting point." That introduces another maxim—that, practically speaking, water is either fully available or quite unavailable to roots.

Effective and Ineffective Irrigation.

To illustrate the effectiveness or otherwise of an irrigation, a theoretical example is taken. A figure to remember is that 1 inch of rain on 1 acre equals 22,700 gallons. If that amount were applied to 1 acre of citrus trees and the soil type were such that 1 inch of water brought 5 inches of soil to field capacity, all that water would be practically wasted, since citrus roots are below that depth, or should be. Much would be lost through evaporation, and any surface weeds would get the remainder. If, however, that amount were applied to a lettuce crop under similar conditions the lettuce would benefit, since, except for the unavoidable evaporation loss, the water would all be in their root zone.

Or course, in practice it is highly unlikely that the water would be so evenly applied that penetration would be an even 5 inches all over the acre. If applied in furrows or basins it would be localised and would sink much deeper at those places; but an undue proportion would be lost by evaporation and the trees would not be effectively irrigated. Actually, persistent under-irrigation of an orchard will tend to develop only shallow rooting, which renders trees susceptible to drought, the effects of high soil temperatures, nutritional troubles, and cultivation damage to roots. It is suggested that the restriction to root area caused by chronic under-irrigation is an aggravating factor in many soil deficiency troubles.

While general principles will remain the same, the actual application of water will depend on the root system of the crop and its water requirements, and the penetration and field capacity of a soil. The only way to decide the quantity required to penetrate to a given depth is to make trial holes with a spade after the water applied at an irrigation has been absorbed, and to vary the amount in future if on inspection the result is unsatisfactory. The shallow depth of penetration is frequently surprising, as it is to the gardener who after hosing his garden for an hour finds the water has only penetrated an inch or so. Actually a ¾-inch hose under a fair pressure will only pass about 300 gallons per hour, and as over 1,000 gallons are required to give 1 inch of water to half a square chain, long periods of hosing are necessary to water a fair-sized garden. This incidentally shows the futility of trying to irrigate an acre of orchard with a small windmill.

Of course, in general, shallow-rooted crops, such as most vegetables, require frequent but comparatively light applications of water; orchard trees require a very much heavier application at longer intervals, and if it is not possible to apply this amount within a reasonable time of pumping, it would be better to give the full supply to half the area alternately.

Loss By Evaporation.

Loss by evaporation is unavoidable and is quite considerable even under the best practices, while with less efficient methods it can be serious. However efficiently water is applied and soil managed, the water in the immediate surface layer must inevitably be lost. Therefore the percentage loss from this cause will be lessened as the depth of the moistened soil increases. For instance, on the assumption that the moisture in the top 2 inches of soil is evaporated the percentage falls from 100 for a 2-inch penetration to 8·3 in a 24-inch penetration. A penetration to the full depth of the root zone is therefore more economical, but it is also desirable, since roots tend to descend deeper, if (within the requirements of the crop) the tendency is for irrigation to a greater depth and lesser frequency.

Irrigation Systems.

Methods of applying water to the soil in common use include several types of spray systems, flooding, and furrows or basins.

For vegetables, fodders, and small crops in general, the spray systems have outstanding merits and are specially suitable for all crops requiring comparatively light but frequent watering. They are also the best for irrigating pineapples. The distribution of water is fairly even, and it is easy to regulate the quantity. Watering of slight slopes or undulating land presents no special difficulties, and once installed the labour required to operate at each watering is small. Once they are set working they can be left to flow without attention. Against these advantages is the fact that the capital cost is rather high. Opinions are divided as to whether they are the best method for orchard irrigation. In some circumstances the moist atmosphere generated may help in the development of fungus diseases. They also are rather awkward to instal amongst trees and when in position obstruct the passage of implements.

The usual layout requires a more or less permanent main from the pump to the cultivated area, with quickly adjustable coupling pieces along its length for attaching the movable spray lines. Into these lines nipples are screwed, from which the water is discharged into the air to fall like rain. Another variation, particularly suitable for pastures, is a movable spray line with semi-flexible joints, which can be dragged over sections of the land at a time.

Basins, furrows, or flooding all require semi-permanent or permanent flumes, piping, or ditches to carry the water to the place of use with a minimum of loss. From these, the water is reticulated into secondary furrows and applied to the land by whatever method is chosen. For level land which is not too porous, ditches will do; the correct fall can be obtained by running, if necessary, the ditch along the top of an embankment. For broken land or over very porous soil, sheet iron or wooden flumes or pipes are necessary to carry the water over depressions or prevent undue loss by percolation. To cross an obstruction such as a roadway, a concrete U can be constructed underground.

Another system described in American literature, but which has not been observed here, is a permanent underground main of concrete pipes from which rise at intervals vertical stand pipes adjusted for height, so that the tops shall be level. The water overflows from the open tops into furrows. This method would seem an excellent permanent installation for orchards.

For vegetables and small crops generally, the final application of water is often by furrows run between the rows and close to the plants. If it is necessary to work amongst the plants, successive waterings may be down every alternate furrow in turn, so that one furrow will always be comparatively dry. The porosity of the soil determines the length of the furrow; if over-long, the far end will receive too little water and the near end too much.

In orchards, one method is to draw up the soil in a circle around each tree, or in spaces containing two or more trees, and fill each in succession, usually commencing with the most distant, from a water furrow between the rows of trees. Such basins should be of ample diameter or width so that the whole root area will receive water. In some heavy soils where water remains around the trunk for an appreciable time, this method may induce crown rot, but for light or medium soils it is simple and satisfactory.

Another method is by running the water along a number of parallel furrows between the rows of trees; and yet another by forming large square basins between the trees—practically restricted flooding. The argument for these methods is that in an established orchard the feeding roots are mostly out beyond the spread of the branches and, therefore, the bulk of the water should be placed there.

The choice of systems will depend on several considerations. The chief point is to water as large a surface as possible, since the lateral spread of water in most soils is comparatively small. In general, it is desirable to give a light cultivation as soon as possible after an irrigation. For crops which receive a frequent watering, this usually cannot be done, but, in orchards which are irrigated comparatively heavily at longer intervals, the land should be cultivated as soon as practicable after each irrigation.

In any of these systems fertilizer can be applied by throwing a water soluble type into each basin or furrow as soon as it is filled, and the flow of water stopped.

Irrigation by actual flooding of larger areas requires that the land be perfectly level; and it is usually necessary to level the ground with a grader. The land is subdivided into suitable bays, about half a chain wide and of convenient length, by a low permanent ridge. This method is very suitable for lucerne or pastures, and also with suitable modifications for banana plantations, where frequent deep disturbance of the soil is undesirable.

Drainage.

Good subsoil drainage is most important on irrigated land, and land which does not answer to this requirement is quite unsuitable for irrigation. In all new cultivations intended for irrigation, test holes should be dug and filled with water to test the drainage. Poor drainage results in root injury; and dissolved salts in the irrigation water will accumulate in the soil and eventually render it infertile.

Sources of Water.

In large district irrigation schemes, the water is usually obtained from a river barrage, or dam, and the water conveyed by main canals to secondary canals and reticulated to individual farms. The individual farmer or orchardist may obtain his water from river or creek, either running or holding water in deep beds of sand so common in North

Queensland rivers; from swamp or lagoon; from wells or from "spears" driven into the sandy bed or porous water-bearing strata. From whatever source it is obtained, it is the flow or seepage which will usually determine the area possible to irrigate rather than the actual amount visible. If the flow is small it will be necessary to increase the capacity of well or soak pit. Wells can be increased in diameter or depth, or tunnels can be driven out from the bottom; the numbers of spears increased; or an old tank or boiler sunk into the sand of a river bed. For instance, a well 5 feet square and 20 feet deep at the water level will hold just over 3,000 gallons. This quantity will only suffice to give an inch of water to 1½ square chains, so unless the flow is sufficient to maintain a workable depth against the withdrawal of the pump, the area it is possible to irrigate would be very small. Obviously, it is very necessary to make sure that the supply will be maintained towards the end of the dry season when it will be most required.

Any untried source of supply should be tested for the presence of harmful salts before it is used on the land.

Engines and Pumps.

For the smallest type of installation, such as a garden, a windmill may supply sufficient water or it may be possible to use a hydraulic ram, in each case with a storage tank of ample capacity. However, for any commercial area a power-driven pump is necessary. Where electric power is available the advantages of an electric motor are obvious, but where it is not, the petrol, kerosene, or diesel engine may be used.

The merits of the centrifugal pump are such that one would hardly consider any other. It is compact and light in weight, powerful, and low in upkeep. It may be direct-coupled to an electric motor, or mounted in very confined positions. The centrifugal pump relies on the close fit of the impellor and requires to be driven at its designed speed to work at maximum efficiency and maintain its rated output. Air leaks between the pump and foot-valve will seriously reduce its efficiency and may even prevent it pumping. Sand in the water is an enemy to centrifugal pumps, unless specially designed. As it is desirable for the lift to be as low as possible, the pump may be mounted close to the water level, but it is not good practice for the belt drive to come directly from above; it should be as horizontal as practicable and usually the well can be cut into to permit this. A vertical drive from above reduces the transmitted power considerably because of the weight of the belt lessening the grip on the pulley. If no other is practicable, a vertical drive should be short. In horizontal drives, the drive side of the belt should be underneath. For very short drives, too short for flat belts, V belts are satisfactory. These run in grooves on the pulley and approximately 3 h.p. should be allowed to each belt.

Engine and pump should each be of a type suitable to the other. The engine should have ample power, so as to compensate for any small falling off in power with wear. Unless the farmer has the experience, it is wise to obtain technical advice regarding the installation, since many factors influence the output of a pump and hence the power required to drive it. Any engineering firm handling irrigation equipment will advise on the most suitable outfit.

The vertical height from water level to the highest point in the delivery line (i.e., the vertical lift), plus friction losses in the pipes, is the total "head." The greater the head the higher must be the speed

of the pump, and hence the power required. For practical purposes, the height from water level to pump should not exceed 25 feet at or near sea-level, but the nearer it can be to water-level the better. The suction pipe should be as straight and short as possible and of ample diameter. The delivery also should proceed straight from the pump without sharp bends. When the height from pump to the highest point of the delivery is great or the line very long, a non-return valve and an ample air chamber, fitted in the delivery line as near to the pump as possible, are desirable.

Friction losses in the pipes may be considerable, as shown by the following example. For a flow of 15,000 gallons per hour as delivered by an efficient 3-inch pump, the friction loss for different sizes of pipes per 100 feet of pipe is as follows:—

3″	3½″	4″	5″	6″	
28	13	6·5	2·74	1·1	ft. additional head.

This shows the very considerable effect of length of delivery pipe on the power requirements, which, however, can be adjusted to some extent by increasing the diameter of the pipe. For the smaller sizes it is desirable to have the pipes 1 inch larger than the pump.

The following example shows how to calculate the size of a pump for a job. A farmer plans to have at any one time a maximum of 15 acres of irrigated crops, and to pump eight hours per day. What sized pump will be required to enable the whole to be given 3 inches water per week?

3/7 (inches water per day) × 15 (acres) = 6 3/7 inches per day.

A 4-inch pump will deliver up to 8 inches in eight hours and would, therefore, be large enough and allow a margin. A 3-inch pump would deliver up to 5⅓ inches in the same period and would, therefore, be too small.

The power of the engine required, however, would depend on the total head, i.e., the vertical lift and the length and diameter of the pipes, and also the efficiency of the drive. It could range from a minimum of about 4 h.p. to many times this power for a very long line. This shows the desirability of having the installation planned by an expert.

The following table gives the approximate size of pump and horse-power required for different deliveries and heads for one well-known make of pump. The horse-power shown is, of course, that actually transmitted to the pump pulley, such as from a direct-coupled electric motor:—

Total Head.		Gallons per Hour.	Size of Pump.	R.P.M.	B.H.P. Required.
			Inches.		
10 feet	(*a*)	3,000–4,200	1½	1,350–1,690	1·2
	(*b*)	4,800–6,000	2	1,320–1,500	1·3
	(*c*)	6,600–9,000	2½	1,050–1,230	2·4
	(*d*)	10,200–15,000	3	980–1,250	3·9
	(*e*)	16,500–22,500	4	980–1,250	4·5
20 feet	(*a*)		1½	1,640–1,890	1·6
	(*b*)		2	1,530–1,750	2·0
	(*c*)		2½	1,270–1,400	2·8
	(*d*)		3	1,200–1,390	4·2
	(*e*)		4	1,140–1,350	5·6

Total Head.	Gallons per Hour.	Size of Pump.	R.P.M.	B.H.P. Required.
		Inches.		
30 feet	(*a*)	1½	1,900–2,110	1·9
	(*b*)	2	1,730–1,900	2·5
	(*c*)	2½	1,470–1,570	3·3
	(*d*)	3	1,360–1,540	5·2
	(*e*)	4	1,290–1,460	6·7
40 feet	(*a*)	1½	2,120–2,310	2·4
	(*b*)	2	1,900–2,060	3·0
	(*c*)	2½	1,640–1,720	3·8
	(*d*)	3	1,540–1,700	6·0
	(*e*)	4	1,430–1,570	7·8
50 feet	(*a*)	1½	2,320–2,450	2·8
	(*b*)	2	2,060–2,200	3·5
	(*c*)	2½	1,810–1,870	4·5
	(*d*)	3	1,715–1,850	7·2
	(*e*)	4	1,550–1,660	9·2

Useful Memoranda Not in Text.

Actual horse power required to raise water to different heights is—

$$\frac{\text{gallons per minute x 10 x total head in feet}}{\text{33,000 x efficiency}}$$

The efficiency of centrifugal pumps is approximately 50 per cent., so for purposes of estimation, the formula for horse power required is—

$$\frac{\text{G.P.M. x total head in feet x 2}}{\text{3,300}}$$

½ inch hose with nozzle at normal household pressures discharges approximately 200 gallons per hour.

¾ inch hose with nozzle at normal household pressures discharges approximately 300 gallons per hour.

Discharge of pipes 1,000 feet long at 1 foot head in gallons per minute—

½″	¾″	1″	1¼″	1½″	2″	2½″	3″	3½″	4″	5″	6″
·16	·45	·93	1·63	2·57	5·28	9·22	14·5	21·3	29·8	52·1	82·2

Discharge of pipes 50 feet long at 1 foot head in gallons per minute—

½″	¾″	1″	1¼″	1½″	2″	2½″	3″	3½″	4″	5″	6″
·715	2·01	4·17	7·29	11·49	23·6	41·21	64·81	95·21	133·21	232·89	367·43

N.B.—For a pipe less than 1,000 feet long multiply the figure for 1,000 feet by the following factor :—

50 ft.	100 ft.	150 ft.	200 ft.	300 ft.	400 ft.	500 ft.	750 ft.
4·47	3·16	2·58	2·237	1·827	1·58	1·414	1·154

1 imperial gallon weighs 10 lb., and contains 277·464 cubic inches.

1 cubic foot water weighs 62·35 lb., and contains 6·235 imperial gallons.

A column of water 1 foot high exerts pressure of ·434 lb. per square inch.

To convert heads in feet to lb. pressure multiply by ·434.

To convert 1 lb. pressure into feet head multiply by 2·3.

Pressure at sea level=14·7 lb. per square inch, and equals a column of water 33·9 feet high.

In practice the maximum lift is approximately 25 feet.

1 inch rain equals 22,700 gallons per acre, approximately.

1 acre equals 10 square chains ,or 4,840 square yards.

Circles—Area .. .. = diameter² x ·7854.
Circumference .. .. = diameter x 3·1416.
Diameter .. .. .. = circumference x ·3183.

Capacity of circular tank in gallons = ares of base in inches x height in inches ÷277·464.

Wartime Fruit Cases.

J. H. GREGORY, Instructor in Fruit Packing.

FRUIT producers in Queensland are at present experiencing many difficulties in obtaining enough suitable cases in which to market their products. It is no longer possible to obtain enough new cases, therefore increased use of second-hand cases has become necessary.

As growers well know, the types of cases used for marketing Australian-grown fruit in Queensland are many in number and variety. When supplied as second-hand cases in times of shortage, these cases, if new in type to growers, are likely to cause difficulties in packing. These notes are designed, therefore, to suggest to growers ways of using the various types of new and second-hand cases to the best advantage and so, as far as practicable, avoid difficulties which, otherwise, are sure to arise.

In using second-hand cases the first thing to do is to remove or obliterate all old brands. It is an offence against the *Fruit Marketing Regulations* to market fruit in cases on which the old brands are still discernible. Painting the ends is obviously the easiest way of obliterating old brands and marks. Growers who use case labels need not bother about obliterating brands, as the labels will cover them. Where a grower receives a variety of types of cases, he will avoid a lot of trouble in the packing of all fruits if he first sorts the cases into classes and uses each class for packing the fruits which will be found to pack easiest into the particular class or type. Cases available will probably be of the following types:—Standard; Dump; Long bushel; Half bushel standard; Half bushel dump; and Half bushel long (with partition).

Bushel Cases.

Most Queensland growers are familiar with both the standard and dump cases. The standard bushel case is an excellent container as a new box, but loses points when it becomes a second-hand case. It is customary for shopkeepers when removing its contents to open this case by taking off the side. This leaves the second-hand box with a bulging top and bottom which then become the sides unless the case is completely remade. Satisfactory packing under these conditions is difficult. In using this case, it is advisable to change the type of pack from the usual 3-3, 3-2, and 2-2 packs to 3-2 and 2-2 packs. Care should be taken to make each layer tight while packing. This type of case should, as far as practicable, be used for wrapped fruit only. It is anticipated that wrapping paper will be hard to get, so growers who can only wrap portion of their crop should use this case if they have them on hand among other kinds of cases. Common-sense handling is what is required.

As an all-purpose case, the dump bushel case—18 inches long by $8\frac{3}{8}$ inches wide by 14 inches deep—is now the best available. All fruits packed in bushel cases are easy to pack. The shopkeeper invariably removes either the bottom or the lid when taking out the fruit. This leaves a box of a normal type, ready for re-use, with very little effort required to make it fit for packing.

The long bushel case is 26 inches long by 6 inches wide by $7\frac{1}{8}$ inch deep, clear of the central partition. This case is popular for pear packing, so Queensland growers are not likely to have a large number supplied to them. If any grower does obtain long bushel cases, he is advised to cut them into half-bushel cases and use them as suggested in the notes on the long half-bushel case. As these cases are received in Queensland during the latter half of the year, it is safe to assume that

Stanthorpe growers should have them in time for the harvesting of stone fruits. As half bushels, they could be best used for the smaller fruits—such as cherries, apricots, and plums.

Half-bushel Cases.

The standard half-bushel case is 18 inches long by 11¾ inches wide by 5¼ inches deep. This case has been used often in Stanthorpe for packing grapes, for which it is quite satisfactory. The New South Wales gin case is similar, except for its hinged lid. Plums, apricots, and cherries, and other small fruits are easy to pack in this box. Tomatoes under 2½ inches in size will come to the top if packed diagonally—3 layers deep, 3-3, 4-3, or 4-4- packs. Large-sized fruits are difficult to pack diagonally and often solid packs have to be used. With this pack, the fruit is placed in the case with the layers directly one upon another (Plate 114). It is therefore easily understood that with this type of pack, care should be taken to see that the fruit does not come higher above the top of the case than will permit of the lid being placed in position without unduly squeezing the fruit.

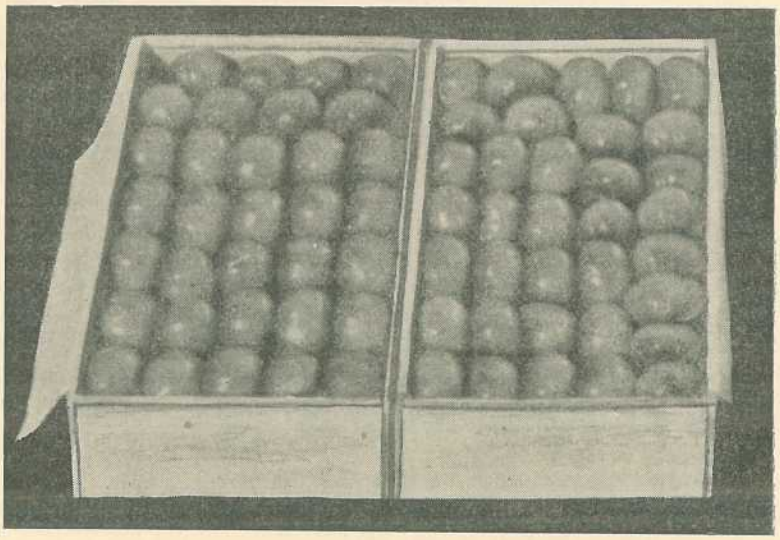


Plate 114.

HALF-BUSHEL STANDARD CASE.—Tomatoes packed on the layer-on-layer principle.

Large fruit over 2¾ inches may have to be packed by placing one layer on its edge, with the second layer placed on its flat upon it. Experienced growers do not welcome packs of this type and will, therefore, use them for marketing grapes or the smaller types of stone fruits. This will leave the half-bushel dump cases for tomatoes, large peaches, and other large fruits. The long half-bushel case is 26 inches long by 6 inches wide by 7⅛ inches deep (clear of partition). This is, perhaps, the oldest type of case in use in Australia, and may be used in the packing of most fruits, more or less satisfactorily. Its narrow width makes it a somewhat inconvenient container for packing. Packers should be careful, when placing bottom layers in position, to prevent the fruit from rubbing on the boards of the inside of the box which would cause skin

damage and early breakdown of the fruit. This case is best used for the smaller sizes of fruits, keeping the half-bushel dump cases for the largest and most awkward sizes over 2½ inches in size. With this case it is difficult to make an attractive pack. How to pack tomatoes in this case is described and illustrated in a booklet on fruit marketing, which is obtainable free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The half-bushel dump case is 18 inches long by 7⅛ inches wide by 8⅔ inches deep. In all Queensland, except parts of the North, this case is well known and presents little difficulty in packing. Growers will find that keeping this case for packing the large, harder-to-pack sizes, would be well worth while.

Whilst the shortage of new and second-hand cases may be irritating, it is worth while remembering that unless every effort is made by all concerned to utilise as far as practicable the cases available, the case shortage will be accentuated and losses of much-needed fruit will result to the detriment of both the war requirements and the growers themselves.

There will probably be supplies of new cases made up of various types of timbers, such as plywood. Some of these may appear to be thinly cut, but these types of boards can only be milled from first-grade timber, but will under normal conditions give as much protection as thicker second-grade boards. In making up any of the makeshift timbers, growers would do well to remember to, as far as possible, place the boards close together down the centre of the tops and bottoms of the case. This will help to prevent pinching and damaging the fruit where it would normally be forced into the cracks by the pressure of the two-piece lids or bottoms.

A careful selection of fruit is also a consideration. There is no doubt that, in effect, many cases are wasted through growers using them to send poor-grade fruit to market. This fruit is rejected, which means in effect that later the case and transport are all wasted. Rejection of low-grades on the property will go a long way towards assisting maximum use of the available cases, whilst at the same time helping market conditions to maintain better values.

An appeal is made to growers during this crisis in shortage of case supplies to do their utmost to use the cases obtained to their best advantage, at the same time making every effort to keep up the quality of their packing. It will only be by doing this that a maximum use of transport with a minimum of waste will return to the nation the best of war efforts.

HANDY WEIGHTS AND MEASURES.

In order to prepare mashes which will give maximum results it is necessary for the various ingredients to be weighed. As scales are not available on all farms, the average weight of the various kinds of foodstuffs most commonly used is given for two convenient measures, the kerosene tin and the quart measure. These weights refer to the measures being filled, but not pressed.

Kerosene tin: Bran, 12 lb.; pollard, 18 lb.; lucerne meals, 12 lb.; maize (whole), 28 lb.; maize (cracked), 25 lb.; wheat and sorghum, 30 lb.

Quart measure: Barley meal, 1 lb. 8 oz.; bone meal, 1 lb. 12 oz.; bran, 8 oz.; maize (whole), 1 lb. 12 oz.; maize meal, 1 lb. 8 oz.; meat-meal, 1 lb. 8 oz.; linseed meal, 1 lb.; pollard, 1 lb.; salt (fine), 2 lb.; wheat, 1 lb. 12 oz.; wheatmeal, 1 lb. 8 oz.

Bushels to short ton: Maize, 35.7; barley, 40; sorghum, 33.3; wheat, 33.3; bran and pollard, 100; oats, 50.

Vegetable Production

Blood and Bone for Tomatoes.

L. G. VALLANCE, Assistant Research Officer.

BECAUSE of the acute shortage of chemical fertilizers which are sources of nitrogen and phosphate, an increasingly important part is being played by blood and bone in the production of tomatoes in the Redlands district. That this fertilizer is capable of supplying the needs of the plant with respect to nitrogen and phosphate has been amply demonstrated by a series of experimental plots in the Cleveland area. These trials, some of which are still in progress, have been designed with the object of determining the effect of various combinations of nitrogen, phosphate and potash upon tomato yields. A fundamental part of the work is the evaluation, by means of chemical analyses, of the plant food content of the soils. From these analyses the soils may be classified as being of high, medium, or low fertilizer requirements. While it is not intended in this article to anticipate the final results of these investigations, there are some features of the results already obtained which will be of interest to all growers who are endeavouring to obtain maximum yields from their quotas of fertilizer.

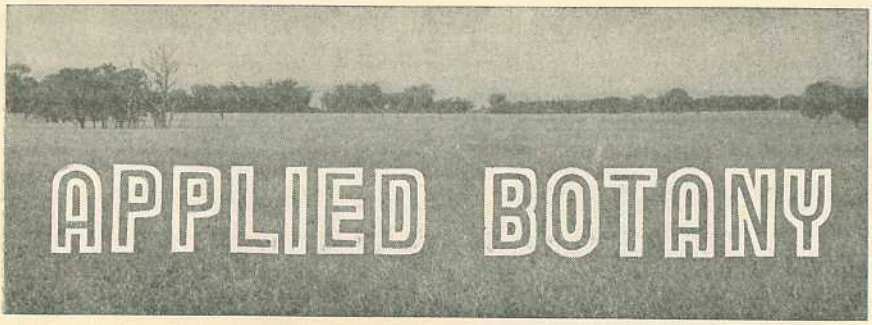
Excellent results were obtained from the trials in which blood and bone alone was used as a pre-planting fertilizer. In order to test whether the phosphate contained in the bone of the meatworks mixture was sufficiently rapidly available, some plots were included in the trials in which additional phosphate, as superphosphate, was added to the blood and bone. As no benefit either in plant growth or yield was obtained from the additional phosphate it is evident that blood and bone is capable of supplying the requirements of the tomato plant in respect to phosphate. Until details are available as to the most satisfactory amounts of meatworks fertilizer to be applied as a basal dressing, a tentative recommendation of one kerosene tinful (approximately 35 lb.), per five chain row, will be a guide to those growers who have had limited experience with this type of fertilizer. In some of the trials so far completed a basal dressing of 75 lb. of blood and bone per five chain row was given to an autumn planting of trellised Break o'Day variety. A yield of 1,700 cases per acre was obtained without the addition of further fertilizer, either at planting time or as a side dressing. However, in many of the plots on which this heavy application was used there were definite indications that an excessive quantity of very readily available nitrogen was present.

The importance of maintaining the correct balance between nitrogen and phosphate in the early stages of growth cannot be over emphasised. When a dressing of meatworks fertilizer greater than three-quarters of a kerosene tinful (approximately 28 lb.) per five chain row is placed in a

drill before planting, some time must be allowed to elapse before the plants are set out. During this interval the phosphate contained in the fertilizer will become more readily available because of the decomposition of the bone. Furthermore, since blood is quickly acted upon by soil bacteria, the nitrogen it contains will, to some extent, be incorporated in the soil organic matter, from which it is made available to plants comparatively slowly. Under the above conditions, meatworks fertilizer is capable of supplying a very suitably balanced ration of nitrogen and phosphate to the tomato plant.

Many growers are aware of the more obvious symptoms of excessive nitrogen application in the basal dressing. In the most obvious cases the plant is stunted and yellowish in colour. In addition the leaves are stiff with the leaflets small and often folded upwards. The condition is usually termed fertilizer "burn." If the injury is severe, the plant, although it does not die, will make practically no growth throughout the season. In less severe cases a lateral shoot will develop and grow normally while the remainder of the plant retains the original symptoms. However, very often these obvious symptoms are not present; there is no marked yellowing but the lateral growth is not vigorous, and the early leaves have a somewhat cramped appearance whilst the leaflets are characteristically small. If good growing weather prevails the plants will apparently recover and ultimately there will be no visible indications of the injury. Nevertheless, the yield of fruit will be adversely affected both as regards earliness and total weight.

The question then arises as to the length of the period which should be allowed to elapse before plants are set out where blood and bone has been used as a basal dressing. Actually this will vary according to the amounts of fertilizer used, the moisture present in the soil, and the nature of the subsequent working of the soil. Amounts exceeding three-quarters of a kerosene tinful (approximately 28 lb.) per five chain row when placed in the drill require a considerable amount of working to thoroughly mix the fertilizer with the soil. At least two scufflings are necessary in the first fortnight. This procedure should be followed by re-ploughing the drill, followed by another scuffling before planting. It is wise to take every opportunity of working, and so aerating, the soil in the row in order to ensure that maximum decomposition of the fertilizer material will take place. Frequent inspections to ascertain whether any lumps of rotting fertilizer are still present towards the bottom of the drill are also advisable. If any such are found the field is not yet ready for planting. Furthermore since the decomposition of the fertilizer is accelerated by the presence of adequate soil moisture, it is often advisable to give the land a watering after the fertilizer has been scuffled in, particularly if the soil is somewhat dry at the time. It should also be borne in mind that many of the fertilizer mixtures at present in general use contain a considerable proportion of their nitrogen as blood and the phosphate as bone. In consequence, therefore, when these mixtures are used as pre-planting fertilizers for tomatoes, precautions, similar to those outlined above, should be taken to ensure that the roots of the young plants do not come into contact with the fertilizer before a suitable amount of decomposition has taken place.



Edible Trees and Shrubs.

3. QUEENSLAND BOTTLE TREE.*

W. D. FRANCIS, Botanist.

THE Queensland Bottle Tree is readily recognised by its characteristic bottle-shaped stem. It is met with in western parts of the State, mostly south of the tropics. It is a pleasing feature in the streets of several towns of the south-west, such as Augathella and Tambo. It belongs to the same plant family† as the common Kurrajong and the Brown Kurrajong.

Plate 115 shows the characteristic shape of the stem of the tree. The bark is brown or grey in colour and strongly fissured lengthwise. The wood is very soft. The leaves are placed alternately on the branchlets. On adult trees they are narrow, 2–4 inches long, and 3–5 times as long as broad. In the seedling stage of the tree and on coppice shoots the leaves are divided into 3–9 narrow, leaf-like segments. The flowers are about ½-inch in diameter when expanded. The fruit consists of 3–5 pod-like vessels. These are 1–1½ inch long, open in a slit on one side, and contain 4–15 seeds.

The tree is limited to Queensland and is found principally in the Darling Downs, Maranoa, Warrego, Port Curtis, Burnett, and Leichhardt districts. It approaches the coast near Marmor, south of Rockhampton.

The Queensland Bottle Tree is one of the best known and most valuable fodder trees of the State. All of the green parts are edible. It is commonly planted as a shade and ornamental tree in inland and coastal parts of the State. Large trees are often transplanted in western parts of the State. Attractive specimens growing in distant parts of western properties are often dug out, transported on lorries, and planted near homesteads. For this purpose the large roots are severed a few feet from the base of the stem.

* *Brachychiton rupestris.*

† *Sterculiaceae.*

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

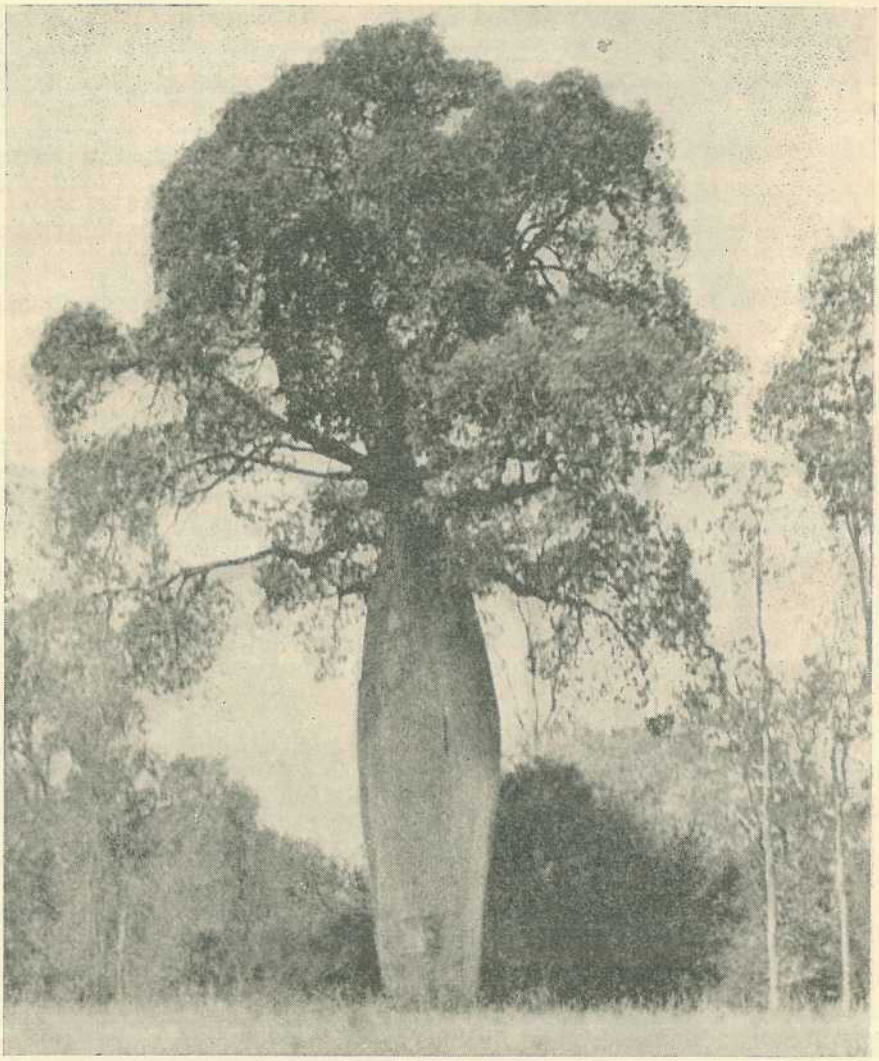


Plate 115.
THE QUEENSLAND BOTTLE TREE.

Queensland Trees.

THE BLACKBUTT.

THE Blackbutt* is one of the commonest trees of the coastal belt in Queensland from the Tweed River to Fraser Island. Though finding its greatest development on the coast it is occasionally found some distance away from it, as at Crow's Nest on the Darling Downs and the Blackdown Tableland inland from Rockhampton.

It is a large, handsome tree up to 150 feet high, frequently forming dense stands with long, straight boles. The stump or coppice leaves are not remarkably different from the adult ones, though at first they are opposite and sessile—*i.e.,* seated on the branchlet without any stalk; they are also markedly paler on the under surface than on the upper. They soon pass into the adult form. The adult or ordinary leaves are straight or somewhat sickle-shaped, 3–5 inches long, ¾-inch to 1 inch wide, and borne on a slender stalk of ½–1 inch. The flowers are borne in clusters on the old wood, the buds somewhat pointed. The seed capsules are globular, about ½-inch in diameter, mostly four-celled, with the valves over the cells rather small and about flush with the top.

On account of its availability, ease of working, and response under forestry management, Blackbutt is one of the favourite mill woods of Eastern Australia, though the timber is not so durable as some of the other Australian hardwoods. It is, however, reported that telegraph poles of Blackbutt erected at Maroochy were quite sound after forty years' service.

The Queensland Sub-department of Forestry proposes the name of Grey Blackbutt as the standard trade name for the timber and states it is applied to the purposes of floor framing of carriages or waggons and for waggon sheeting, for bridge planking, and for the crossarms of telegraph poles. In general building it is extensively used for floorings, weatherboards, plates, joists, and studs.

The vernacular, "Blackbutt," refers to the fact that the basal part of the trunk is clothed with a rather fibrous bark, frequently blackened by bush fires. The upper part of the trunk and limbs are clean and smooth. The Latin adjective, *pilularis,* is a diminutive from pila, a ball, and refers to the shape of the seed capsule.

* *Eucalyptus pilularis.*

ANSWERS.

Selected from the Government Botanist's outward mail.

Specimens Named.

R.D.C. (Rockhampton)—

1. Strychnine Bush.—Feeding tests have shown definitely that this plant is poisonous to stock.
2. Fuchsia Bush.—Poisonous to stock. Contains a prussic acid yielding glucoside, which at times rises extremely high; at other times, paddock resting stock may feed on the plant with comparative safety.
3. Gallweed.—Suspected of poisonous properties, but feeding tests have always given negative results.
4. Yellow-wood.—Causes staggers in stock.
5. Cotton Bush.—Generally regarded as a comparatively reliable fodder in times of drought.
6. Damson or Plum-wood.—A good fodder.
7. Barrier Saltbush.—Generally regarded as a good fodder.
8. Cane Grass.—This grass contains a small amount of a prussic acid yielding glucoside, but unlikely to cause trouble.

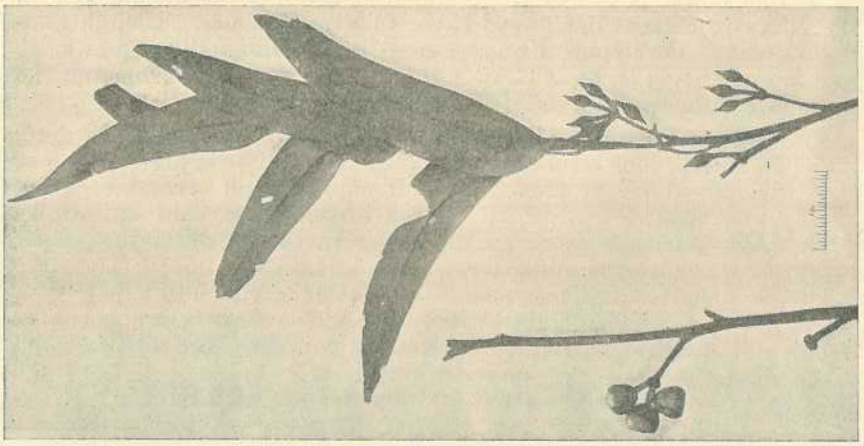


Plate 117.
LEAVES, FLOWER BUDS, AND SEED CAPSULES OF BLACKBUTT.

Plate 116.
BLACKBUTT.

PLANT PROTECTION

Four Major Diseases of Citrus.

F. W. BLACKFORD, Assistant Research Officer.

CITRUS has long been an important section of the fruit growing industry in this State and wartime food requirements have tended to increase its importance rather than otherwise. Hence it is considered desirable to publish an account of the various diseases of citrus and of the measures which are now being recommended for their control as the result of an extensive series of experiments which has been carried out by the Department of Agriculture and Stock during recent years. The four important diseases known as black spot, melanose, scab and brown spot are discussed in this issue.

Black Spot.

Black spot is probably the commonest disease affecting citrus in Queensland. All varieties may be infected by it but the disease is rarely found on Washington Navel oranges and grapefruit. The spots which are characteristic of this trouble are usually encountered on the fruit but similar spots may be found at times on the leaves and twigs. The disease is most prevalent on the warm sunny side of the trees and on the exposed side of the fruit.

On oranges, mandarins and grapefruit the first indications of the presence of the disease are roughly circular, reddish-brown spots which appear on the skin of the fruit as it approaches maturity or is commencing to colour. These spots develop to a size of about $\frac{1}{16}$ to $\frac{1}{8}$ inch in diameter and usually have a grey, sunken centre surrounded by a dark brown to black ring. Very small black pin-points, which are the fruiting bodies of the fungus causing the disease, may be found within the grey areas. (Plate 118.) Similar spotting is found on lemons but very often infections on lemon fruit merely produce quite small, shining, black spots which are slightly, if at all, sunken in the rind, and which do not develop further. Severe outbreaks have been known to cause extensive fruit shedding, but the main loss occasioned by the trouble is the grading down or culling of fruit because of the blemished rind. On fallen fruit and fruit held in storage for long periods a dry, dark-brown, shrivelled rot develops on affected portions of the rind. The flesh of the fruit is unaffected, however, and fruit rotting organisms seem to be unable to gain entry to the fruit through blemishes caused by the black spot fungus.

Melanose.

Next to black spot, melanose is the most important cause of the grading down of citrus fruit in this State. All varieties may be attacked and symptoms may be found on the leaves, twigs and fruit. In the early stages of the disease, brown, waxy spots appear on the surface of the fruit, leaves or twigs, these spots developing as a result of some of the surface cells becoming filled with a resin-like substance. It is at this

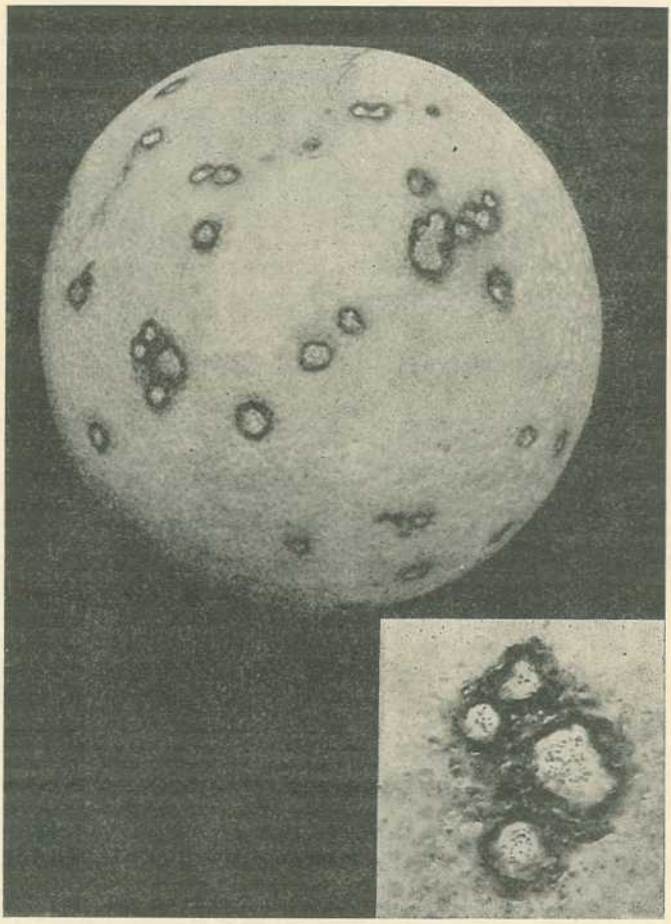


Plate 118.

BLACK SPOT.—Orange showing typical spotting; in the inset the spots are enlarged. Note the black pin-point fruiting bodies of the fungus in the centre of the spots.

stage in the development of the disease that it is difficult to distinguish between an orange or a mandarin fruit affected with melanose and one injured by Maori mite infestation. A good distinguishing characteristic, however, is provided by the fact that whereas a "Maori" fruit remains smooth, the surface of the resin-filled cells on a fruit affected by melanose lifts and cracks at the edges so that the rind is very rough and conveys the impression of a sandpaper surface.

The disease (Plate 119) is caused by a fungus which carries over from season to season on the dead wood on the tree and this fact accounts for its prevalence in old or neglected orchards in which the dead wood has not been pruned out. In showery weather or when heavy dews or fogs are prevalent, spores suspended in drops of water fall on uninfected leaves and fruit and, if the underlying tissue is susceptible, infection takes place. This is the reason why melanose spots are often found in circles outlining that portion of the leaf or fruit surface on which a water drop containing spores had rested, or in "tear streaks" marking

the track of a drop as it ran down over the surface of the fruit or leaf. One important point in connection with the incidence of this disease is that after the leaves and fruit are approximately six weeks old they are immune to attack from the melanose fungus. Hence as showery, warm conditions and heavy dews and fogs are of frequent occurrence in Queensland coastal citrus districts for a short time after the blossoming in spring, i.e., when the fruit is young and the trees have shot into young growth, the disease is invariably present in these areas in contrast to the inland districts, which usually have a dry spring, and in which the disease seldom appears to any extent.

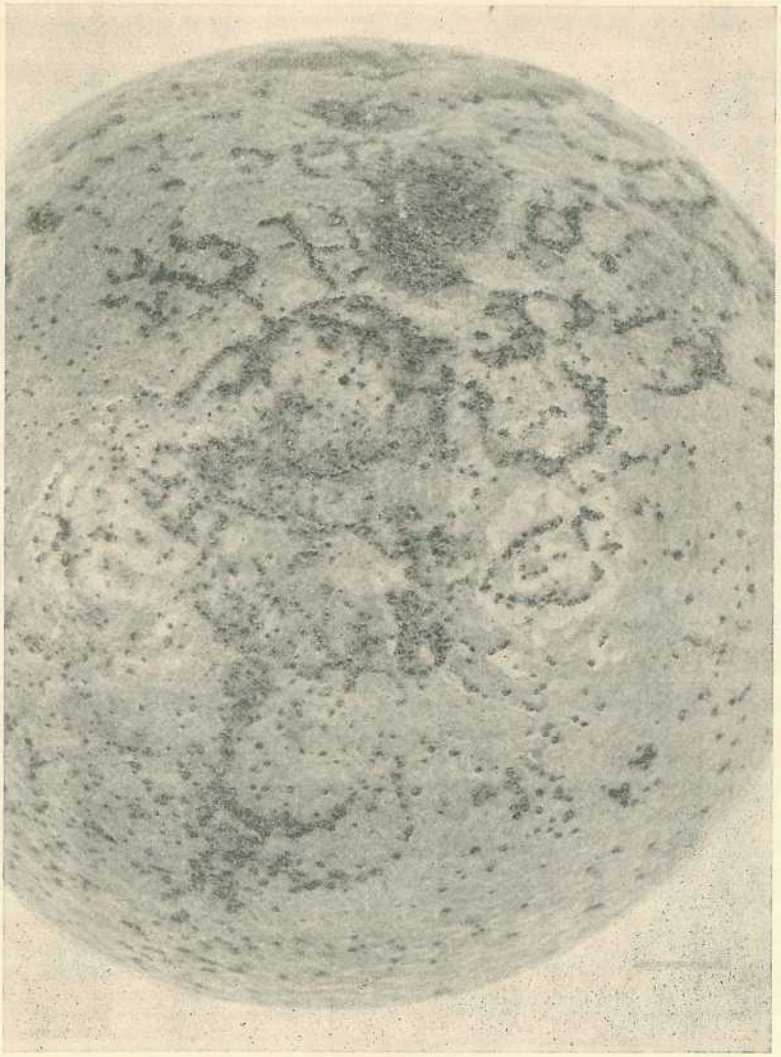


Plate 119.

MELANOSE.—Note how the melanose spots roughly outline the position where drops have rested on the rind.

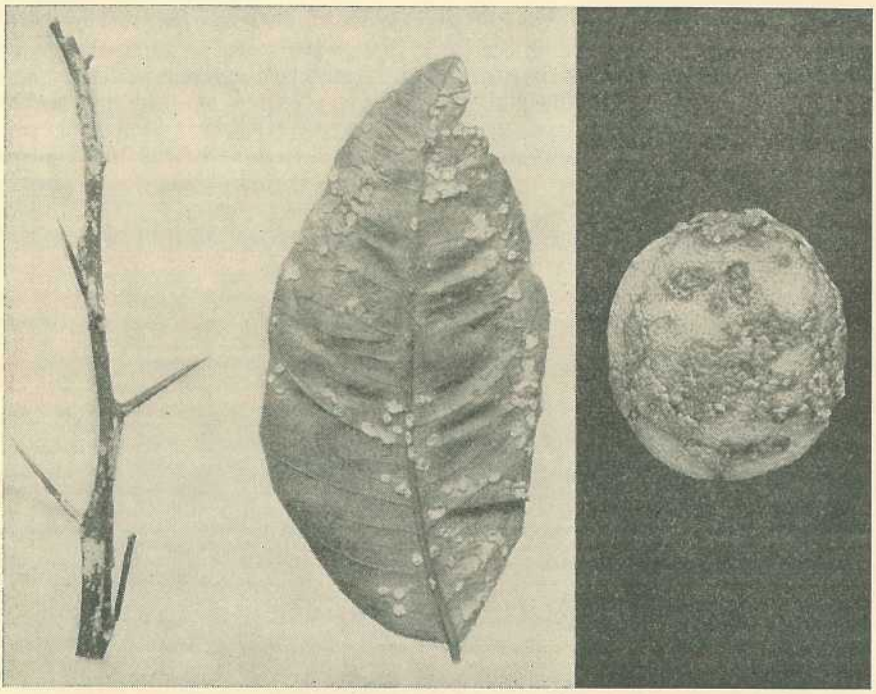


Plate 120.

SCAB.—Scabs on leaf, twig, and fruit of rough lemon.

Scab.

Scab is the name given to a disease caused by a group of fungi each of which produces very similar symptoms on citrus. Fortunately, there is only one variety of these fungi in Queensland and it is confined to lemons and mandarins. It can be particularly severe on rough lemon used as nursery stock, infection resulting in the production of very distorted seedlings unsuitable for budding purposes.

On the twigs (Plate 120) the disease appears as raised, light-brown, corky, scabby spots which are rather wartlike in appearance. Similar lesions are also produced on the leaves and fruit. On the leaves the disease results in marked distortion and may typically cause the leaf to appear as though the leaf blade had been pushed up from one side into a minute peak on the point of which the typical scab is found. Each scab is surrounded by a pale-coloured halo, giving the foliage a generally unhealthy light, yellowish-green appearance. Severely affected lemon fruit sometimes develop knobby outgrowths of the rind, each outgrowth being tipped with the corky scab. The disease is rarely serious in well-established mandarin trees, the main source of trouble in this variety of citrus being the infection of twig growth in young trees which results in the development of a badly shaped framework.

Brown Spot.

In Queensland, brown spot is confined to the Burrum and Elimbah districts. Only one variety of citrus, the Emperor of Canton mandarin, is attacked but in this variety the disease can be very destructive.

The most conspicuous symptom of the disease appears on the fruit as a small black dot on the rind which enlarges until it becomes a chocolate-coloured, sunken spot $\frac{1}{8}$ to $\frac{3}{8}$ inch in diameter, often with a raised area in the centre as though infection has taken place through some puncture. (Plate 121.) A spot may develop anywhere on the fruit, a very common place for its appearance being at the point of insertion of the stalk. Spotted fruit colour prematurely and are shed very readily and in severe outbreaks it is easy to pick out the Emperor variety in an orchard simply by noting the number of highly coloured fruit which are lying on the ground under the trees. Dark brown spots surrounded by a light-coloured halo may be found on the leaves and these cause distortion and leaf fall. The twigs may also be affected, dark-brown spots on them developing into small cankers as the wood matures. Affected twigs, particularly the affected tips of water-shoot growth, often die back with a characteristic curling over of the tip.

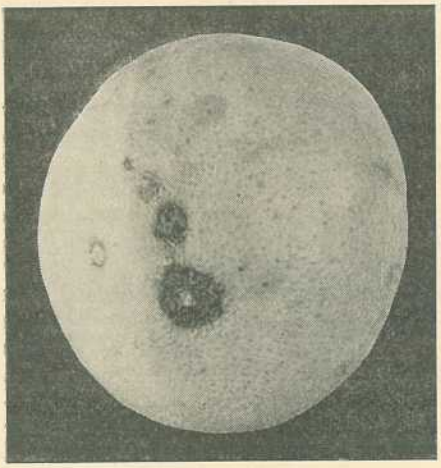


Plate 121.
Brown Spot.—Affected Emperor of Canton Mandarin Fruit.

Control.

The methods adopted for controlling the four diseases just discussed have several features in common. Firstly all diseased wood and infected fruit should be removed from the orchard and burned. As dead wood is either known, or suspected to be, the source of spores which spread the disease each season, it should be pruned out together with any sickly growth. To promote strong, healthy growth the orchard should receive good care and attention with respect to adequate fertilizer applications, green-manure cropping, cultivation and, if possible, irrigation.

While much may be accomplished by these methods it is necessary in certain districts, especially in those on the coast, to apply copper sprays in order to prevent infection developing. Home made cuprous oxide mixture at a strength of three gallons of the stock solution to forty gallons of water has been found the most suitable spray for this purpose. Both melanose and scab may be prevented by a single application of this spray as the fruit is susceptible to infection for only a very short period after setting. In the case of black spot and brown spot, however, the period of susceptibility is much longer and two and three applications respectively are necessary to achieve control. The following table sets out the number and time of the applications required in each of the four diseases. For successful control, it is important that these applications be made at the times shown and not delayed even for a short period.

Disease.	Time of Application of Spray.		
	½ to ¾ Petal Fall.	Two Months Later.	Late February.
Melanose ..	Cuprous oxide mixture (3–40)	..	..
Scab	Cuprous oxide mixture (3–40)	..	..
Black Spot ..	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)	..
Brown Spot ..	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)

The above schedules have been drafted for the main crop of all citrus varieties set in the blossoming period of September and early October. These are usually the only sprays necessary; although lemons may blossom at other times during the year, the other principal crop of this variety set in late January and February will be free from disease providing these schedules are adhered to each year. Occasionally because of the adverse weather conditions some varieties, particularly the Late Valencia orange, may fail to set a main crop. Fruit set in the late blossoming which follows such an occurrence may be protected from black spot, which is usually serious in such a crop, by further applications of the fungicide in a schedule delayed according to the time of blossoming. In the case of rough lemon nursery stock, an application for the control of scab is necessary at each flush of young growth.

In most citrus districts there is usually a complex insect pest control problem which necessitates fumigation or spray applications. The copper spray applications required for disease control, however, may be incorporated in such an insect pest control programme and certain sprays combined to accomplish a two or threefold purpose. As, however, some precautions have to be observed, particularly where fumigation is practised, it is advisable for citrus growers, who may contemplate the adoption of a programme for the simultaneous control of several citrus diseases and pests to consult the combined citrus pest and disease control programmes as set out in a leaflet published by this Department.

CAUTION—DANGEROUS BACTERIA IN PRESERVED VEGETABLES.

Attention has recently been directed towards the possibility of contracting botulism from certain preserved foods, and housewives who bottle fruit and vegetables for consumption at a later date are now advised to take steps to eliminate the possibility of this type of food poisoning. Whilst most organisms likely to cause spoilage of the bottled product, or to render it dangerous for consumption, are killed in the ordinary cooking processes, some others, and in particular the bacterium responsible for botulism, may survive. This bacterium is associated with non-acid vegetables, and when the spores are not destroyed they may later grow in the container and produce a poison. There is no danger of botulism in the case of acid foods, and it is therefore prudent in the home to make use of this type only unless an efficient steam pressure canner is available. The addition of acids such as vinegar, citric acid, lemon juice, or the like cannot be used to overcome the trouble unless so much is added as to make a pickle in place of the normal preserve. It is therefore recommended that only acid foods be preserved by the usual home processes. The following list shows the class to which the more common foods belong:—

Acid foods (safe for home bottling):—Apples, apricots, cherries, gooseberries, peaches, pears, pineapples, plums, strawberries, and tomatoes and rhubarb.

Non-acid (unsafe unless processed in steam pressure canner):—Asparagus, beans (both dry and green), beetroot, carrot, sweet corn, peas, pumpkin, squash, sweet potatoes, and greens generally.

Queensland Butter Production.

E. B. RICE.

THE accompanying tables cover the operations of all butter factories in Queensland for the year ended 30th June, 1943. The information has been compiled and tabulated by Miss P. Horsley, of the Dairy Branch, from monthly returns to the Department in accordance with the requirements of the *Dairy Produce Act*. It will be noted that some factories, because of large local orders and, in many cases, the treatment of milk for Service requirements and otherwise, had only a comparatively small portion, if any, of their output graded officially.

A scrutiny of the figures indicates the quantity of butter in each grade made by the respective factories and the quantity of each grade for which suppliers were paid. The official gradings columns indicate the results of the gradings of butter examined officially by both Commonwealth and State officers. The information contained in these tables should prove of interest to factory suppliers, as well as to managers and directors.

SUMMARY OF PRODUCTION AND GRADINGS OF BUTTER FOR THE YEAR ENDED 30TH JUNE, 1943.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
111,511,198 lb.	74,901,915 lb.	33,263,919 lb.	3,306,393 lb.	38,971 lb.
	67·17%	29·83%	2·96%	·03%

PAY IN LB.

112,010,699 lb.	76,459,478 lb.	32,886,149 lb.	2,634,399 lb.	30,673 lb.
	68·26%	29·35%	2·35%	·02%

OVERRUN.

Actual	2,976,595 lb. = 2·74%
Paid	3,476,096 lb. = 3·22%

GRADINGS IN BOXES.

Submitted as—	Choice.	First.	Second.	Pastry.
Choice.				
973,464	838,894	134,519	51	..
	86·17%	13·81%	·02%	..
First.				
495,878	..	475,419	20,459	..
	..	95·87%	4·13%	..
Second.	..	..		
57,513	..	..	51,035	6,508
			88·68%	11·32%
1,526,855	838,894 lb.	609,938 lb.	71,545	6,508
	54·94%	39·94%	4·68 %	·44%

Percentage of production graded = 76·65 per cent.

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Atherton	Make	2,604,979	2,604,979	..	..	..	72,872 lb.	71,672 lb.	..
	Pay	2,603,779	2,603,779	..	..	..	2·87%	2·83%	
Bushy Creek	Make	108,406	..	108,406	..	..	3,365 lb.	3,192 lb.	..
	Pay	108,233	..	108,233	..	..	3·203%	3·03%	
Daintree	Make	147,921	..	147,921	..	..	3,838 lb.	3,838 lb.	..
	Pay	147,921	..	147,921	..	..	2·66%	2·66%	
Evelyn Tableland ..	Make	515,537	515,537	..	..	..	18,647 lb.	16,919 lb.	..
	Pay	513,809	513,809	..	..	..	3·75%	3·404%	
Fraser	Make	1,965	..	1,965	..	..	Underrun	..	..
	Pay	4,919	..	4,919	..	..	2,954 lb.	..	
Millaa Millaa	Make	996,089	994,626	..	1,463	..	29,910 lb.	25,927 lb.	..
	Pay	992,106	990,983	..	1,123	..	3·09%	2·71%	
Gladstone	Make	1,686,846	215,439	1,226,226	245,181	..	31,081 lb.	38,553 lb.	79·204
	Pay	1,694,318	267,539	1,201,250	225,529	..	1·93%	2·32%	
Biloela	Make	3,337,446	1,072,462	2,192,099	72,885	..	88,107 lb.	89,468 lb.	64·529
	Pay	3,338,807	1,073,620	2,220,312	44,825	..	2·61%	2·65%	
Bundaberg	Make	2,056,724	585,785	1,346,891	124,048	..	24,593 lb.	40,555 lb.	64·306
	Pay	2,072,686	626,066	1,334,076	112,544	..	1·21%	1·99%	
Mackay	Make	886,488	302,751	543,403	13,838	26,496	16,766 lb.	30,116 lb.	4·097
	Pay	900,838	314,063	546,420	14,522	25,833	1·92%	3·46%	
Monto	Make	3,933,296	1,278,964	2,590,896	63,436	..	83,423 lb.	84,218 lb.	68·388
	Pay	3,934,091	1,281,707	2,603,666	48,718	..	2·16%	2·18%	
Rockhampton	Make	2,491,621	338,150	1,987,920	158,775	6,776	58·266 lb.	74,196 lb.	9·619
	Pay	2,507,551	432,232	1,931,157	141,636	2,526	2·39%	3·04%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Atherton	..	..	..	..	..	..	..	..	..	..
Bushy Creek	..	..	..	..	..	..	..	..	..	..
Daintree	..	..	..	..	..	..	..	..	..	..
Evelyn Tableland	..	..	..	..	..	..	..	..	..	..
Fraser	..	..	..	..	..	..	..	..	..	..
Millaa Millaa	..	..	..	..	..	..	..	..	..	..
Gladstone	..	..	..	..	19,225 ..	19,071 99·2%	154 ·8%	4,633	4,331 93·48%	302 6·52%
Biloela	8,521	5,318 62·41%	3,203 37·58%	..	29,112	28,709 98·61%	403 1·38%	825	692 83·88%	133 16·12%
Bundaberg	1,787	433 24·23%	1,354 75·77	..	19,929	19,810 99·40%	119 ·6%	1,902	1,812 95·27%	90 4·73%
Mackay	..	..	..	..	46	..	46 100%	601	226 37·6%	375 62·39%
Monto	12,919	12,064 93·38%	855 6·62%	..	34,207	34,171 99·89%	36 ·105%	908	770 84·80%	138 15·19%
Rockhampton	..	..	..	..	2,407	1,786 74·2%	621 25·8%	1,873	1,443 77·04%	430 22·95%

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Wowan	Make	2,588,202	419,624	2,078,045	83,757	6,776	62,372 lb.	62,954 lb.	56·369
	Pay	2,588,784	508,356	2,003,307	74,593	2,526	2·46%	2·49%	
Silkwood	Make	46,567	..	43,836	..	2,731	417 lb.	..	..
	Pay	46,150	..	43,836	..	2,314	·9%	..	
Caboolture	Make	2,545,238	2,204,030	325,584	15,624	..	67,971 lb.	70,624 lb.	74·416
	Pay	2,547,891	2,258,021	279,190	10,680	..	2·78%	2·85%	
Eumundi	Make	2,248,109	1,974,289	253,244	20,576	..	60,557 lb.	60,363 lb.	91·389
	Pay	2,247,915	2,008,299	224,751	14,865	..	2·76%	2·75%	
Pomona	Make	1,548,340	1,384,122	150,846	13,372	..	41,884 lb.	42,526 lb.	100
	Pay	1,548,982	1,421,461	121,986	5,535	..	2·77%	2·82%	
Dayboro'	Make	47,052	..	47,052	..	..	Underrun	..	17·138
	Pay	365,166	282,731	82,435	..	..	318,114 lb.	..	
Esk	Make	2,098,929	1,189,797	847,681	61,451	..	67,056 lb.	67,126 lb.	91·798
	Pay	2,098,999	1,194,578	863,904	40,517	..	3·3002%	3·303%	
Logan and Albert ..	Make	3,611,375	3,147,695	463,680	..	..	108,549 lb.	108,616 lb.	94·782
	Pay	3,611,442	3,176,482	433,101	1,859	..	3·09%	3·1%	
Maleny	Make	2,496,550	2,371,446	125,104	..	..	75·041 lb.	73,848 lb.	83·209
	Pay	2,495,357	2,380,276	114,182	899	..	3·09%	3·05%	
Munro Bros, Sold Oct., 1942	Make	151,457	80,393	70,116	948	..	2,003 lb.	1,901 lb.	100
	Pay	151,355	88,724	62,226	405	..	1·34%	1·27%	
College	Make	79,413	10,527	10,527	..	..	1,217 lb.	1,153 lb.	31·732
	Pay	79,349	75,465	3,800	84	..	1·55%	1·47%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Wowan	1,698	1,411 83·09%	287 16·9%	..	22,862	22,862 100%	..	1,493	1,108 74·21%	385 25·78%
Silkwood	..	..	..	..	..	..	..	..	..	..
Caboolture	27,747	25,486 91·85%	2,261 8·14%	..	5,876	4,627 78·74%	1,249 21·25%	200	131 65·5%	69 34·5%
Eumundi	31,749	18,001 56·69%	13,748 43·30%	..	4,613	3,515 76·19%	1,098 23·80%	326	295 90·49%	31 9·51%
Pomona	26,444	25,301 95·67%	1,143 4·32%	..	3,578	3,311 92·53%	267 7·46%	225	210 93·33%	15 6·67%
Dayboro'	..	..	..	..	144	137 95·13%	7 4·87%	..	..	..
Esk	20,691	19,948 96·40%	743 3·59%	..	12,573 ..	12,473 99·20%	100 ·79%	1,143 ..	1,050 91·86%	93 8·14%
Logan and Albert	52,864	48,645 92·02%	4,219 7·98%	..	8,225	7,083 86·11%	1,142 13·88%	35	17 48·57%	18 51·42%
Maleny	34,874	25,136 72·07%	9,738 27·92%	..	2,222	2,043 91·94%	179 8·05%	...	..	..
Munro Bros. sold Oct., 1942	1,461	1,167 78·8%	294 21·2%	..	1,311	1,311 100%	..	10	5 50%	5 50%
College	262	106 40·46%	156 59·54%	..	184	166 90·2%	18 9·78%	..	..	..

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Booval	Make	3,332,646	2,480,229	599,119	252,682	616	126,239 lb.	126,618 lb.	57·367
	Pay	3,333,025	2,421,284	741,729	170,012	..	3·93%	3·94%	
Boonah	Make	3,708,354	2,393,649	1,203,125	111,524	56	108,687 lb.	108,718 lb.	96·125
	Pay	3,708,385	2,481,763	1,148,005	78,617	..	3·01%	3·02%	
Grantham	Make	2,215,175	1,434,338	588,421	191,968	448	90,992 lb.	91,134 lb.	94·302
	Pay	2,215,317	1,494,138	581,815	139,364	..	4·28%	4·29%	
Laidley	Make	1,867,557	1,470,314	360,596	36,647	..	61,687 lb.	61,870 lb.	96·389
	Pay	1,867,746	1,516,246	328,429	23,071	..	3·41%	3·42%	
Lowood	Make	598,983	252,093	337,585	9,193	112	8,461 lb.	17,537 lb.	93·519
	Pay	608,059	254,397	334,514	19,148	..	1·42%	2·95%	
Kingston	Make	5,209,628	4,636,188	443,016	130,424	..	186,191 lb.	185,739 lb.	100
	Pay	5,209,230	4,662,652	441,484	105,094	..	3·706%	3·69%	
Woodford	Make	1,790,700	1,680,820	109,648	232	..	69·539 lb.	70,184 lb.	92·01
	Pay	1,791,345	1,668,612	122,321	412	..	4·04%	4·07%	
Cooroy	Make	2,049,570	1,430,098	588,840	30,632	..	69,480 lb.	68,139 lb.	91·864
	Pay	2,049,229	1,537,102	495,062	16,065	..	3·508%	3·44%	
Gympie	Make	7,695,054	7,085,341	522,872	86,841	..	235,231 lb.	236,817 lb.	83·88
	Pay	7,696,650	7,217,800	411,186	67,664	..	3·15%	3·17%	
Murgon	Make	2,749,091	2,353,171	389,760	6,160	..	69,407 lb.	71,143 lb.	83·274
	Pay	2,750,827	2,333,786	413,279	3,762	..	2·59%	2·65%	
Proston	Make	1,339,295	833,503	412,888	92,904	..	30,875 lb.	28,737 lb.	100
	Pay	1,337,157	877,173	380,976	79,008	..	2·35%	2·19%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Booval	18,863	16,944 89·83%	1,919 10·17%	..	10,686	10,265 96·06%	421 3·94%	4,591	4,186 91·18%	405 8·82%
Boonah	40,227	37,820 94·02%	2,407 5·98%	..	21,497	20,839 96·94%	658 3·06%	1,931	1,748 90·52%	183 9·47%
Grantham	23,583	17,926 76·01%	5,657 23·98%	..	10,327	10,171 98·48%	156 1·51%	3,393	3,350 98·73%	43 1·27%
Laidley	24,439	18,453 75·50%	5,986 24·49%	..	6,800	6,434 94·61%	366 5·38%	906	811 89·51%	95 10·48%
Lowood	3,949	3,590 90·9%	359 9·1%	..	5,893	5,851 99·2%	42 ·8%	161	117 72·6%	44 27·4%
Kingston	86,322	77,516 89·79%	8,806 10·2%	..	6,916	6,847 99%	69 ·99%	2,444	2,343 95·86%	101 4·14%
Woodford	26,885	12,795 47·59%	14,090 52·4%	..	2,537	2,236 88·13%	301 11·86%	2	..	2 100%
Cooroy	22,410	21,890 97·67%	520 2·32%	..	10,591	10,470 98·85%	121 1·14%	621	461 74·23%	160 25·76%
Gympie	118,776	115,599 97·32%	3,177 2·67%	..	9,779	7,112 72·72%	2,667 27·27%	1,685	1,301 77·21%	384 22·79%
Murgon	33,732	28,429 84·27%	5,303 15·72%	..	7,061	6,902 97·74%	159 2·25%	87	70 80·46%	17 19·54%
Proston	14,578	12,558 86·15%	2,018 13·84%	..	7,616	7,244 95·11%	372 4·88%	1,705	1,675 98·24%	30 1·75%

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Nanango	Make	2,273,142	955,189	1,268,894	49,059	..	78,466 lb.	78,997 lb.	96·25
	Pay	2,273,673	1,032,328	1,201,755	39,590	..	3·57%	3·59%	
Maryborough	Make	995,072	467,958	470,918	56,196	..	25,444 lb.	22,599 lb.	22·184
	Pay	996,227	451,593	493,854	50,780	..	2·61%	2·31%	
Biggenden	Make	2,056,877	1,406,268	622,049	28,560	..	85,101 lb.	85,426 lb.	77·819
	Pay	2,057,202	1,477,109	566,234	13,859	..	4·31%	4·33%	
Kingaroy	Make	4,143,915	4,022,512	..	121,403	..	179,330 lb.	180,820 lb.	33·495
	Pay	4,145,405	4,037,247	..	108,158	..	4·52%	4·56%	
Mundubbera	Make	2,661,200	2,317,472	304,920	38,808	..	94,403 lb.	94,386 lb.	90·062
	Pay	2,661,183	2,360,170	274,976	26,037	..	3·67%	3·67%	
Wondai	Make	2,401,798	1,923,011	414,026	64,761	..	112,529 lb.	114,198 lb.	75·45
	Pay	2,403,467	1,973,089	394,110	36,268	..	4·91%	4·98%	
Gayndah	Make	1,558,579	1,098,655	440,344	19,580	..	58,004 lb.	57,892 lb.	92·592
	Pay	1,558,467	1,093,431	448,121	16,915	..	3·86%	3·85%	
Chinchilla	Make	1,843,183	1,358,727	417,032	65,856	1,568	17,761 lb.	22,675 lb.	95·318
	Pay	1,848,097	1,390,588	412,399	45,110	..	·97%	1·24%	
Toowoomba	Make	2,483,889	2,104,379	334,488	45,022	..	7,255 lb.	81,505 lb.	50·661
	Pay	2,558,139	2,168,840	343,998	45,301	..	·29%	3·29%	
Clifton	Make	1,390,592	671,048	686,952	32,592	..	35,514	35,818 lb.	93·077
	Pay	1,390,896	672,276	689,260	29,360	..	2·62%	2·64%	
Crow's Nest	Make	1,678,600	1,187,368	489,664	1,568	..	48,976 lb.	49,142 lb.	98·872
	Pay	1,678,766	1,187,369	489,844	1,553	..	3·005%	3·01%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Nanango	15,871	11,950 75·29%	3,913 24·65%	8 ·05%	22,218	20,998 94·51%	1,220 5·49%	981	655 66·77%	326 33·23%
Maryborough	710	51 7·18%	659 92·81%	..	2,385	1,029 43·14%	1,356 56·85%	847	431 50·89%	416 49·11%
Biggenden	16,753	14,500 86·55	2,253 13·45%	..	11,136	10,335 92·81%	801 7·19%	694	616 88·76%	78 11·24%
Kingaroy	22,669	20,389 89·94%	2,280 10·05%	..	32	32 100%	..	2,085	1,767 84·74%	318 15·25%
Mundubbera	36,719	32,616 88·82%	4,103 11·17%	..	5,315	4,160 78·26%	1,155 21·73%	765	703 91·89%	62 8·1%
Wondai	24,142	21,622 89·56%	2,520 10·43%	..	7,462	6,563 87·95%	899 12·05%	756	655 86·64%	101 13·35%
Gayndah	17,458	16,039 91·87%	1,419 8·13%	..	7,943	7,550 95·05%	393 4·94%	369	247 66·93%	122 33·06%
Chinchilla	22,742	15,611 68,64%	7,098 31·21%	33 ·14%	7,385	6,467 87·57%	918 12·43%	1,246	893 71·67%	353 28·33%
Toowoomba	15,832	15,500 97·90%	332 2·1%	..	6,020	6,020 100%	..	619	619 100%	..
Clifton	10,197	9,561 93·76%	636 6·24%	..	12,333	12,299 99·72%	34 ·27%	583	574 98·46%	9 1·54%
Crow's Nest	20,620	17,297 83·88%	3,323 16·11%	..	8,948	8,728 97·54%	220 2·45%	30	30 100%	..

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Dalby	Make	3,203,843	1,542,099	1,540,616	121,128	..	89,085 lb.	91,135 lb.	92·904
	Pay	3,205,893	1,539,667	1,559,075	107,151	..	2·85%	2·92%	
Goombungee	Make	1,595,664	935,200	660,464	..	..	57,290 lb.	57,266 lb.	90·626
	Pay	1,595,640	934,809	660,774	57	..	3·72%	3·72%	
Jandowae	Make	2,375,072	1,410,024	936,208	28,840	..	80,826 lb.	80,839 lb.	99·313
	Pay	2,375,085	1,410,689	936,035	28,361	..	3·52%	3·52%	
Miles	Make	1,377,380	257,320	1,050,784	69,276	..	45,291 lb.	45,544 lb.	87·351
	Pay	1,375,633	257,003	1,051,317	67,313	..	3·4%	3·42%	
Killarney	Make	1,441,480	808,012	620,140	13,328	..	28,745 lb.	27,696 lb.	66·385
	Pay	1,440,431	807,698	620,770	11,963	..	2·03%	1·96%	
Millmerran	Make	1,284,383	185,538	948,080	150,765	..	31,949 lb.	31,823 lb.	95·755
	Pay	1,284,257	234,581	937,235	112,441	..	2·55%	2·54%	
Oakey	Make	3,245,756	2,401,332	597,744	256,680	..	102,593 lb.	104,929 lb.	91·18
	Pay	3,248,092	2,352,801	716,159	179,132	..	3·26%	3·33%	
Roma	Make	999,598	33,667	725,859	240,072	..	22,685 lb.	22,462 lb.	47·081
	Pay	999,375	299,974	495,177	204,224	..	2·32%	2·29%	
Warwick	Make	2,066,315	1,502,787	503,552	59,808	168	58,304 lb.	52,783 lb.	50·882
	Pay	2,060,794	1,477,064	539,642	44,088	..	2,903%	2·62%	
Allora	Make	1,619,333	1,187,698	430,448	1,187	..	40,085 lb.	43,233 lb.	76·599
	Pay	1,622,485	1,194,026	423,647	4,812	..	2·53%	2·73%	
Texas	Make	212,071	158,543	30,706	22,822	..	6,891	7,408 lb.	24·901
	Pay	212,588	100,812	89,520	22,256	..	3·35%	3·61%	
Inglewood	Make	483,448	273,336	193,256	16,856	..	15,670 lb.	16,284 lb.	66·709
	Pay	484,062	204,949	262,875	16,238	..	3·34%	3·48%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Dalby	22,968	21,912 95·40%	1,056 4·59%	..	28,033	27,790 99·13%	243 ·86%	2,133	1,763 82·65%	370 17·34%
Goombungee	14,127	12,969 91·80%	1,158 8·19%	..	11,694	11,694 100%	..	2	2 100%	..
Jandowae	24,782	23,692 95·6%	1,090 4·4%	..	16,816	16,700 99·31%	116 ·69%	523	477 91·2%	46 8·79%
Miles	1,926	1,860 96·57%	66 3·43%	..	18,455	18,414 99·78%	41 ·22%	1,104	1,035 93·75%	69 6·25%
Killarney	5,239	4,360 83·22%	879 16·77%	..	11,609	11,286 97·21%	323 2·78%	240	230 95·83%	10 4·17%
Milmerran	2,298	1,841 80·11%	447 19·45%	10 ·43%	17,056	16,014 93·89%	1,042 6·11%	2,608	2,284 87·57%	324 12·42%
Oakey	37,733	29,367 77·82%	8,366 22·17%	..	10,713	10,356 96·66%	357 3·33%	4,402	4,210 95·63%	192 4·36%
Roma	..	..	..	..	4,399	4,367 99·27%	32 ·73%	4,005	3,996 99·77%	9 ·22%
Warwick	9,400	7,916 84·21%	1,484 15·78%	..	8,335	8,254 99·02%	81 ·97%	1,040	996 95·76%	44 4·23%
Allora	14,259	11,476 80·48%	2,782 19·51%	..	7,791	7,407 95·07%	384 4·92	101	23 22·77%	78 77·22%
Texas	..	..	..	..	536	463 86·38%	73 13·62%	407	374 91·89%	33 8·11%
Inglewood	2,241	1,829 81·61%	412 18·38%	..	3,217	3,217 100%	..	301	301 100%	..

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of The Australian Illawarra Shorthorn Society, the Jersey Cattle Society and the Ayrshire Cattle Society. Production records for which were compiled during the month of September, 1943 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Yarranvale Lovely (208 days)	W. Henschell, Yarranlea	7,802·75	290·022	Trevor Hill Bosca
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Penrhos Janet	A. Sandilands, Wildash	6,404·81	266·463	Penrhos Pansy Prince
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Sunlit Farm Ollie	W. H. Sanderson, Mulgeldie	6,225·25	253·183	Sunlit Farm King Billy
JERSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Gem Leila	W. Bishop, Kenmore	6,599·95	343·886	Calton Lothean
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Hocknell Waimate Barleycorn	N. C. Webb, Beaudesert	7,155·7	332·607	Hocknell Golden Surprise
Mayfair Bluebell 3rd	J. Carpenter, Flagstone	5,266·2	295·464	Trecarne Victory
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Hocknell Peer's Sweetheart	N. C. Webb, Beaudesert	5,637·0	309·196	Carnation Hopes Robin
Elwyn Golden Queen	E. J. Dunning, Stanmore	5,617·4	285·681	Glenside Lone Star
Mayfair Beauty 4th (257 days)	J. Carpenter, Flagstone	5,175·1	260·667	Trecarne Victory
AYRSHIRE.				
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Leafmore Sonya	J. P. Ruhle, Motley	5,826·4	267·243	Myola Jellico
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Leafmore Bonnie Bess	J. P. Ruhle, Motley	7,111·75	282·776	Myola Jellico

PRODUCTION RECORDING.

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Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
College Mayflower 6th	Queensland Agricultural High School and College, Lawes	8,301·1	349·291	Hillview Premier 2nd
Sunlit Farm Poppy	W. H. Sanderson, Mulgeldie	7,518·6	297·522	Sunlit Farm King Billy
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Rosenthal Choice 17th (365 days)	S. Mitchell, Warwick	9,442·53	395·689	Rosenthal Perfection
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Mountain Camp Charm	W. Caldwell, Bell	6,346·59	288·453	Rosenthal Red Major
Mountain Camp Fancy	W. Caldwell, Bell	5,497·15	235·982	Rosenthal Red Major
JERSEY.				
SENIOR, 4 YEARS (STANDARD 330 LB.)				
Boree Clover	W. and C. E. Tudor, Branch Creek	8,781·5	415·061	Boree Soldier Boy
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Boree Harebell	W. and C. E. Tudor, Branch Creek	6,443·86	326·967	Boree Soldier Boy
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
College Holly	Queensland Agricultural High School and College, Lawes	7,096·65	363·777	Richmond Stalworth
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Gem Noreene	W. Bishop, Kenmore	5,776·15	320·263	Gem Sir Neville
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Glenview Kenia Watnot	F. Eager, Petrie	4,625·76	242·454	Trinity Governor's Hope

More Pig Meats Wanted.

E. J. SHELTON, Instructor in Pig Raising.

A NOTED British authority, Sir John Russell, has said of the brood sow in relation to other farm stock:—

> "Beef has always been the Englishman's favourite meat, but it is extravagant to produce, for the bullock is a poor transformer of food into flesh and still worse when he is making the prime beef of peace-time.
>
> "Sheep are better transformers, but the pig is the best of all. Considered merely as a machine for making meat, the pig wins easily. But she (pigs are mostly feminine or neuter) suffers from one fatal defect: she is much nearer the human being in structure and in food requirements than are cows or sheep, she has only one stomach, is not well adapted to feed on grass or on what farmers call roughage, i.e., straw, hay, &c., but needs grain if she is to do well, and, of course, some green food. . . . In short, she eats the same food as we do, although she accepts a lower standard."*

In Queensland, pig raising has always been closely allied to dairying, yet the production and marketing of pigs as a specialised rural industry has proved profitable on all farms where pig raising is conducted as a business on approved lines; on farms which are not run by guesswork, but where attention is given to every detail.

Bacon curers, meat exporters, and, most important of all, the nation want more pigs, and farmers themselves want more pigs. The Stud Pig Breeders' Society has as its slogan "Better Pigs on Every Farm," which to-day might be reset and worded "More and Better Pigs on Every Farm."

Breeding and Feeding.

In pig keeping, as in other farm industries, there is a right and there is a wrong way in the feeding and management of livestock, and the farmer has to be up-to-date in his ideas and in his practice; he needs to adopt the "right" way if results are to be up to expectation. The farmer who dilutes skim milk (which itself contains more than 90 per cent. water) "fifty-fifty" with added water and expects the pigs to make satisfactory growth is so much out-of-date that he is being superseded automatically by more enlightened farmers whose knowledge of food values and of nutritional factors, while not yet complete, is being

* *Britain's Food in Wartime*, by Sir John Russell.

built up and added to in a variety of ways. This view is expressed after correcting the answers to several hundred "Section Answers" sent in by Queenslanders taking the free correspondence course of instruction in pig raising conducted by the Department of Agriculture and Stock.

Altered Demands of the Trade.

With changing wartime demands, there has come about a notable change in trade requirements which need some further explanation. Farmers have been asked by those in charge of the food production campaign to increase pig production by 30 per cent., or more, above normal averages; and to do this in quick time the maximum dressed weight of bacon pig carcases has been lifted to 200 lb., which is roughly 270 lb. live weight, "a heavy baconer"; the weight range being from 100 lb. dressed (145-150 live weight) to 200 lb. The guaranteed price has been fixed for first grade at 9d. per lb. at export port, which is equal to between 8½d. and 8¾d. at farms or country centres. For other grades, the price is lower.

There has been an appreciative response to the appeal for increased production, which, however, started on its way with the handicaps of man-power shortage, shortage of and difficulty in procuring building and fencing material, shortage of meat meal and similar protein-rich concentrates, plus high-priced grain, and for quite a long period unfavourable weather, now fortunately ended.

The Pig Feeders' Problems.

Under the Commonwealth Pig Meat Acquisition Scheme, the price to be paid for bacon pigs has been fixed and guaranteed for some time ahead, and apparently there is no intention of departing from this fixed scheme, which provides for payment to the farmer on the basis of grade—the grade specifications being very similar to those operating when frozen carcases were being exported in large quantities.

Of the problems the farmer has to face, one of the most important is how to top-up this heavy weight bacon pig without resultant carcase being degraded as overfat. This problem is greatly simplified if farmers will avoid shutting the pigs up in small sties for fattening during the three or four weeks before marketing. The advice given in this respect is to finish (or top up) the baconers in open yards, areas sufficiently large to permit of some grazing and ample exercise in the sunshine. Those farmers who have adopted this system are already obtaining better results and better grades.

Then the amount of maize or other grain should be restricted so that instead of the pig gorging and then sleeping off the after effects, the animal is always anxious for its food, and thus takes ample exercise grazing on succulent pasture.

Similarly, it is preferable to allow the animals a smaller quantity of skim-milk (pure) or similar product and plenty of clean drinking water and mineral matter like charcoal and wood-ashes.

Labour-saving practices also are important, and farmers who prepare a balanced grain meal—maize meal or wheat or grain sorghum meal plus meat or bloodmeal, plus lucerne chaff—and feed this mixture in dry form after the pigs have cleaned up their milk, report excellent results; this system is certainly cleaner and obviously less wasteful.

Unless for special reasons on individual farms (like those feeding food scrap and similar garbage), there is no payable advantage in cooking or even in soaking grain or meal, and at butchers' slaughter yard piggeries this feeding of grain or meal in dry form is advocated, the soup, of course, being a boiled product.

Greater use should be made of green food—inclusive of grass—and root crops; and those crops which can stand over for a lengthy period without undue deterioration are worth special attention. It has been emphasised over and over again that the secret of success lies largely in the production and utilisation on the farm of as much of the food supply as is possible.

Breeding.

There is a right and there is a wrong type of pig, just as there is a right and a wrong system in feeding and management. It is not urged, nor is it desirable, that farmers should immediately set about changing the type of pig they are breeding unless there is a specific reason for so doing.

Departmental officers are willing and prepared to report on the suitability of farmers' pigs if and when opportunity offers for so doing. Similarly, factory managers have expressed their willingness to supply detailed reports on the condition and usefulness of farmers' consignments. And as there is an appreciable difference in the price paid for the various grades, with top price for first grade only, there is no reason why farmers should lose money on the marketing of their pigs, if they are in the right condition and of the most desirable weight and type.

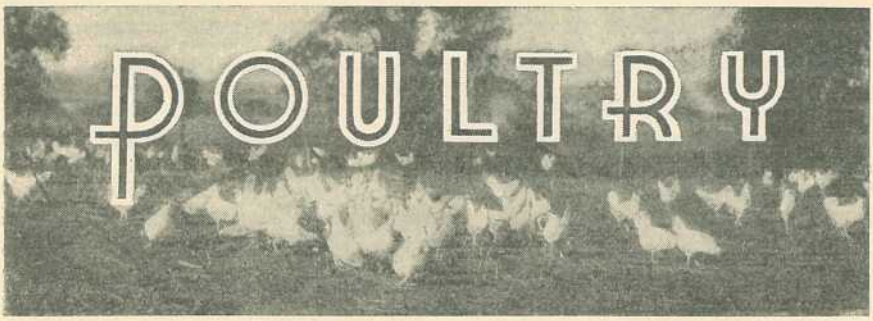
All these points are worth following up with a view to increasing pig production to the maximum to meet heavier demands of the Services as well as civilian requirements.

Farmers having difficulty in relation to their pigs are invited to communicate with the Department, so that suitable action can be taken to go fully into their pig-meat production problems.

PIG-TRUCKING POINTS.

The raising of first-grade top-weight pigs to 200 lb. dressed weight necessarily limits truck loadings as follows:—FP truck, no more than 24 to 26 pigs; L truck, 48 to 52 (24 to 26 on each deck); MGP truck, 80 to 86 (40 to 43 on each deck). Should any extra heavy baconers be included, i.e., pigs dressing 180 lb. or more, numbers should be further reduced. For choppers, the allowance should be on the basis of one chopper being equal to two average baconers. Bacon factories prefer to have pigs held back for a later trucking rather than run the serious risk of losses through overloading. Moreover, pigs should never be allowed to become overheated, and should always be unloaded by way of a race. Feeding pigs before trucking should be avoided, as it has been found by experience that this causes sickness in transit often with fatal results.

Because of the greatly increased demand for all classes of meat, it is imperative to prevent avoidable losses of animals through overloading or any other cause.



Marketing Eggs.

P. RUMBALL, Poultry Expert.

TO too many farmers, the egg is just an egg, and little thought is given to its quality. The producer should not lose sight of the fact that the hen provides a highly nutritious food in a convenient form, specially wrapped and sealed within a shell, although of a highly perishable nature.

A brief outline of the structure of the egg and the various causes of depreciation in quality, it is hoped, will make for better care in handling.

The Yolk.

The yolk is the first part of the egg to develop. This occurs in the ovary, where numerous yolks are situated in various stages of development. Each yolk is enclosed in a sac, which, when the yolk is mature, ruptures along the non-vascular area, releasing the yolk into the oviduct. Occasionally this rupture extends beyond the non-vascular area, causing bleeding from one of the small blood vessels of the yolk sac, with the result that the yolk is released with a clot of blood. The presence of blood with the yolk renders the egg unmarketable because of its appearance. When a producer collects a high percentage of such eggs, he should examine the system of feeding. Over-stimulating foods are suggested as the probable cause, and if an examination of the whole ration supplied indicates that the protein content exceeds 15 per cent., the crude protein content should be reduced to that level.

The colour of the yolk is influenced by feeding, and may vary from a pale straw colour to a deep orange red. The colour most sought after is that of a good golden yellow, and breeders who are producing pale yolks may improve colour by feeding yellow maize and green feed.

How the Whole Egg is Formed.

As the yolk passes down the oviduct, it gathers several layers of albumen. The first is a layer of dense albumen and the formation of what is termed the chalaza. The chalaza is that thickened, twisted mass of albumen that may be noticed when an egg is broken into a dish, extending from the yolk on opposite sides. The chalaza is intended to keep the yolk more or less centred in the egg. Passing further down the oviduct, the second layer of albumen is laid on; this is not so dense as the first. Then another layer of thinner albumen, followed by the two membranes, and then lastly the shell is added. The shell is not laid on its solid form as seen, but by the accumulation of lime salts

in more or less a semi-liquid form which becomes hardened before the egg is laid. Naturally there are minute pores between the particles in the shell-forming material.

Protective Coating on the Egg.

Nature, as a further protection, coats the egg with a gelatinous material before it is laid. This coating is frequently referred to as the "bloom" of the egg, and if the egg could be carefully collected from the hen when laid, and allowed to dry, one would have then the best possible product to handle, and if given the correct subsequent treatment, there would be little cause for complaint as to quality. This, however, is not possible under commercial conditions, but it would be as well at the outset to realise that the less removal of the protective coating the better is the keeping quality of the egg, and therefore the producer should do all he can to maintain the egg in its nearest approach to that as laid and realise that until some protective medium is found, which may be added to any fluid used for washing eggs without detriment to the egg, that such washing renders the egg more susceptible to deterioration.

Factors in Egg Quality.

The poultry raiser has three principal factors to give consideration to in the protection of the egg quality—

(1) Fertile eggs;

(2) Soiled eggs;

(3) The effect of heat on the egg.

There are other influences to which eggs may be exposed which affect quality—namely, the attack of moulds and bacteria. These influences, however, are not common where the best possible conditions for production have been followed.

The production of fertile eggs should be avoided as far as possible. Although incubators are operated at a temperature of 100 deg. Fahr., it does not need a similar temperature to commence the development of the germ, and in the height of summer it is almost impossible on many farms to keep eggs at a sufficiently low temperature to prevent some form of cell division taking place with fertile eggs, for once embryonic development has advanced to any degree and stops, decomposition soon follows.

In these circumstances, roosters should not be allowed to run with the flock, excepting during the breeding period.

The next condition to guard against is the soiling of eggs within the nests. Naturally, plenty of clean nests, sufficiently roomy for the bird, should be provided. In these nests it is essential to have some form of material to make the nest comfortable and attractive to the bird, to protect the egg from being broken and from becoming soiled. Many egg producers use old butter boxes for nests. These, in size, are very suitable, and in planning any form of nests, the butter box could be used as a guide for size.

Various forms of nesting materials are used, such as straw, shavings, sawdust, and shell grit. Shavings and sawdust are very absorbent, and not scratched out of the nest to the same extent as straw, and because of their fineness, are more absorbent, and have a greater cleansing effect on the feet of the birds, thereby preventing, to some extent, the soiling of eggs. If sawdust or shavings are used, pine-wood residues

should be chosen, as many hardwood sawdusts stain the shell of the egg. Shell grit is a reasonably good nesting material, naturally not so absorbent as sawdust, but too expensive for use.

The frequency with which eggs are gathered has a very marked effect on their cleanliness, and, more than that, on the labour entailed in preparing the eggs for market. Three gatherings a day should be the rule on most farms, particularly when production is at its height, and several birds are visiting each nest daily. When production is slack, the gathering of eggs may be reduced to twice daily. Not only does the frequency with which eggs are gathered assist in keeping the eggs clean, it protects also against breakages, and the possible development of the vice of egg-eating.

The Effect of Heat on the Egg.

Heat hastens the evaporation of the moisture contained in the egg, enlarging the air cell. The albumen also becomes thinner, and the yolk more visible when candling, and instead of being retained in a more or less central position it becomes "sided," and at times attached to the shell. It does not require a very high temperature to cause this breaking down, and it has been found that a temperature over 60 deg. Fahr. is conducive to rapid deterioration of quality. In fact, temperatures of 68 deg. Fahr. have been known to stimulate embryonic development; therefore the coolest position on the farm should be sought for the storage of eggs pending transport to market. Further protection of the egg against excessive heat is given by frequent gatherings, as it prevents their being reheated by the visits of several other birds to the nests.

Moulds and Bacterial Infection.

Mould invasion of eggs is not uncommon in Queensland, particularly during the humid weather which prevails in the early part of the year. Mould growths have been traced to the ordinary brown strawboard fillers frequently used, and also to nests in which mouldy grass or straw has been used for litter.

Humid conditions are conducive to the development of moulds, which enter the eggs through the pores of the shells, causing them rapidly to develop into what is known as black rots. Protection is given by using only sweet and dry nesting material, by keeping the cases and fillers used for packing quite dry, and by never packing eggs with shells still moist.

Packing.

The practice of using chaff and similar materials has, for packing, fortunately, largely ceased with the more extended use of the standard case and fillers. Many producers, however, with the object of giving greater protection to the egg, use chaff and material of a like nature in the bottom, and frequently the top of the cases. This is not recommended. As well as causing the eggs to become dusty in appearance, the practice exposes the egg to infection by moulds. If it is at all necessary to use anything as a filler in the case, crumpled paper is preferable.

The standard 30-dozen case, as now used by the Queensland Egg Board, obviates the necessity for any further protection, and is definitely recommended to all producers as the best means of packing eggs for market.

ANIMAL HEALTH

Rearing Dairy Calves.

G. R. BRETTINGHAM-MOORE.

THE arrangement and function of the stomach of the newborn calf should be understood so that an intelligent appreciation of the essentials of calf-feeding may be grasped.

Though the four stomachs of the adult animal are present, their relative sizes are quite different at birth and for the first twelve days only the fourth or true stomach is functional.

The table below makes the relation clear—

RELATIVE CAPACITY OF PARTS OF THE RUMINANT STOMACH.

—	Rumen and Reticulum. 1st Stomach. 2nd Stomach.	Omasum. Bible.	Abomasum. 4th Stomach.
	%	%	%
At Birth	30	5	65
At Maturity	85	7	8

It is thus apparent that at birth the capacity of the fourth stomach is about twice that of the rumen and reticulum combined. At maturity the rumen and reticulum together are approximately ten times the size of the true stomach.

The development of the stomach of the newborn calf can be divided into three stages—

1. First Two Weeks.—The fourth stomach alone is working and only liquid food can be digested;
2. Third Week.—Transition, while the rumen and reticulum gradually develop. A little "picking" is taken;
3. Fourth Week.—Development of rumination and solid food taken in ever-increasing quantities.

Though the rumen does not begin to function till the third week it has been found experimentally that if cold milk—*i.e.*, below blood heat of 101 deg. Fahr.—is fed, some finds its way to the rumen. As it cannot be digested there and cannot escape it decomposes, forming a breeding ground for harmful bacteria, thus favouring the development of white scours.

Though the fourth stomach is the largest it is relatively small, as the suckling calf feeds naturally 12–18 times a day. If too few feeds are permitted the calf will overeat, leading to indigestion and a further predisposition to scours.

Vitamins.

Vitamin A.—Calves are born deficient in Vitamin A, which is best supplied by the colostrum. It is present in whole milk but not in skim.

Vitamin B.—Up to the third week the calf can only obtain the supply it needs from whole milk. With the beginning of rumination it is formed by bacterial action in the rumen.

Vitamin C.—Is abundant in newborn calf but becomes depleted in the first twenty-four hours and from then till the third week must be supplied by whole milk.

Vitamin D.—Is of little importance in the early stages and later on is manufactured by the animal in sufficient quantities.

Water.—From an early age the calf needs water, and when rumination begins the supply required daily soon becomes considerable as it is estimated that a calf requires 3 to 4 lb. of water for every 1 lb. of dry food consumed.

In an experiment with calves, one group (A) received water and milk and the other (B) only milk, each getting 14 lb. of milk a day and as much hay as they would eat. The (A)group consumed as much water as milk daily and twice as much hay as group (B) and over the period of the experiments gained 0·44 lb. per day more than (B).

Importance of Colostrum.

Colostrum is the name given to the milk secreted for the first few days after the birth of the calf. For the first five to seven days the mother's milk is of quite different composition from normal milk. It contains certain substances which make it unsuitable for human consumption and yet are essential for the young calf and cannot be provided from any other source.

Composition of Colostrum Milk and its Derivatives.

—	Water.	Minerals.	Protein.	Carbohydrate.	Fat.
Colostrum ..	74·5	1·6	17·6	2·7	3·6
Whole Milk ..	87·0	0·7	3·3	5·0	4·0
Skim Milk ..	90·5	0·7	3·4	5·1	0·3
Butter Milk ..	91·0	0·8	3·5	4·2	0·5
Whey	93·4	0·7	0·8	4·8	0·3

Besides being laxative and of high protein content it contains vitamins and special bodies called antibodies, which confer a certain immunity against disease before the calf can build up its own resistance. The ability of young animals in the womb to receive from the maternal blood stream the antibodies they require for protection in later life varies with different types of placenta. Those in which the contact is very close, as in the bitch, do receive their antibodies in this way. In others, such as cows and ewes, the contact is less intimate and the young depend on the colostrum for these substances. For the first three weeks, then, we can summarise the following essentials of calf-feeding:—

1. The calf must have the colostrum.
2. All food must be fed at blood heat.

3. Feeds must be as frequent as possible, say, four times a day for the first week, three times daily for the second week, and twice daily for the third week. This is the very minimum that is permissible. Thereafter, it should not be less than twice daily up to three months, when a sturdy calf will do satisfactorily on solid food alone, though milk can be continued much longer than this with benefit.
4. Up to three weeks the calf should have whole milk. If this is impossible, skim milk and properly compounded calf feed may be gradually substituted after the first week, spreading the process over at least ten to fourteen days.

Feeding.

For convenience, calf feeding may be divided into three periods.

First Stage—Birth to Three Weeks—Fifty-fifty Method.—There is much to be said for the system of running cow and calf together during the day for the three weeks period or part of it. The calf is removed at the evening milking and placed in a pen. After the morning milking it is put with the cow again. If the cow can see her calf through a fence she will not fret unduly, and the calf can be taught to drink from a bucket in the morning before going out with the mother, so that there will be no difficulty in taking to the bucket when weaned. The chief objections urged against this method are—

1. It is difficult to teach the calves to drink.
2. The cows fret too much and hold their milk.
3. The cost of whole milk.

Number 1 may be answered by adhering to the method described above, which also disposes of No. 2, as the cows readily forget about their calves in a week or two, even if they require to have them alongside for a few days to begin with while being milked. If No. 3 is examined it is found not to be very serious, and if a calf is worth keeping at all it must be well fed.

On the average for the first three weeks a calf will consume about 1 gallon of whole milk daily. As the first week's milk has no commercial value, the cost of feeding the calf on whole milk for the first three weeks works out as the cost of 14 gallons of whole milk. Not only will this method practically insure a healthy batch of calves, but it saves cleaning calf utensils and warming the milk for that time, and is almost certainly better for the cow, as there is good reason for believing that the pummelling that the calf gives the udder during suckling is beneficial for that organ. During its life in the womb the large amount of blood required for the nourishment of the calf is supplied by the mother to the fetal membrances. At birth the flow is suddenly cut off and diverted to the udder for the secretion of milk, and the calf "massage" is valuable in facilitating this change over. If this ideal of three weeks cannot be arranged, at least the first week should be insisted upon.

It is realised that this plan will meet with strong opposition from many dairymen, and if they are raising healthy calves by other methods there is no need to make a change. But, on all too many dairy farms, large calf losses are being experienced, and the survivors are sickly and stunted. In some cases the whole year's drop of heifers is lost, and in nearly all the damage is due to departure from one or other of the above-mentioned essentials, and is preventable.

Bucket Feeding.—If this method is resorted to the calf must have the colostrum for the five to seven days while it lasts, and after that should have its mother's milk or, at any rate, milk from a recently calved cow. The reason for this is that in the early stages of lactation the curd is softer and more easily digested than in the latter stages, and if the young calf gets milk from a cow that is towards the end of her milking period, digestive troubles may arise. For the rest, the milk must be clean, warm, and fed as frequently as possible. About a gallon a day is the average consumption; less for the small breeds, and more for the larger. Children are usually more adept at teaching calves to drink because of their smaller hands. Clean water must be available in troughs, and a shady, dry yard and pen provided. A calf bail greatly facilitates feeding.

Second Stage—Three Weeks to Three Months.—At three weeks the calf presents no problem if left with its mother on the half-time plan, but this is not economical, and should only be resorted to in special circumstances such as stud cattle or shortage of labour. Skim milk, butter milk, calf meal, or a mixture of these must be substituted for the whole milk by a gradual process spread over ten to fourteen days. The quantity required per day may be estimated on the basis of 1 lb. per 10 lb. body weight, and good grass or hay should be available and water in troughs. The foam on skim milk has been found to cause mild bloating, but is believed to have no permanent ill effects.

Calf Meal.—At present these are difficult to obtain, but the farmer may make up his own mixture as follows:—

Cereal Meal	50 parts
Meat Meal	40 parts
Bone Meal	5 parts
Coarse Salt	5 parts

Making a trough of this meal available to the calves tends to stop them sucking each other and thus prevent malformed udders. If a handful is put in the bottom of the bucket for a few days they develop a taste for it and will help themselves from the trough between meals.

Buckets or Nipples.—Buckets are easier to keep clean and are in the long run more satisfactory than nipples for this reason.

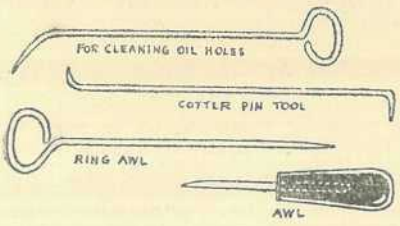
Third Stage—Three Months and Over.—If skim milk or buttermilk are available they should be fed as long as possible. On good green grass little else is necessary, but if the grass is dry lucerne hay should be supplied. Roughages such as silage and chaffed cane are insufficient in themselves, and what they lack can to some extent be made up by supplying a lick as follows:—

Sterilized Bone Meal	30 parts
Coarse Salt	30 parts
Meat or Blood Meal	30 parts

This must be put out in covered troughs so that the weather cannot affect it.

Normal Rate of Gain.—Dairy calves properly fed gain weight rapidly. As a guide it may be said that they should gain 1 lb. per day for the first three months, and at least 1¼ lb. per day in the first six months.

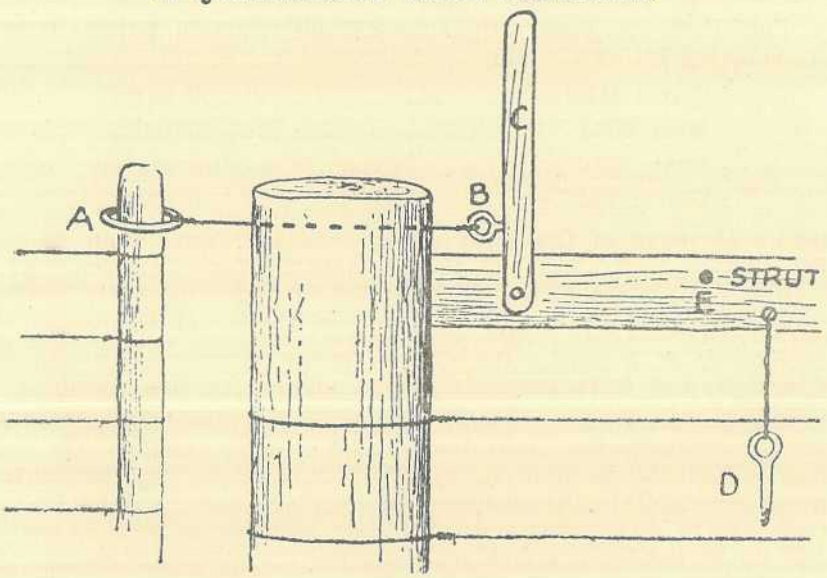
GADGETS AND WRINKLES



TOOLS FROM FORK TINES.

Most farms have a broken old fork or two in the scrap pile. Here are some useful tools that can be made in a few minutes from the tines. The one for cleaning out oil holes is better than a piece of wire. The cotter pin tool is useful in many ways. The awls are very useful in the workshop for making small holes and scratching lines on metal or tin. If you have no forge you can heat the tines in the stove and bend them.

A QUEENSLAND GATE FASTENER.



The Queensland gate usually consists of four or five strands of barbed wire fastened to one post of a gateway, and, at the other end, attached to piece of round timber 4 or 5 ft. long. The gate, when closed, is kept in position with length of wire attached to a stick. This illustration is an adaptation of the principle which is an improvement on the usual lever job.

A is metal ring big enough to fit over gate upright. From the ring a chain or length of twisted wire passes through a hole bored in strainer post to an eye-bolt B fixed in a strong lever C.

When lever is pressed down gate is drawn taut. Another eye-bolt D hangs on a length of chain when not in use, and is plugged into hole E to keep the lever down when gate is closed.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUMMER HOLIDAYS AND THE CHILDREN.

SUMMER is approaching and school holidays will soon be commencing, so Queensland's fresh air and sunshine should be used to the best advantage for the children's health. Sunshine properly used will build up the children's resistance to sickness and bring colour to their lips and cheeks as well as a nice tan to their limbs and bodies. Best of all, it will help to build up strong bones and teeth by assisting their bodies to use the lime and phosphorus in their foods. So whether at the seaside or in the home yard or garden, the children can obtain benefit from their holidays. Some sort of a shelter could be built in the corner of the yard—boys will love to make a wig-wam and be Red Indians, or a tent and be explorers or soldiers, and the girls these days will assume equal rights to be any of these things also. Allow them to eat lunch outside in their camp, and do try not to mind if the place is rather untidy for a while as long as the children are happy. Baby can lie in his play-pen under a shady tree, or if he is old enough to sit up how he will enjoy watching the others play!

Children should have a minimum of clothing—sunsuits or sleeveless shirts and shorts and shady hats, but if they have not been accustomed to so much sun, the exposure must be very gradual. Baby will respond to sunbaths too and mother and baby can have theirs at the same time. They can sit on the verandah or on the lawn in the sunshine—shady hats on both—and the baby's legs exposed to the sun for say five to ten minutes before the 10 a.m. feeding, and, in the course of another week or so, before the 2 p.m. feed also. By slow degrees the sunbath may extend to the waist and later to the arm pits. Let him kick in the sun before or after his bath and give him stimulation and passive exercise by stroking the legs and arms gently but firmly, starting at the hands and feet and working towards the trunk. This increases the activity of the circulation. If the baby has a fine sensitive skin and reddens instead of tanning, his sunbaths must be taken very slowly, commencing with only one or two minutes until the skin can be educated to re-act properly.

If the mother wears a short sleeveless frock and no stockings she can obtain quite a lot of benefit herself from her baby's sunbaths—and also have a few minutes rest and relaxation.

If living in flats or rooms with no yards or gardens, the baby's sunbaths can be given in a sunny room or verandah, provided the windows are wide open; and then there are public parks or gardens for the children's sun and air baths. Watch for next month's article when a few special summer time "Do's and Dont's" will be listed.

Questions on this and any other subject concerning maternal and child welfare will be answered by communicating personally with 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.

IN THE FARM KITCHEN.

A Holiday Mixture.

Fresh Pea Soup.

Cook together 2 lb. shelled peas, 1 large sliced onion, a little chopped parsley, 2 cups boiling water, salt, pepper, 1 teaspoon sugar. Simmer until tender with a hambone, if liked. Remove bone and rub vegetables through a sieve. Melt 1 tablespoon butter in a saucepan, add 1½ tablespoons flour, cook a little, then add 1 pint milk, and, if liked, 1 tablespoon cream. Add vegetable puree and stir well together. Thoroughly heat and serve with sippets of toast or fried bread.

Baked Tomatoes.

Well grease a pie dish and put in a layer of tomatoes, peeled and cut into thick slices. Sprinkle with salt, pepper, a little sugar, and curry powder. Add a layer of tomato, a layer of well-boiled rice, then another layer of tomato. Cover top with buttered crumbs and bake slowly for half an hour. Serve with fingers of fried bread.

Custard Tart.

Line a sandwich tin or ovenproof tart plate with shortcrust and fill with the following:—Beat 2 eggs slightly, add 2 tablespoons sugar, vanilla, and 1½ cups cold milk. Rub bottom of pastry with egg-white and pour in custard very gently. Sprinkle top with a little nutmeg and place in hot oven for a few minutes, then lower heat a little and bake until pastry is set. Reduce the heat to slow and continue to bake until custard is set.

Steamed Apple Pudding.

Peel and chop 4 or 5 apples into dice. Melt 1 tablespoon butter in a saucepan, add apples, and fry a little, add 1 cup sugar and fry until apples change colour. In the meantime, sift 2½ cups plain flour with 2 teaspoons baking powder and a good pinch salt. Rub in 3 oz. margarine and 1 tablespoon sugar. Add enough milk to form a firm paste. Line a basin with paste, reserving enough for top. Fill with apples, and, if liked, a few raisins and a little minced mixed peel may be added. Cover with remaining paste, cover with buttered paper, and steam for 2 hours.

Banana Charlotte.

Line a round, buttered cake tin with fingers of buttered bread, taking care to overlap each other. Put a layer of sliced bananas in the bottom and cover with apricot jam, then a layer of banana, and so on, until the dish is full, piling it much higher in the centre. Cover with a layer of bread and butter, sprinkle with sugar, and bake in a hot oven for half an hour.

Christmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins (if procurable), ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, 6 oz. flour, 1½ gills ale, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in the suet, then the blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale, cover, and leave for several days, stirring once daily. Pack into two buttered basins. Cover with buttered paper, then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water coming half way up the sides. When required, cook for three hours, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Economical Christmas Pudding.

Take ½ lb. beef suet, ½ lb. flour, ½ lb. breadcrumbs, 6 oz. cleaned currants, 6 oz. stoned raisins (if procurable), ½ lb. brown sugar, ¼ lb. cooked carrot, ¼ lb. cooked potato, 2 oz. candied peel (finely shredded), 1 teaspoonful salt, 2 tablespoonfuls brown treacle.

Rub the carrot and potato through a sieve. Mix together all the dry ingredients with the sieved carrot and potato, and this will require time, as it is not easy to mix them well without moisture. Last of all stir in the treacle, after warming it until it runs. Mix very thoroughly, and keep in the mixing basin several days, stirring the pudding every day. Then put into a large basin (well greased), cover with greased paper and thick dry paper over all, and steam for six hours. When reheating, allow two hours for steaming through. Serve with brandy (if procurable) sauce or custard.

A. H. TUCKER, Government Printer, Brisbane.