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QUEENSLAND AGRICULTURAL JOURNAL

Badila Sugar Cane, Following Tropical Kudzu, South Johnstone.

LEADING FEATURES

Onion Growing.

Building Contour Banks.

The Mango.

Citrus Bud Selection.

Modern Milking Methods.

Preparing for Shearing.

Cattle Fattening in the United States.

Castration of Pigs.

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Contents

Onion Growing in Queensland.

W. G. FERGUSON, Adviser in Agriculture, Agriculture Branch.

ONION growing is not a major primary industry in Queensland, but is of particular importance in some districts. For the five-year period ending in 1947, the average annual acreage was approximately 2,000.

Although onions could be grown in many districts in Queensland, production at present is confined almost entirely to the south-eastern corner of the State, and particularly the Lockyer Valley, where soil, climate and irrigation facilities make the onion a profitable farm crop.

Suitable Soils.

The onion plant thrives in fertile, friable soils of light to medium texture (loams and sandy loams), of good depth and good moisture-retaining properties. The plant is not tolerant of soil acidity and grows best in soils of neutral or only slightly acid reaction. Heavy soils such as clay loams produce a bulb with a firm skin and satisfactory keeping qualities, but with favourable growing conditions onions on these soils tend to form abnormally thick necks popularly known as "bull necks" or "bottle necks." Onions of this type (Plate 52) are not desired by the market.

Sandy soils which require the addition of heavy applications of organic matter to maintain tilth are not suitable for onions. Such soils need regular and frequent rainfall or irrigation to avoid growth checks.

Rotations.

Since the main cultural problem in onion growing is weeding, it is a common practice to grow onions for several years on the same piece of land. Though this does help to overcome the weed problem the practice is often overdone and rotations with other crops should be adopted.

Onions can be grown successfully after most crops but do better following lucerne and potatoes. They respond particularly well following a legume, such as cowpea, grown as a green manure.

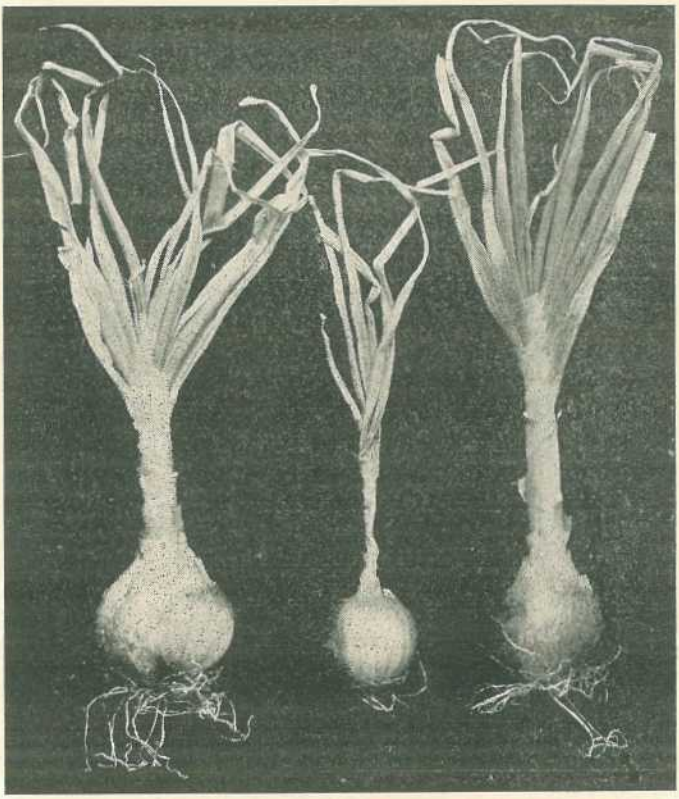


Plate 52.

"BULL NECK" OR "BOTTLE NECK" BULBS.—The centre bulb is a good market type of onion. Poor seed and excessive irrigation on fertile heavy soils may tend to produce "bull necks."

Preparation of the Seed-bed.

Too much emphasis cannot be placed on the careful working of the soil. Thorough preparation not only means a good seed-bed but also reduces the risk of serious weed infestation in the growing crop.

The initial ploughing is usually made in November to a depth of about eight inches, and the land is then worked lightly to avoid soil moisture loss and at the same time provide good conditions for the absorption of rain. Normally one ploughing suffices, but in the case of newly broken-up lucerne land, or land in which the risk of a serious weed problem is known to be great, two ploughings will be necessary, the first of which should be made 12 months before the onions are due to be planted. Subsequent cultivation is aimed at eliminating weeds before they seed and preparing a seed-bed of desired fineness and condition. The final operation before planting will entail the use of harrows with or without the roller or sledge board, as soil conditions demand.

Before planting, the seed-bed should be completely free of weeds, about two to three inches in depth, and have a surface tilth of market garden fineness. The sub-surface soil should be moist and firm, but not too compact, for the onion is a fairly deep rooting plant.

Planting.

The onion is a biennial, requiring cool weather early in the growing season and dry weather with moderately high temperatures later. The normal time for planting in the Lockyer Valley is in May, but field selection of early-maturing bulbs over many years by local farmers has produced non-bolting strains which may be planted with safety in early April. These extra-early maturing strains play an important part in meeting market requirements in late August, September and October. It is emphasised that the use of reliable seed is an important factor in profitable onion production.

Plate 53.

TOO EARLY PLANTING.—The crop on the left was planted very early and has developed seed stems.

Too early planting of seed produces bulbs with seed stems (Plates 53 and 54), while on the other hand planting too late allows insufficient time for the bulbs to mature before hot weather, when the risk of bulb scald is high.

In the Lockyer Valley, the seed is sown in drills in the field. The transplanting of seedling onions from seed-beds is laborious, and is not practised by commercial growers under present-day conditions.

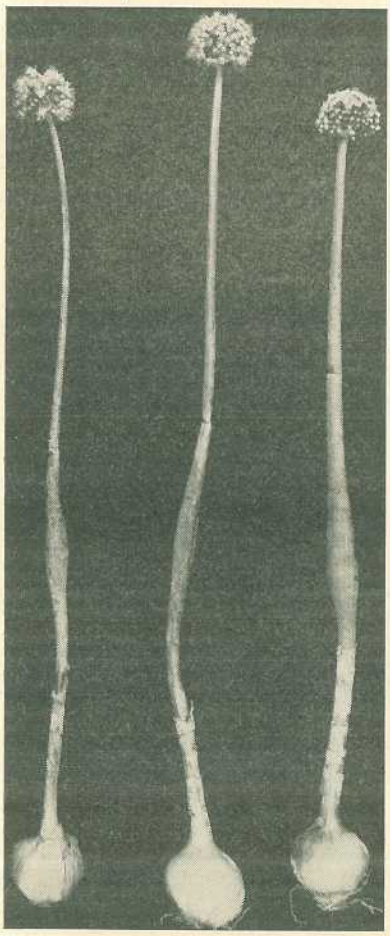


Plate 54.

ONION BULBS WITH SEED STEMS.—Such bulbs should not be marketed.

The seed is sown at a depth of approximately one inch in drills 12 to 15 inches apart, and at a rate of 1¼ to 1¾ lb. per acre. This sowing rate gives an adequate stand (Plate 55) and at the same time eliminates the labour of hand thinning. Drills less than 12 inches apart do not allow sufficient room for inter-row cultivation; row spacings wider than 15 inches mean unnecessary waste of land.

Planting is done with either the single-row hand sowing machine or the motor-driven garden-cultivator, which plants and cultivates three rows at a time. In all machines, it is necessary to reduce the seeding rate set by manufacturers as this usually gives a rate of 3 lb. per acre. An approximate seeding rate per yard of row length, with the rate recommended per acre, is 24 to 28 seeds.

Normal plant spacing for irrigated crops is three inches. Less than this results in malformation of bulbs and favours the spread of disease, while wider spacing tends to produce an onion too large for prime market requirements. Rain-grown crops do not produce reasonably-sized bulbs, except under unusually favourable conditions, unless spaced four to six inches.

Varieties.

The globe types are preferred in Queensland because the flat onion is prone to rots and other diseases around the base under summer conditions. Locally selected strains of Early Hunter River Brown Spanish are used for April plantings, with Brown Spanish as the main crop variety planted in the May to June period. Hunter River Early White Globe is the white variety which gives best results and strains of this variety are normally planted in May.

Cultivation.

Keeping the rows and inter-row spaces free of weeds can be a tedious and costly operation. Normally, weeding does not call for excessive labour and time, provided the seed-bed has been efficiently prepared to eliminate weeds.

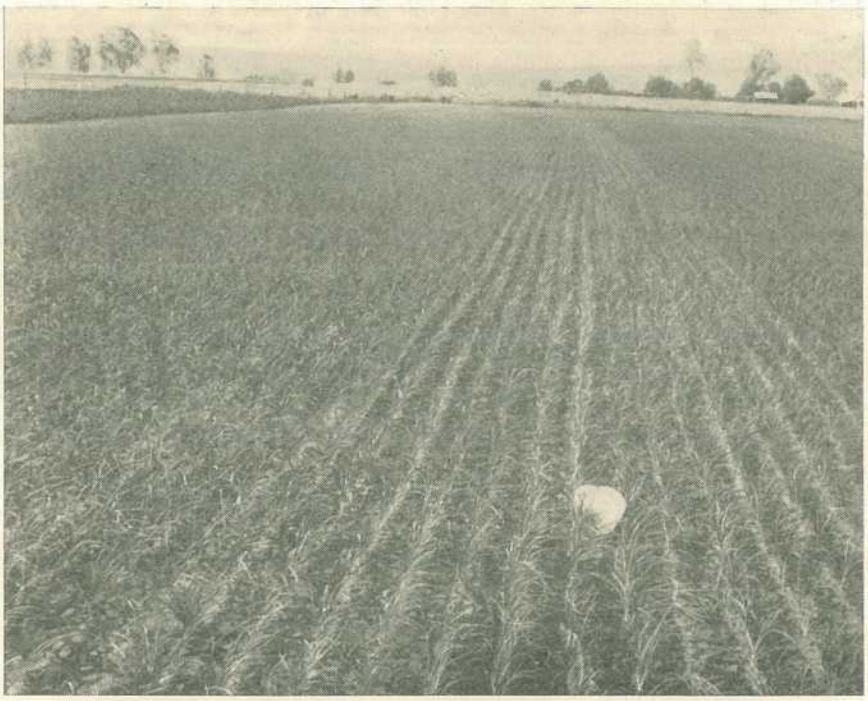


Plate 55.
A FIELD OF YOUNG ONIONS COMMENCING TO BULB.

Inter-row cultivation is best done with the wheel hoe or garden tractor equipped with appropriate weeders. In addition to weed control, an important consideration is the drawing away of soil from the plants, as any hilling restricts bulb growth. Weeds in the rows themselves are removed with a two-inch garden hoe. Selective weedicides, such as sulphuric acid and dinitro types, which do competent work at a comparatively low cost, are a useful supplementary method of weed control especially where weed growth along the rows is heavy.

Irrigation.

On irrigable areas of south-eastern Queensland the onion is fast finding a permanent place in the farm crop programme. In general, the water requirements of the onion are light in the early stages of growth and heavier as the crop matures. The spray systems are the only form of irrigation used in Queensland.

Normal procedure is to dry-plant the seed and then apply sufficient irrigation for germination, which usually takes 9-11 days. This application is not heavy and varies from 20 to 50 points.

If insufficient rain falls after the seedlings are established, a second light irrigation will be necessary. Subsequent waterings will depend upon the type and condition of the soil. It must be emphasised, however, that excessive irrigation will produce "bull necks" and scallions (Plate 56), delay ripening, favour diseases and produce an onion of poor keeping quality. The recommended procedure is to withhold heavy irrigation until the bulb is fairly forward, in order to promote root and bulb formation, and then apply an irrigation of about two inches. This should suffice to carry the crop through to harvesting.

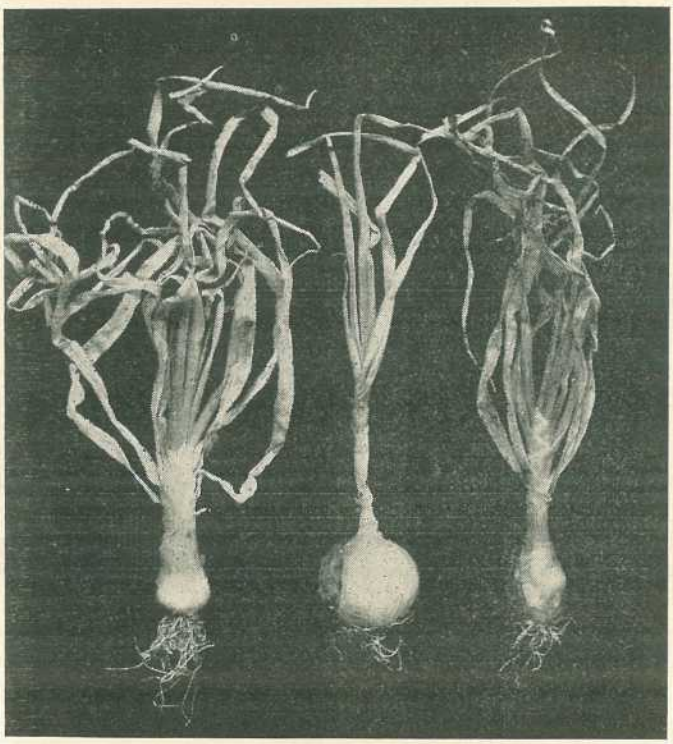


Plate 56.

SCALLIONS COMPARED WITH A GOOD MARKET TYPE OF ONION.—Scallions commonly develop on heavy fertile soils which are irrigated excessively.

Harvesting.

A period of five to six months elapses from the time of planting to the date at which the onion reaches maturity. The mature stage is indicated by the shrivelling of the stalk immediately above the bulb and by the stalk subsequently falling over, yellowing and dying.

Harvesting commences at the yellowing stage, the plants being pulled and laid in windrows. Where garden tractors are available, it is customary to attach a cutting implement to the tool bar and under-cut the roots to facilitate pulling. In the Lockyer Valley, the bulbs are usually trimmed in the field, that is, the remaining roots are clipped close to the base and the neck cut about one-half to one inch above the bulb

with sheep shears. The bulbs are then bagged in the field into open-mesh bags (Plate 57) and either stored in the barn or marketed. A better article can be marketed, however, if the bulbs are allowed to cure in the field before they are trimmed and bagged.

An average yield for irrigated onions is seven tons to the acre, but yields of up to 10 tons per acre are not uncommon. Yields from non-irrigated onions vary markedly according to the season, but in some years may be little inferior to irrigated crops.

Plate 57.
HARVESTING AND GRADING ONIONS IN THE LOCKYER VALLEY.

Grading and Marketing.

Better prices are received when the bulbs are graded into size according to popular demand, bearing in mind that moderate-sized onions are in greater demand than larger ones. In pursuance of the provisions of *The Fruit and Vegetables Act of* 1947 the following regulation was gazetted on September 9th, 1948, to cover the grading and marketing of onions in Queensland:—

"No person shall sell or offer for sale any onions contained in a package unless, in addition to compliance with the general requirements of these Regulations, the onions have been graded into one or other of three grades, viz:—

"First Quality Large"; "First Quality Table"; or "Picklers," and have been graded as to size and quality, and packed in accordance with the following provisions:—

(*a*) The package shall be marked with a true designation of the grade, whether "First Quality Large," "First Quality Table" or "Picklers," of the onions contained in the package;

(*b*) Each external layer of onions on the top, bottom and sides of the onions, whether described as "First Quality Large," "First Quality Table" or "Picklers," shall be a true indication of the average grade of the onions throughout the package;

(*c*) Onions described as "First Quality Large" shall consist of sound, clean, well-cured onions of similar varietal characteristics, free from abnormal doubles, pipers, bottle necks, scallions, sprouts, root growths, disease, mechanical injuries, dirt or other foreign matter, and reasonably free from peeled onions. Not less than ninety per centum of the total of the individual onions in each package shall be two (2) inches or over in diameter and the individual onions in the remaining percentage of the total shall be not less than one and three-quarters ($1\frac{3}{4}$) inches in diameter;

(*d*) Onions described as "First Quality Table" shall consist of sound, clean, well cured onions of similar varietal characteristics, free from abnormal doubles, pipers, bottle necks, scallions, sprouts, root growths, mechanical injuries, dirt or other foreign matter, and reasonably free from peeled onions. Not less than seventy-five per centum of the total of the individual onions in each package shall be one and five-eighths ($1\frac{5}{8}$) inches or over in diameter and the individual onions in the remaining percentage of the total shall be not less than one and one-half ($1\frac{1}{2}$) inches in diameter;

(*e*) Onions described as "Picklers" shall consist of sound, clean onions, one and one-half ($1\frac{1}{2}$) inches or less in diameter.

Every package shall be legibly and durably stamped or stencilled on a prominent part of the outside of the package with the initials of the christian names and the full surname and the address of the packer and the grade in letters not less than three-quarters ($\frac{3}{4}$) of an inch in height, except that where open mesh onion bags are used such bags shall be deemed to be marked if tags showing the above particulars are securely fixed to the bags.

Definitions.

In this Regulation unless the context otherwise indicates the following terms have the meanings respectively assigned to them:—

"Doubles" in relation to onions means that an onion has more than one distinct bulb visible externally.

"Pipers" in relation to onions means the possession of a weak or hollow centre, or onions which have developed seed stems.

"Bottle Necks" in relation to onions means the possession of abnormally thick necks.

"Scallions" in relation to onions means the possession of thick necks on poorly developed bulbs.

"Peeled" in relation to onions means onions from which the outer skin has been removed."

Plate 58.
An Onion Seed Plot in the Lockyer Valley.

Seed Production.

An essential requirement for good quality onions is the use of seed produced by bulbs specially selected in the field. Selection is made prior to harvest and is restricted to bulbs ripening at the desired time of harvest which are true to type with a slim neck of good length and show no malformation or symptoms of disease. These selections are placed in racks in a cool dry place away from direct light. The bulbs are inspected at intervals and any rotted, early sprouting or double bulbs are removed.

In the period May to June, the bulbs are planted about two feet apart with three to four feet between rows (Plate 58). Where irrigation is available, it is advisable to furrow irrigate rather than spray, as spraying favours the development of downy mildew, a fungus disease

which is harmful even in mild attacks. From the planted bulbs, numerous bulbils form, each of which sends up a shoot from which the flower sack arises. The sack bursts, the flowers open, and eventually seed is formed.

Seed heads are normally harvested in November. The procedure is to clip the seed stem about 12 inches below the head. The heads and attached stems are then placed in chaff bags and hung in a cool, well ventilated place and allowed to dry out. Before threshing, the head is clipped from the stem just above the stem button. After threshing, the seed is winnowed and thoroughly cleaned. A final cleaning and a rough viability test are given by immersion in water; the floating seed and trash are skimmed off leaving sound seed on the bottom. The seed is washed once or twice more, then dried thoroughly and bagged.

It is not advisable to keep onion seed for more than 12 months as it deteriorates rapidly. Seed 12 or more months old should always be given a germination test before planting to assess whether the normal planting rate should be increased. Germination tests can be carried out simply by placing a known number of seeds between two sheets of blotting paper kept moist in a fairly warm place and calculating germination percentage from the number of sprouted seeds.

Onion Diseases and Pests.*

Onion crops are normally grown in Queensland with little if any attention to the control of disease. The most serious disease of the onion plant, namely onion smut, is not present in this country and every endeavour is being made by quarantine authorities to keep it out. Another disease, downy mildew, is well established here. It is caused by a fungus which produces purplish-grey blotches on the leaves and, in the seed crop, on the stems of onion plants. At times the loss of leaf tissue becomes serious and a reduction of crop results. This occurs only when conditions are favourable to the disease, that is, during and after a cool, damp spell. At such times, applications of a copper spray with the addition of spreader should be made at intervals of 10 to 14 days.

The only serious insect pest of onions is the onion thrips. This is a very small, slender, straw-coloured insect that infests quite a number of plants and is notably capable of causing serious damage on onions. The foliage of the plant may be heavily infested and affected leaves will become blotched or streaked, finally withering back from the tip. The whole plant may present an unthrifty appearance and the resultant onion bulb will be markedly reduced in size. If onions are grown for seed the thrips will ascend the flower stalk and may cause flower "blasting," preventing seed production. The control of onion thrips depends on preventing the development of large populations on the plants. The most satisfactory treatment is to apply a spray prepared from a DDT emulsion to give a spray strength of 0·1 per cent. DDT. This should be applied at least fortnightly throughout the life of the plants.

* Notes supplied by R. B. Morwood (Senior Pathologist) and J. A. Weddell (Assistant Senior Entomologist).

Building Contour Banks with a Plough by the Island Method.

J. E. LADEWIG, Senior Soil Conservationist.

THE correct use of land, in accordance with its capability, is the basic principle of conservation farming, and only level to moderately sloping land should be utilised for cultivation; the maintenance of the soil in a satisfactory condition of structure and fertility will be achieved by the retention and utilisation of all crop residues, the adoption of contour cultivation procedures, and the institution of correct rotational practices on the land. Correct land use reduces the wasteful loss of soil and water, and establishes the basis for permanent agriculture.

However, under Queensland's climatic conditions, the land periodically receives falls of rain which exceed the absorptive capacity of the soil, and occasionally, even that of soils which have been worked under the best possible conditions of land management. On land which has already suffered the ravages of soil erosion, absorption rates are reduced because of loss of top-soil, and run-off water readily congregates in the existing eroded drainage lines.

CONTOUR BANKS.

In order to prevent this run-off water gaining momentum as it races down the slope, it is necessary to construct contour banks across the slope to intercept the water and transfer it from the field at low velocities. Care in the design of these banks is a necessity to ensure that water from them is disposed into stabilised drainage lines, that the banks are correctly spaced, and that they possess a gradient sufficient to avoid overtopping in heavy storms, but with just enough gradient to transport the run-off at low velocities.

Officers of the Department of Agriculture and Stock will design contour banks as an integral part of a soil conservation farm plan, will advise concerning methods to be adopted in the surveying of lines for these banks, and will make recommendations concerning methods of construction.

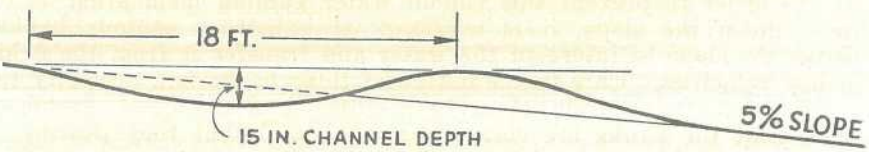
Building the Bank.

The construction of contour banks frequently presents problems due to the unavailability of suitable earth moving equipment; usually the use of heavy equipment for the construction of banks has proved too costly in operation to justify its extensive use. The use of ploughs for this purpose has proved quite satisfactory, and the United States Soil Conservation Service has developed a system of construction known as the "Island System"—so called because the procedure starts with an island of unploughed soil, on which the contour bank is built. The method is well illustrated in the J. I. Case booklet, "Moldboard Plow Terraces by the Island Method," from which, by courtesy of the J. I. Case Co. and G. E. Holroyde Ltd., the accompanying illustrations have been reproduced.

Plate 59.
A COMPLETED CONTOUR BANK BUILT ON THE ISLAND SYSTEM.

Plate 59 shows a finished contour bank which has been constructed with a two-furrow mouldboard plough. Pictured and described on the following pages is the round-by-round procedure followed in its construction.

The ideal contour bank should be sufficiently wide to enable farm machinery to be operated along its sides, and the channel should be of a depth and width which will ensure conveyance of the maximum amount of run-off water. The following diagram shows suitable dimensions for a bank constructed on a 5 per cent. slope.



Because of the large volume of soil that must be moved, it is important that the plough have ample clearance between beam and share point and between plough bottoms. To avoid difficulty in ploughing operations, heavy surface stubble should be raked aside before starting to plough.

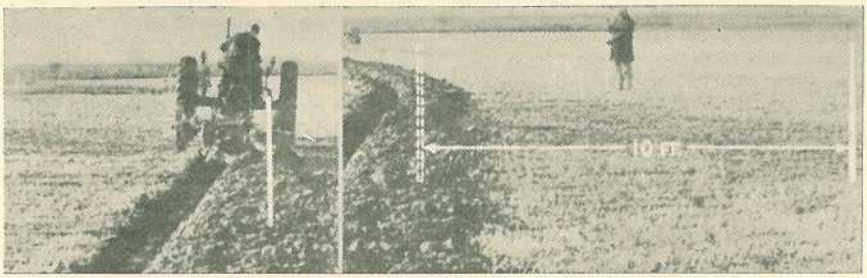


Plate 60.

Making the First Round (at Left), and Marking a Line for the Return Trip (Right).

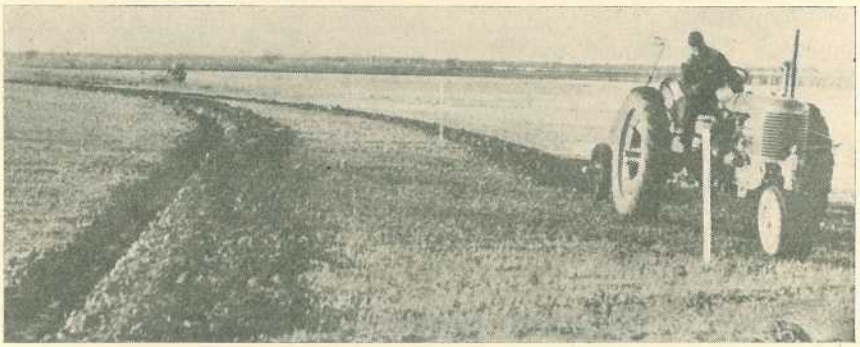


Plate 61.

Completing the First Round.

First Three Rounds.

The first trip of the plough (Plate 60) is made just above and along the line of stakes which have previously been placed, during the survey, to establish the grade line of the contour bank. When the bank is completed this stake line will represent a point about half-way up the top side of the bank.

When the far end of the bank has been reached, the stakes are moved downhill to mark the width of a uniform island, illustrated at the right in Plate 60; the width of island varies according to slope and width of bank desired, as is indicated in Table 1. A modification of the above method of marking a line for the return trip may be adopted, if an implement of the appropriate width is utilised, the bottom edge of the line marked by that implement becoming the guide line for the return trip.

TABLE 1.

Suggested Island Widths for Different Slopes.

Slope.	Island Width.
3 per cent. or under	12 ft.
4 per cent.	11 ft.
5 per cent.	10 ft.
6 per cent.	9 ft.
7 per cent. or over	8 ft.

Plate 61 shows the first round in the building of a bank where the marking out on the return trip is almost completed.

Two complete rounds now follow so that at the commencement of Round 4 six furrows have been turned downhill on the top side and six furrows uphill on the lower side of the island.

Rolling Soil on to Upper Side of Island.

After making three rounds, the plough is operated on the upper side, as shown in Plate 62, to roll the soil on to the island. This is the first of the second series of six furrows (3 rounds) on the channel side (left). The plough is advanced 8 to 12 inches closer in on the island to commence this round. Rounds 4 (Plate 62), 7 (Plate 64), 10 (Plate 65), 13 (Plate 66), 16, &c., each advance the loose soil 8 to 12 inches closer in on the island; the smaller the advance the greater will be the depth of loose soil which forms the bank. On the lower side ploughing is continued out in the normal way for a further three rounds.

The channel begins to form as the dead furrow widens on the upper (left) side. The first trips of Rounds 3, 6 (Plate 63), 9, 12, 15 (Plate 67), &c., are made with the rear plough bottom set shallow (on slopes of less than 6 per cent.) to avoid cutting too deep a channel; steeper slopes require deeper ploughing.

Plate 62.
ROLLING THE SOIL ON TO THE ISLAND ON THE FOURTH ROUND.

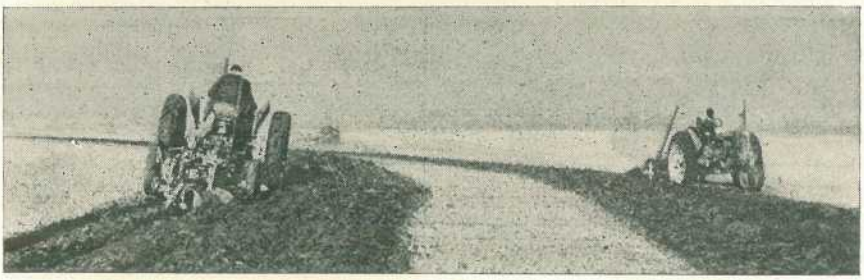


Plate 63.
ON THE SIXTH ROUND.

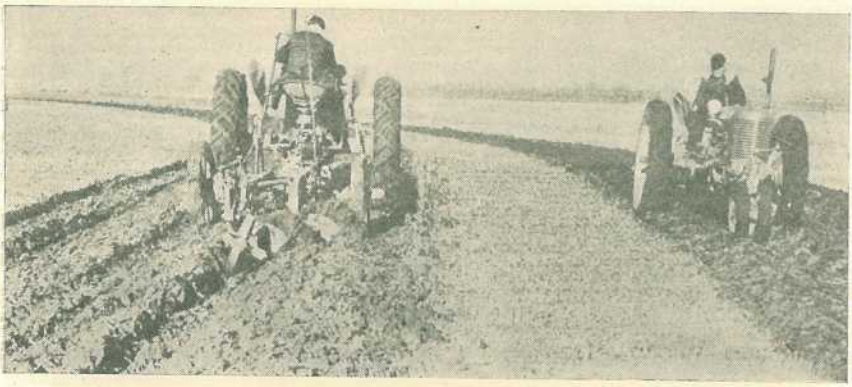


Plate 64.
STARTING TO THROW ON TO THE LOWER SIDE OF THE ISLAND (SEVENTH ROUND).

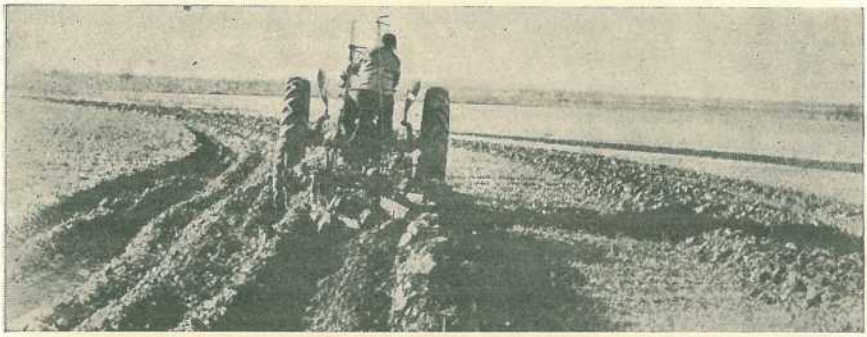


Plate 65.
ON ROUND 10, STILL THROWING THE SOIL ON TO THE ISLAND.

Plate 66.
ON ROUND 13.

Plate 67.

ON ROUND 15. NOTE THE DEPTH OF LOOSE SOIL ON THE ISLAND.

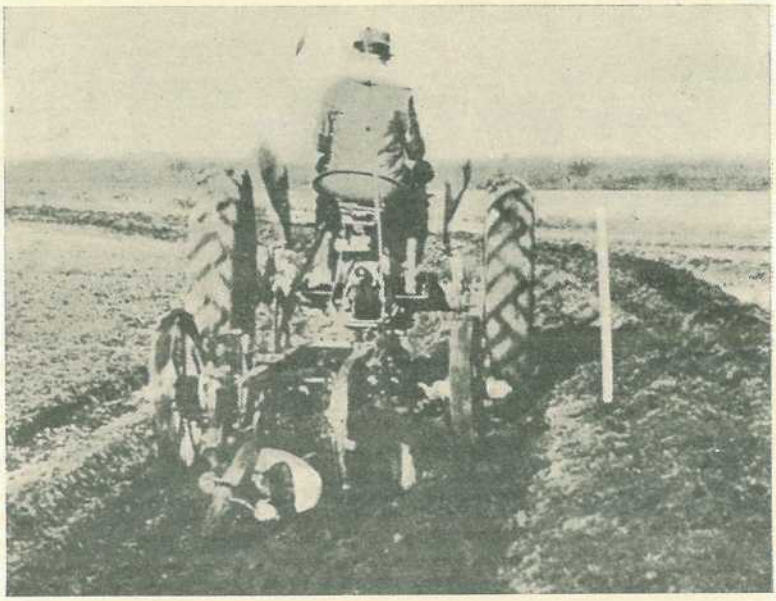


Plate 68.

ON ROUND 18. THE STAKE IS ON THE ORIGINAL SURVEY LINE.

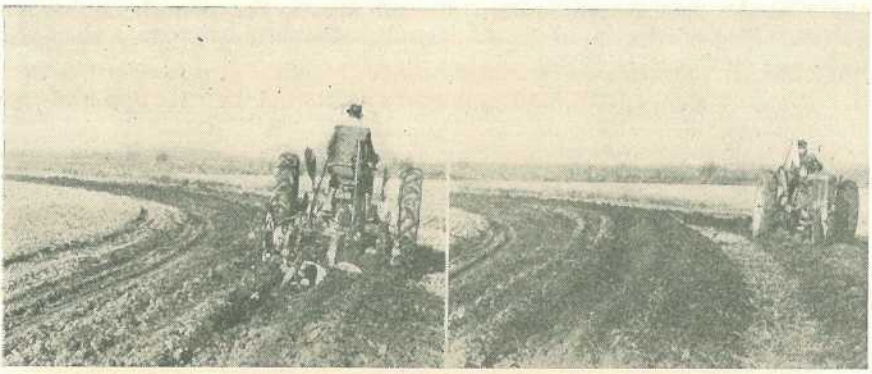


Plate 69.
ON ROUND 19.

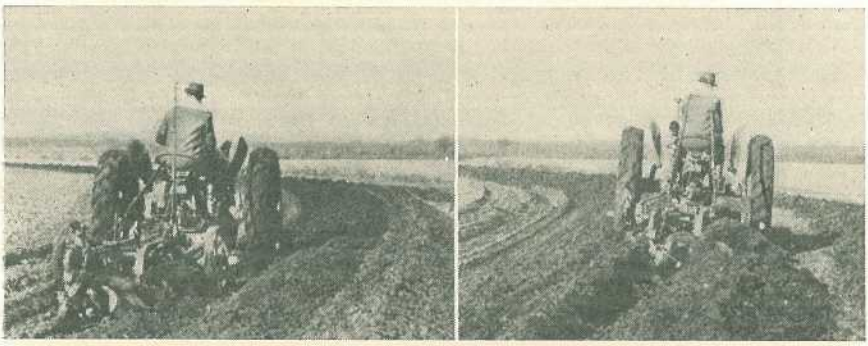


Plate 70.
LEFT, ROUND 21. RIGHT, ROUND 22.

Rolling Soil on to Lower Side of Island.

Return trips of the plough form the lower side of the bank and are made in a series of 12-furrow (6 round) operations. Rounds 7 (Plate 64), 13 (Plate 66), 19 (Plate 69), &c., repeat the start of the series at the lower edge of the island; on slopes of less than 3 per cent. the plough is stepped in 6 inches on to the island on the 7th, 13th and 19th rounds; on 5 per cent. slopes it is stepped in 4 inches, whilst on slopes of 7 per cent. or over no "step-in" is allowed.

On a slope as steep as this (5 per cent.), the movement of soil uphill on the return trip of rounds 7, 13, 19, &c., is approximately 4 inches. The objective is principally to have the "waves" of soil from the upper and lower sides at almost equal depth when they meet on the island.

Working across the Island.

Careful driving maintains a uniform width on the diminishing island, up to the last round. The smaller the advance made on each series of rounds, the greater will be the depth of loose soil which forms the contour bank. Eventually, the wave of loose soil becomes so deep

that, on the first round or two of each series, the plough no longer cuts into the hard ground of the island, but operates entirely to move loose soil inward.

Plate 67 shows Round 15 and Plate 68 Round 18. In Plate 68 the stake marks the position of the original surveyed line.

Plate 69 pictures the first round of the 7th series on the channel side, and the first round of the 4th series on the return trips below the ridge. This is Round 19.

Rounds 21 (left) and 22 (right) are shown in Plate 70. By Round 24 (Plate 71), the island has almost disappeared; with an 8 ft. island 24 rounds would have completed the bank on this slope, but channel capacity would not have been adequate.

Plate 72 shows the outfit operating on Round 25 at maximum ploughing depth to move the greatest possible amount of soil. The return trip continues to raise the ground level to form the lower part of the bank. Round 28 is shown in Plate 73.

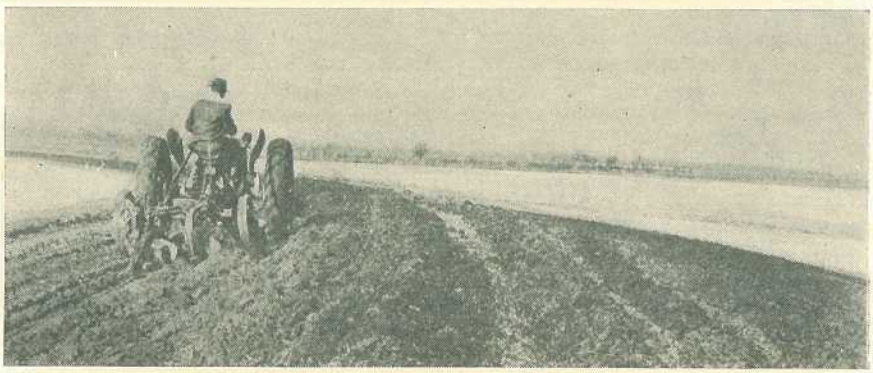


Plate 71.
ON ROUND 24, WITH THE ISLAND ALMOST DISAPPEARED.

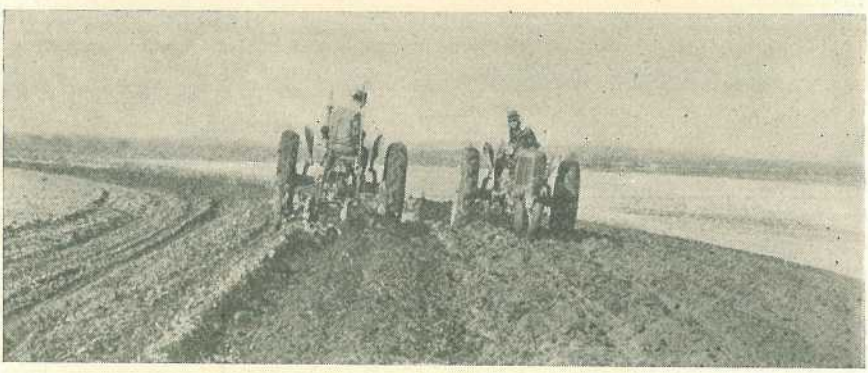


Plate 72.
PLOUGHING DEEPLY ON ROUND 25.

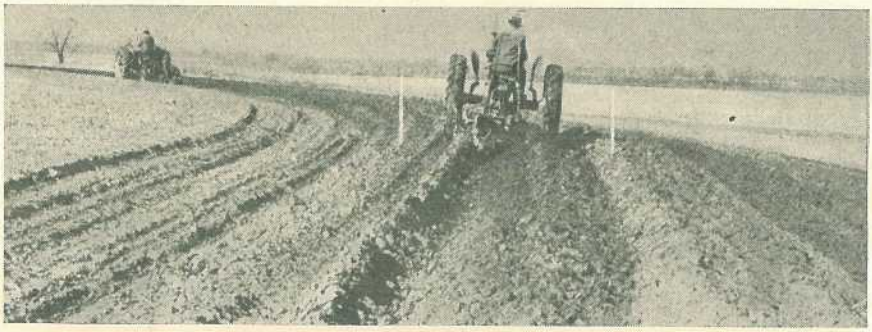


Plate 73.
ON ROUND 28.

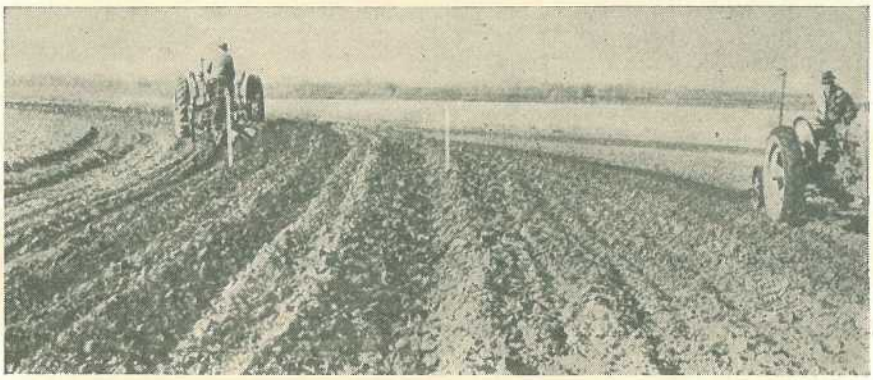


Plate 74.
THE BANK COMPLETED ON ROUND 30.

Completing the Bank.

Under favourable ploughing and moisture conditions Round 30 (Plate 74) should complete this contour bank. Original stake lines are indicated in the photograph.

As shown in Plate 75, the "going" trips of rounds 31, 32 and 33 complete the movement of the upper "wave" of soil to a point where it overlaps with the lower "wave." The return trips of these rounds are used to good advantage in filling the depression at the lower base of the ridge. After these trips the disturbed area below the lower stake (right) is 18 furrows wide.

Plate 76 shows the completed contour bank, which is of the desirable dimensions, with a broad-base bank on which weed control is facilitated, and possessing a channel of adequate capacity.

Diagram of Operations.

The procedure and approximate number of rounds required to construct a contour bank on a 5 per cent. slope, using a 9-ft. island, are shown in Plate 77, and indicate the whole series of operations used in the construction of the bank.

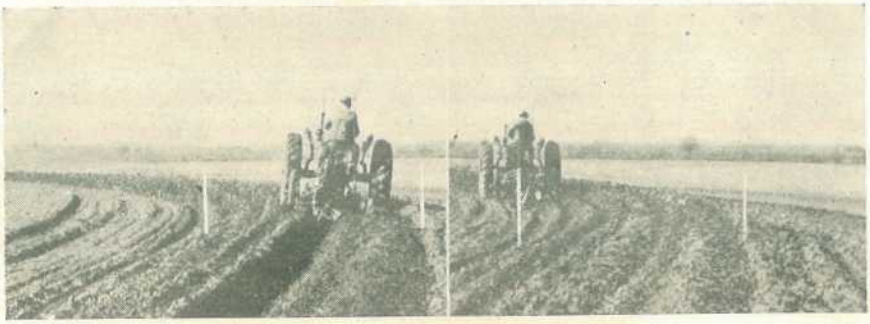


Plate 75.
OVERLAPPING THE THROWN SOIL ON THE ISLAND.

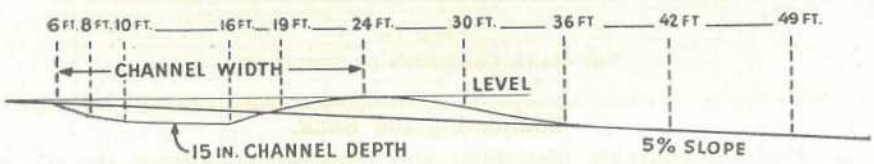


Plate 76.
A COMPLETED BANK, WITH DIMENSIONS INDICATED.

Contour Banks only a Palliative.

These banks are intended only to flow safely from the farm such surplus water as cannot be absorbed where it falls. They are only soil conservation aids, and the objective of the farmer should be the adoption of farming techniques which will ensure the maximum penetration and retention of rainfall at the site where it falls. Farmers are strongly advised not to build contour banks on "trial and error" lines; they must be correctly designed and surveyed first, or disastrous consequences may follow.

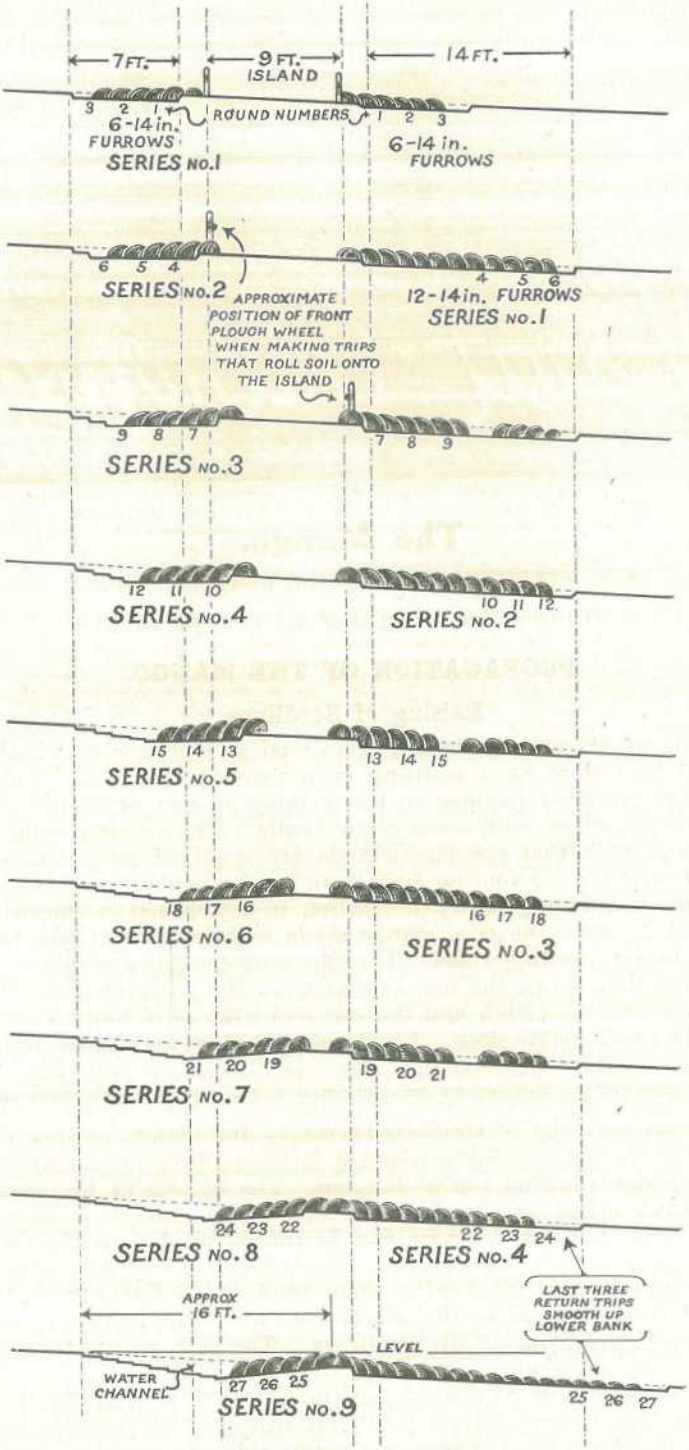


Plate 77.

Diagram of Operations in the Construction of a Bank.

The Mango.

S. E. STEPHENS, Horticulturist, Horticulture Branch.

(*Continued from page 82 of the February Issue.*)

PROPAGATION OF THE MANGO.

Raising of Seedlings.

MANGO plants must be raised from seed irrespective of whether the final tree is to be a seedling or a grafted tree. No commercial success has yet been attained in the striking of root or branch cuttings such as is practised with some other fruits. The rooting habit of the seedlings is such that special methods are required to produce plants that will have a good rooting system and so transplant readily. Under conditions of ordinary seed-bed culture, in which soil is worked up to good tilth to form the bed, mango seeds will develop a long tap root with no fibrous feeding roots. The tap root elongates at about two to three times the rate of the top, so that after the initial growth flush the top may be 9 inches high and the tap root—the only root to develop—will be 18 to 24 inches deep. Plants of that type are almost impossible to transplant with any degree of success, so modification of the usual seed-bed method is necessary to produce a transplantable seedling.

The special type of seed-bed necessary for mango raising is made by first excavating the soil to about 8 inches or by building up a board frame 8 inches high on top of the soil. The bottom of the excavation or the earth inside the frame must then be covered with sheet iron. Alternatively, the board frame can be placed on a concrete floor, the object being to isolate the seed-bed from the soil underneath. The frame or the excavation is filled with clean sand of medium-coarse texture. Previous illustrations show the effect which a proper mango seed-bed has on the rooting system of the seedlings. The iron or concrete bottom prevents elongation of the tap root and the sand medium encourages vigorous development of fibrous feeding roots. Plants of this type can be readily lifted from the sand without injury to their roots and they have the necessary root expanse to enable them to establish themselves rapidly when transplanted.

Mango seed must be fresh and is better not dried out before planting. Fully ripe fruit should have the flesh roughly sliced from it with a knife and the remainder of the pulp then washed out with water. Quickest results are obtained by the use of a hose with a solid water jet under good pressure. The yellow pulp is all removed and the seed left with only the clean fibres adhering to it. The washed seeds should then be spread out in the air to dry off excess moisture so that they can

Plate 78.
STAGES IN THE PREPARATION OF MANGO SEEDS FOR PLANTING.

be gripped securely for the next operation, which is husking. Plate 78 shows the various stages of this operation. The three seeds on the top left are cleaned and dried ready for husking. The three on the top right have been clipped round the dorsal edge. This is done with secateurs, care being taken not to cut into the kernel. The two seeds on the lower left have the husks partially prised open. This can be done quite easily provided the clipping has been extended to both ends. In the lower centre of the plate, five husked kernels are grouped, while two opened and empty husks are shown on the lower right.

Husking of the seeds prior to planting is essential to prevent deformed root growth. Plate 79 shows tangled roots developing in an unhusked seed and Plate 80 the deformed root growth and weakened tops obtained when husking is not carried out. These should be compared with the vigorous tops and straight roots that develop from husked seeds as shown previously.

Plate 79.
TANGLED DEVELOPMENT FROM UNHUSKED SEED.

The seeds should be planted in the seed-bed as soon as possible after husking, allowing about six inches between the seeds each way. They must be placed on the ventral edge and set about three-quarters of their depth in the sand. A mulch of straw, blady grass, wood wool, or planing

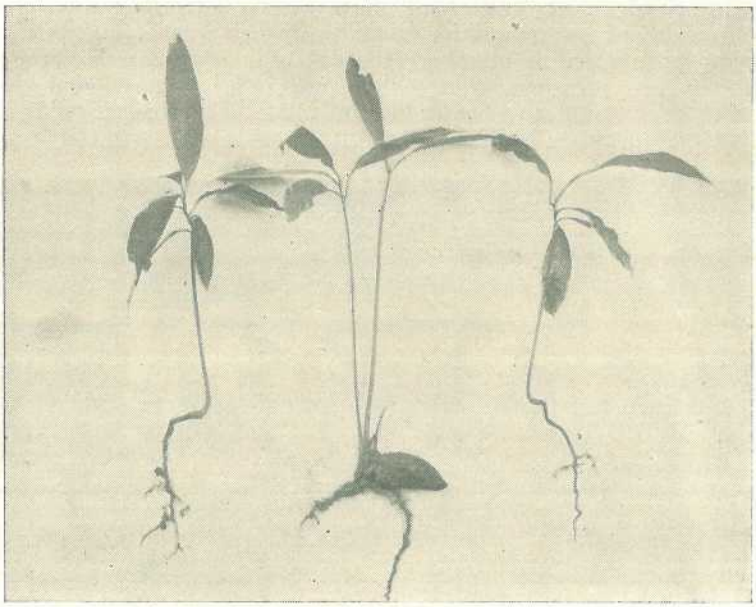


Plate 80.
ROOT DEFORMITY DUE TO THE SEED HUSK.

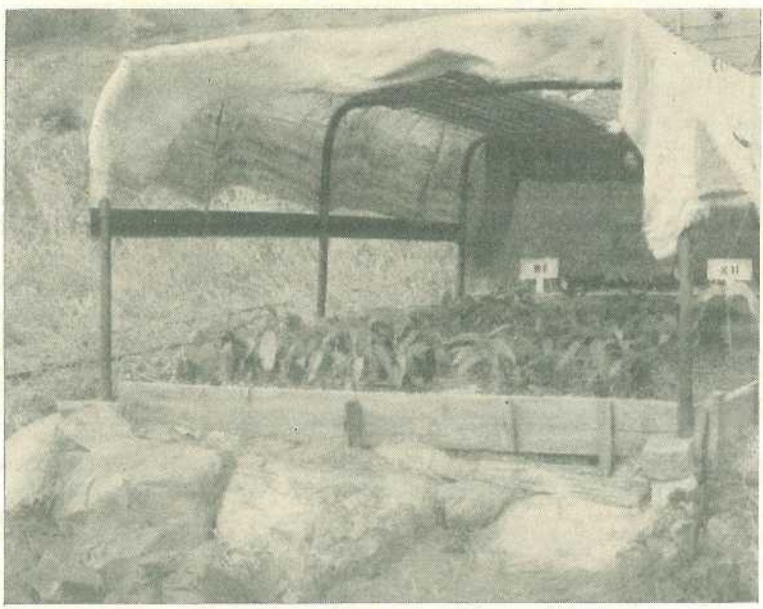


Plate 81.
A MANGO SEED-BED.

mill shavings should then be placed on the surface of the bed, covering seeds and sand. The seed-bed is completed by erecting a hessian or light bush shade about 3 feet above it. Plate 81 illustrates a built-up bed with hessian shade and the plants growing through a blady grass mulch.

The sand medium holds moisture well and the mulch assists in maintaining the moisture right to the surface. Once the seed-bed has been thoroughly soaked the moisture content can be easily kept up by light but regular waterings. Sprouting of the seed commences in 8 to 14 days under tropical summer conditions but may take as long as three weeks in sub-tropical areas. The initial growth flush ripens in about three weeks after germination. When this stage is reached the shelter should be gradually removed over a period of several days.

As soon as the plants have hardened to exposure they may be transplanted to nursery rows or to the field. If they are to be grafted, it is customary but by no means essential to place them in a nursery. Planting direct to the orchard prevents the setback that must take place when a partly-developed evergreen tree is transplanted. Direct planting should certainly be practised if the trees are to be grown as seedlings. If a larger plant is desired for field planting, the seedlings may remain in the seed-bed until they have made and ripened their second flush of growth, but it is not wise to leave them beyond that time as the sand medium contains insufficient nourishment for lengthy subsistence. Transplanting can be accomplished successfully and with very little loss of plants if the leaves are clipped back to half their length and the plants watered in and lightly shaded for a few days with a leafy twig.

Grafting.

As has been explained, mangoes of polyembryonic type can be depended upon to reproduce the characters of their parents in the great majority of cases; so, if they are of a desirable type, there is very little to be gained by grafting such seedlings. However, some of the polyembryonic races have undesirable fruit characters which render them unsuitable for fruit production, but because of their vegetative origin seedlings of these races are very even in type and growth characteristics, and are consequently desirable as rootstocks. The monoembryonic plants are less satisfactory owing to variability in inheritance, which may cause variable growth and so affect the tops that may be grafted upon them. As stock plants for grafting, polyembryonic races of free growth are therefore recommended. The "Common" mango has been found quite suitable for the purpose.

Bud Grafting.

Propagation by bud-grafting is entirely satisfactory insofar as the type of tree produced is concerned but the operation is somewhat more difficult with mangoes than with most other plants with which budding is commonly used. Three methods have been used, all with reasonable success—the ordinary or inverted T bud, the Forkert bud, and the window bud, the last being a special development by the author for mango budding. The great advantage of the window budding method is that it holds the bud in very close contact with the stock—a consideration of particular importance in the case of mangoes, which show a

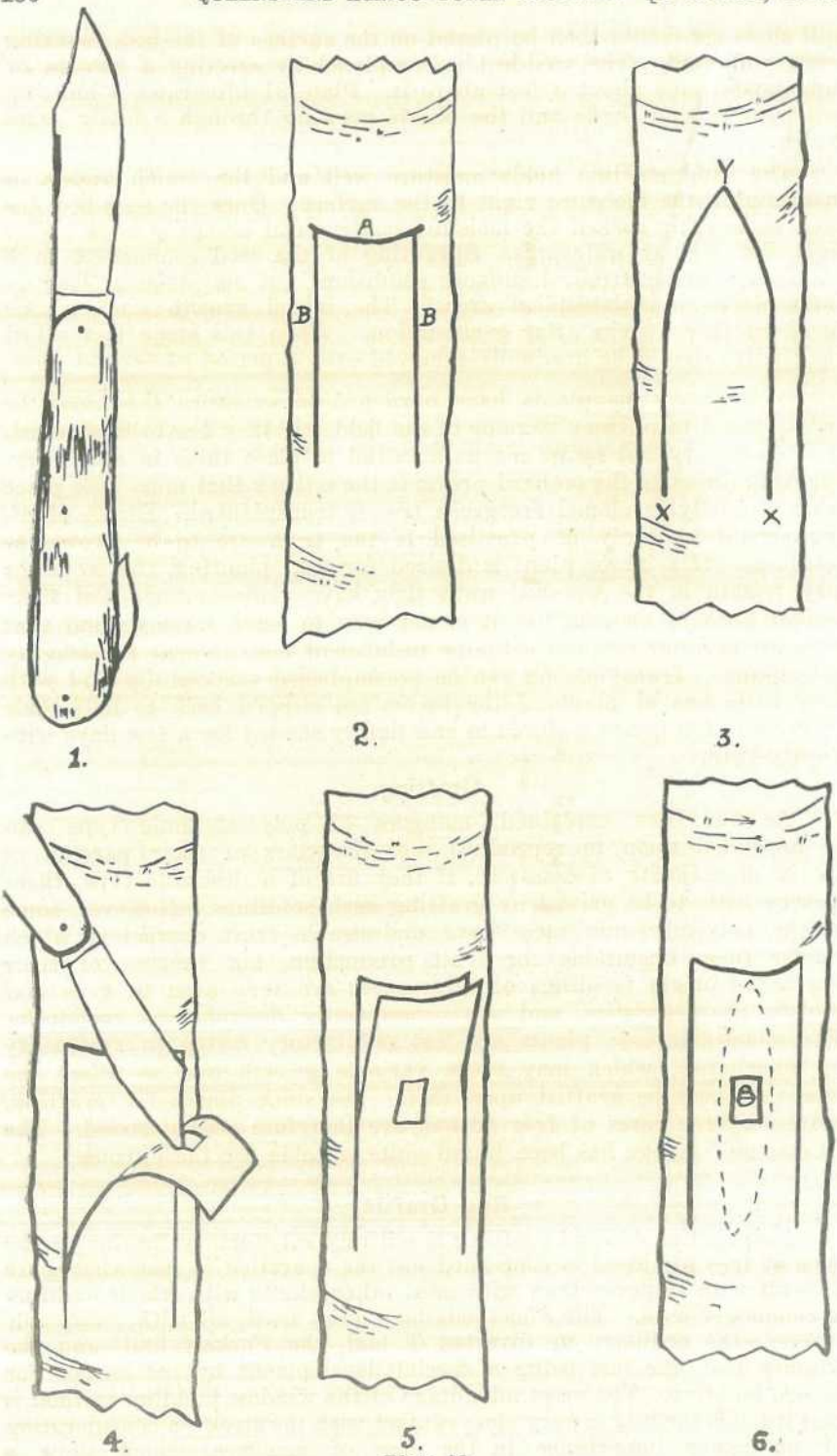


Plate 82.

MANGO BUDDING BY THE WINDOW BUD METHOD.

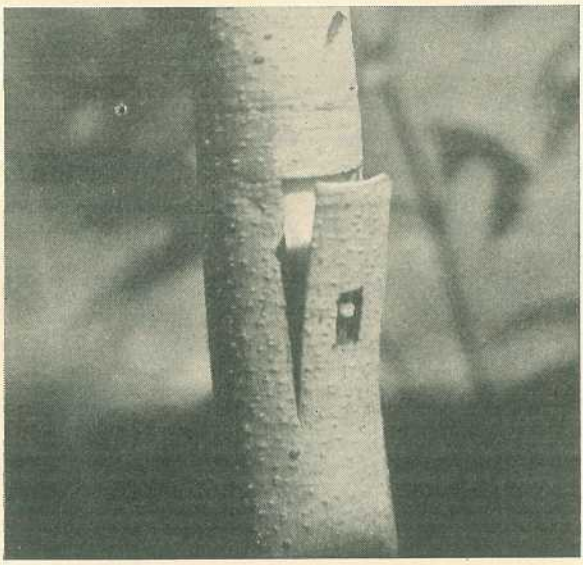


Plate 83.
THE WINDOW BUD—PLACING THE BUD.

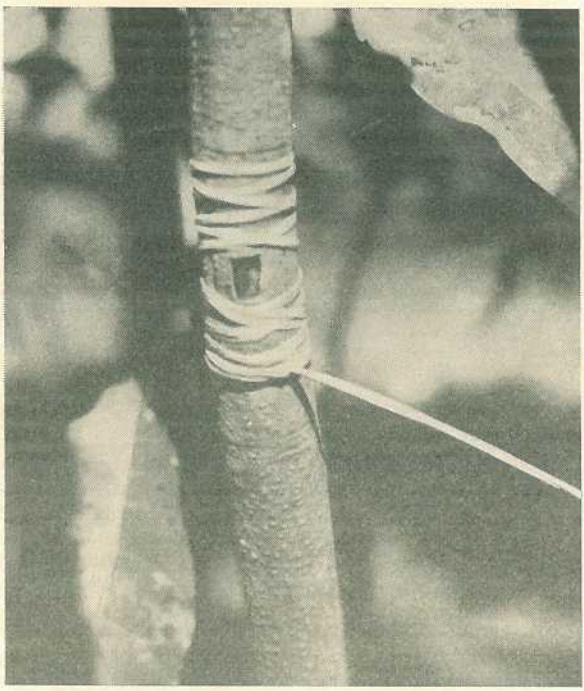


Plate 84.
THE FLAP TIED IN POSITION AFTER INSERTING THE BUD.

pronounced tendency towards the formation of thick corky layers of tissue under the buds with the ordinary T or inverted T methods of budding, thus causing an unsightly and frequently weak union.

Briefly, the method consists in the placing of an ordinary shield bud under a flap of bark turned back from the stock and the cutting of a "window" in the flap before replacing it. Through this window the bud is exposed to view.

Plates 82, 83 and 84 illustrate the operation in detail. A budding knife with a sharp pointed blade, such as that illustrated in Plate 82, fig. 1, is required. Two methods have been used in cutting the flap. It may be done in three cuts, one (A in Plate 82, fig. 2) horizontal across the stock, and two vertical (BB), ½-inch to 1 inch apart, extending from the horizontal cut towards the base of the stock for a distance of about 2 inches; or it may be done with the point of the budding knife in two cuts, starting at XX in fig. 3 (Plate 82), drawing the knife upwards on converging lines to a common point Y. The flap of bark should then be loosened with the point of the knife at the corners AB or Y, as the case may be, and gently pulled away from contact with the wood. This is an important point, as the action of tearing the bark away exposes the cambium layer. Further, it gives an indication as to whether the stock is in a fit state to work, as the bark will peel cleanly and easily only when the stock is in an active condition.

A window is then cut out of the centre of the flap. It should be not more than one-quarter of an inch wide by three-eighths of an inch long. It is cut most easily with the point of the knife from the inside of the flap, which is bent over for the purpose, the tension on the bark assisting in the cutting (Plate 82, figs. 4 and 5).

An ordinary shield bud is then cut from the scion material, the petiole or leaf stalk, if present, being cut back to a stub of about one-tenth of an inch. The bud should be cut rather large—1½–2 inches long. It is inserted without undue delay under the bark flap (Plate 83), and placed in such a position that the bud is visible through the window (Plate 82, fig. 6).

The flap should then be bound back in position with raffia (Plate 84) and the whole sealed with grafting tape or earthed up with soil to completely cover the bud. A convenient method of earthing-up is to bend a sheet of tin of requisite size round the budded plant and fill it with soil. The tin tube should be large enough to allow about 4 inches of soil all round the plant and to cover the bud to a depth of at least 3 inches.

The covering tape or earth should remain in place for about three or four weeks and then be removed and the raffia cut. If the operation has been well performed, the whole flap will have re-united with the stock and the only evidence of its removal will be the window and a narrow line of new tissue along the cuts. The stock may then be ring-barked above the bud, or cut and bent over, to start the bud in growth. After growth has commenced, the stock may be headed back in the usual way.

In this, as in all other budding methods, success lies in cleanliness and neatness in making the several cuts, and in working the stock when it is in active or flush condition, with the bud-wood dormant. Cleanliness of tools is assured by the frequent wiping of the blades with a soft

cotton cloth saturated with alcohol or methylated spirits. Neatness also is assured by maintaining a razor edge on the budding knife. A blade which will not shave is too blunt for budding. A good quality smooth butcher's steel used after every five or six cuts will keep the blade at the required keenness. Active, flush condition of stock may be assured by applying a liquid manure dressing of 1 oz. of sulphate of ammonia in 1 gallon of water several days before commencing the budding.

Under tropical conditions, budding has been successfully carried out at all periods of the year excepting the months of June and July, that is, the cold period. The best condition of the stock for successful budding is between the swelling of the buds and early flush growth when the new leaves are still only partly expanded.

Budwood appears to give the best results if it is cut several days before it is to be used and stored in damp peat moss or wet sand. The best type of budwood is the green wood of the second and third last flushes which is about three-eighths of an inch in diameter. The latest flush should be discarded as it is often insufficiently ripened.

Inarching.

In India, it has been customary over many years to propagate outstanding varieties of monoembryonic type by the grafting method known as inarching. This method involves growing the stock seedling in a pot and raising the pot on a scaffolding to a position in which the seedling can be brought in proximity to a branch of the variety it is desired to propagate. The seedling and the branch must be of about the same thickness and must be so placed that they have the same direction of growth and can be brought into contact over a length of about 6 inches. A slice of bark and wood is removed from the adjacent sides of each and the two cut faces brought together so that close contact is made between the two cambium layers. The union must be firmly tied and waxed over. In the course of time, if the operation has been skilfully performed and the young plant in the pot kept in active growth by frequent feeding, the two shoots unite. When this has taken place the top of the seedling is cut off back to the point of union to divert all the seedling's growth into the scion and after a few more weeks the scion is severed from the parent tree immediately below the union. The inarch is then a separate entity and is removed to a lathhouse for further development and strengthening of the graft before being finally planted in the orchard.

Inarching is a laborious method of propagation and the graft union so made is not a strong one. The method is not recommended to Queensland growers.

[TO BE CONTINUED.]

Citrus Bud Selection in Queensland.

G. W. J. AGNEW, Experimentalist, Horticulture Branch.

AT one time, early in the history of Queensland's citrus fruit industry, the public was mainly supplied with oranges, mandarins and lemons produced on trees grown from seed. Though seedling citrus trees were easily and cheaply raised, and proved hardy when grown under adverse conditions, it was found that the progeny of some varieties did not have the same characteristics as the chosen parent trees. Seedling trees were also very thorny, and often many years passed before they produced commercial crops of fruit. The propagation of seedling trees led to the production of a mixture of types, many of which were inferior in both fruit quality and yields to the original parent tree and the true identity of some of the best varieties was lost. It is recognised, however, that occasionally, useful types of fruit were obtained in this way. The Ellendale Beauty mandarin, which arose as a chance seedling in the Howard district in the latter part of last century, and the Beauty of the Glen Retreat mandarin, which appeared in a similar fashion in 1873 near Brisbane, are well known examples of this.

The introduction of the Bahia Navel orange from Brazil to other countries had a profound effect upon the citrus industry throughout the world. This orange, which later became known as the Washington Navel, bore seedless fruits of high merit and thus could not be propagated by seed. The demand for trees of this variety was largely responsible for the present-day practice of planting "worked" trees in commercial orchards.

"Worked" Trees.

A "worked" citrus tree consists of two components—a stock and a scion or bud. Trees for commercial plantings are produced in nurseries, by first raising seedlings of bush lemon, common sweet orange, Emperor of Canton mandarin and some other varieties as stocks. When this stock plant is large enough—usually at an age of six to 12 months—a bud of a chosen variety is "worked" on to it by an operation known as budding. If the union is successful, the bud begins to grow. That part of the stock plant above the union is then headed back and the bud develops into the new tree, living on the root system of the stock.

To-day, as a result of the almost universal policy of planting "worked" trees, a high degree of varietal uniformity and distinctiveness is obtained in commercial orchards.

Mutation and Its Effect on Bud Selection.

Experience in all citrus growing countries has shown that some trees or parts of trees may develop characteristics which differ from the normal for that particular strain. These are known as "sports" or "mutations." As these mutations occur in the buds, and can be propagated through them, the term "bud variation" is used to describe the phenomenon.

The most important bud variations from the horticultural point of view are those which affect fruit quality, yielding capacity and time at which the fruit matures. Practically all commercial varieties of citrus produce bud variations of different kinds, though some varieties do so more frequently than others.

Some bud variant strains of the Valencia Late orange have demonstrated their unproductiveness by yielding consistently only 20 per cent. of the crop produced by the normal strain. Similarly, in the Washington Navel orange unproductive strains occur as well as several off-type fruit variations such as large and coarse-rind fruits. Excessive thorniness, which sometimes occurs in the Villa Franca lemon, is another example of a variation which may be transmitted by faulty bud selection. A common mutant of the Valencia Late is one producing large fleshy leaves and coarse-rind fruits of poor quality. At least two strains of Joppa orange may be distinguished by their foliage characteristics: one has large twigs with sparse foliage and the other small twigs with a large number of leaves.

Bud variation can be used also to spread the harvesting period of the crop. For example, some bud variant strains selected and propagated in America from the Washington Navel mature their fruit earlier than the standard strain, and others later.

Elimination of Inferior Strains.

Citrus bud variations may lead to the propagation of horticulturally inferior trees, and careful selection of buds is necessary to maintain the standard of a variety. It is considered that bud selection, though it may be of value in isolating superior strains or strains with special characteristics, has as its main purpose the exclusion of inferior trees from new plantings.

Variation Due to Environment.

The bud selector must take into consideration those modifications of a tree's behaviour which may be due to the environment in which the tree is growing. Soil and climatic conditions, and even the age of the tree, may influence the characteristics of a variety. For example, an Ellendale mandarin tree may behave very differently under coastal conditions on the red basalt soil of the Blackall Range at Montville from one growing in the sub-coastal climate of Gayndah on alluvial sandy loam. Other factors, such as the presence or absence of irrigation, differences in fertilizing practices, and the kind of stock on which the trees have been worked, all tend to complicate the work of the bud selector, who has to determine the nature of the variations produced and thus assess the value of a variety or even a tree within a given variety as a source of budwood.

Pedigree Budwood Plots.

At present a programme of citrus bud selection is in operation in Queensland, whereby selected parent bud supply trees are kept under observation and from which performance records are taken. This work is concurrent with the establishment of pedigree plots, in which selected strains of the main commercial varieties are planted under test conditions. One such pedigree plot is already established at the Maroochy Experiment Station in the Nambour district, and another at the Bureau of Investigation Research Station at Lawes, near Gatton. These plots will, in time, provide much of the budwood supplied to registered nurseries.

Citrus Budwood Scheme.

For many years past the Queensland Department of Agriculture and Stock has supplied registered citrus nurseries with buds of standard varieties, selected and cut under the supervision of its officers, in order

to ensure that commercial citrus plantings will, in the main, be comprised of highly productive trees bearing first quality fruit. To illustrate the extent of the bud supply service to nurserymen, it may be stated that, for the autumn and spring buddings of 1948, approximately 200,000 buds were selected, cut and despatched to Queensland nurseries. Since the inception of the Citrus Budwood Scheme in 1934, about 1½ million citrus buds have been supplied for commercial use. About half of these buds were of the three orange varieties—Washington Navel, Joppa, and Valencia Late—the remainder being made up of Ellendale Beauty, Emperor of Canton, and Beauty of Glen Retreat mandarins, Villa Franca, and Lisbon lemons, and Marsh Seedless grapefruit. All of these are listed as "A" grade varieties under the *Diseases in Plants Acts.* Seeds of the more important citrus varieties, grown as stocks for budding, were also supplied to nurserymen.

Prior to 1936, Queensland imported large numbers of "worked" citrus trees from southern States, but at the present time quite a number of trees are exported. Local conditions are such that a large and vigorous "worked" tree can be produced in Queensland nurseries more quickly than in a more temperate climate.

Conditions governing the supply of budwood and seed to nurserymen are as follows:—

Budwood.

Orders for budwood required between 20th January and 20th April must be lodged not later than 7th January, and for budwood required between 20th July and 20th September not later than 7th July.

As from the first budwood supply period of 1949, nurserymen will be charged £4 15s. per 1,000 buds for all "A" grade varieties.

Orders received after the closing dates specified above will be charged at the rate of £5 5s. per 1,000 buds.

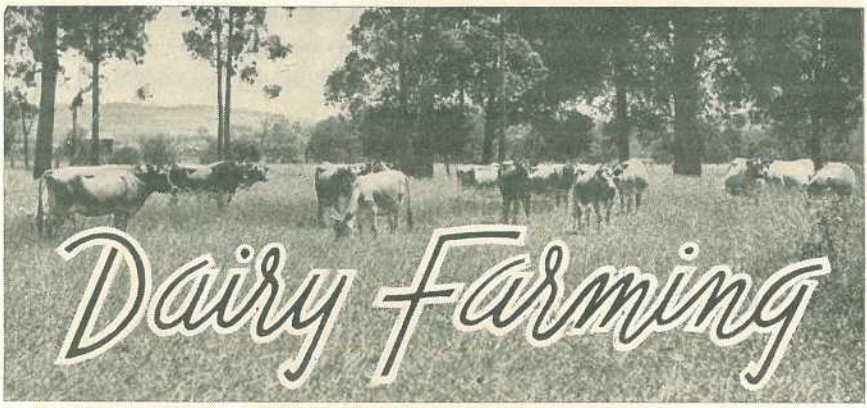
Nurserymen shall have the right to question the quality of budwood provided the matter is reported immediately to the officer responsible for budwood supplies. Each complaint will be dealt with on its merits. Nurserymen shall not have the right to reject budwood simply because it has been stored before despatch.

Seed.

The Department of Agriculture and Stock will supply seed of bush lemon, sweet orange and Emperor mandarin during the months of June, July, and August.

Seed orders must be lodged not later than 7th January.

The price of seed to nurserymen shall be cost price, plus 1s. per lb. (estimated at 20s. per lb.).



Modern Milking Methods.

W. C. T. MAJOR, Dairy Technologist, Division of Dairying.

IN recent years research workers have revealed the intricate physiological mechanisms of the secretion and "let-down" of milk. A simple outline of these findings, and their application to the art of milking, should help farmers to understand modern milking methods.

Structure of the Udder.

The udder of the cow consists of four separate quarters. The diagram in Plate 85 will assist an understanding of its structure.

Each quarter of the udder contains:—

1. *Teat.*—The teat is closed at its lower end by a *sphincter muscle,* which prevents milk flowing from the udder, and restricts the entry into the udder of foreign bodies, including bacteria. The teat surrounds the *teat cistern* and communicates with the exterior via the *streak canal.*

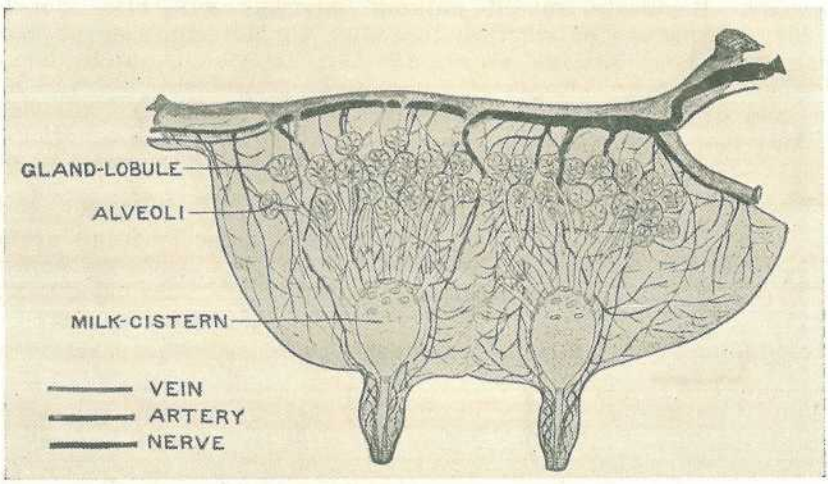


Plate 85.

DIAGRAM OF SECTION THROUGH THE UDDER.

2. *Milk Cistern.*—This is a small reservoir within the udder. It opens into the teat cistern.

3. *Milk Ducts.*—The milk ducts permeate the tissue of the udder. They open into the milk cistern.

4. *Alveoli.*—These are tiny, cell-lined sacs at the apex of the ducts. The transformation from blood plasma to milk occurs within the cells lining the alveoli.

5. *Blood Vessels, Muscles, Nerves.*—The tissue of the udder and teats is well supplied with blood vessels, muscles and nerves.

Secretion of Milk.

Substances digested from the cow's food supply are conveyed to the udder by the blood stream. Selected substances pass into the cells lining the alveoli, and are there manufactured into milk. This milk is secreted into the space within the alveoli. Milk first collects in the alveoli and then passes down the ducts into the udder and teat cisterns.

Not many years ago it was widely believed that milk secretion only occurred during milking. It has now been demonstrated that milk secretion takes place over a much longer period. The rate of secretion is influenced by the pressure developed within the udder. During milking the pressure within the udder falls and secretion commences. It continues until sufficient pressure develops within the udder to stop secretion. In normal, well fed cows approximately eight hours elapse from the commencement of secretion until the rate of secretion commences to decrease considerably. However, it may be 14 hours before secretion apparently ceases—unless milk is removed from the udder during this interval.

Because of the influence of pressure on the rate of secretion, it is possible to increase the yield of heavy producing cows by milking them three times a day. This increase may be as large as 15 per cent. of the twice-a-day yield when the cows are fed to the limit of their capacity. Regularly spaced milking intervals will also increase yields, irrespective of whether the cows are milked twice or three times per day. Milking at regular intervals is also desirable to obtain milk of uniform composition and particularly to avoid low fat milk at certain seasons of the year with some breeds of heavy milking dairy cattle.

Milk "Let-Down."

Milk "let-down," unlike secretion, is not a continuous process, but only occurs as the result of stimulation. The suckling of her calf is the strongest milk "let-down" stimulus a cow can receive. In normal milking this stimulus is best provided by adequately washing the cow's teats and udder with warm milk (110 deg. F.).

Stimulation of the nerve endings in the cow's teat causes an impulse to be transmitted to the pituitary gland at the base of the brain. This impulse causes the pituitary gland to secrete a hormone (oxytocin) into the blood stream. Oxytocin is carried by the blood stream to the udder, where it causes contraction of the muscle fibres surrounding the alveoli, thus developing additional pressure within the udder. It takes about 45 seconds from the stimulation of the teats until milk "let-down" occurs. Active muscular contraction

persists for approximately six minutes. The bulk of the milk within the udder is held in the spongy secreting tissue and is most difficult to remove unless the tiny muscles permeating the tissue squeeze it out. It is therefore important to:—

1. Commence milking one minute after washing the teats and udder;
2. Milk fast enough to effectively empty the udder within four minutes.

The following diagram illustrates the mechanism of milk "let-down."

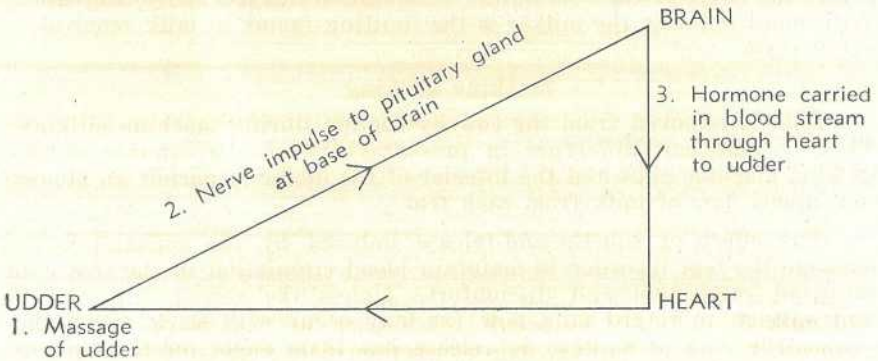


Plate 86.

DIAGRAM OF THE MECHANISM OF MILK "LET-DOWN."

Cows normally associate with milking such actions as—

1. Coming to the milking shed;
2. The normal sounds of the shed; and
3. The milking routine.

In so doing cows develop a "conditional reflex," or habit, which stimulates milk "let-down." Thus, cows with unwashed teats and udders can be trained to let down their milk. However, "let-down" due to habit alone is neither as definite nor as persistent as "let-down" due to habit supplemented by warm udder wash. Correct stimulation permits more milk to be removed from the udder. It also permits milk to be removed more quickly.

Cows are susceptible to stimulation by hormones other than oxytocin and some have an important bearing on milking. For instance, fear, anger and frustration cause the suprarenal glands to secrete adrenalin into the blood stream. Adrenalin prevents contraction of the muscle fibres within the udder and so inhibits milk "let-down" by counteracting the effect of oxytocin. Therefore, handle cows quietly. Never excite them.

Thus, for complete milking, it is necessary to have:—

1. A complete absence of counterstimuli, such as fear, anger, frustration or excitement.
2. A definite udder and teat stimulation—preferably by a warm wash.
3. Rapid removal of milk from the udder while the "let-down" stimulation still strongly persists.

Hand Milking.

During hand milking the upper portion of the teat cistern is closed by the pressure of the hand. As the hand closes, the milk so trapped in the teat cistern is forced to issue from the teat. The pressure developed within the udder by secretion and muscular contraction causes milk to flow into the teat cistern as soon as the hand releases the teat. Hand milking results in an intermittent flow of milk from two teats at a time.

Few milkers have either the ability or the endurance to consistently remove milk from cows quickly enough to completely empty the udder before the effect of the "let-down" stimulation has markedly decreased. With hand milking, the milker is the limiting factor in milk removal—not the cow.

Machine Milking.

Milk is removed from the cow by suction during machine milking. There is sufficient difference in pressure between the interior of the milking machine cups and the interior of the udder to permit an almost continuous flow of milk from each teat.

The effect of squeeze-and-release induced by the pulsator is to massage the teat in order to maintain blood circulation in the teat and so avoid congestion and discomfort. Unless the squeeze interval is long enough to retard milk flow (as may occur with slack, soft inflations), the rate of squeeze to release has little effect on the rate of milking. The effective flow of air through the milking machine influences the rate of milking more than any other factor—provided the machine is otherwise operating efficiently. Effective air flow is influenced by—

1. Capacity and efficiency of the vacuum pump;
2. Leaking joints, flaps and poorly seated pulsators;
3. Sensitivity of the relief valve;
4. Cleanliness of the air admission hole.

Provided that milking machines are in good mechanical condition, the cow, rather than the machine, is the limiting factor in the rate of machine milking. Thus, for efficient machine milking, it is important that—

1. Cows are properly prepared;
2. Machines are mechanically efficient;
3. Shed layout and routine are designed for rapid milking.

The Art of Milking.

Cows are creatures of habit, and regularity in the routine of milking and feeding pays dividends. Do the same things, in the same order, at the same time, each day. The cows like it that way.

The following routine gives excellent results:—

1. Before commencing milking, thoroughly prepare the milking equipment. It must all be thoroughly rinsed, cleaned and sterilized between milkings.

2. Bring the cows quietly from the paddocks to the dairy. Don't use savage dogs, whips or other harsh treatment. Well trained cows do not require to be driven to a dairy.

3. Milk the cows at regular intervals. This will increase production, and help to overcome low fat problems which some milk suppliers experience during certain seasons of the year.

4. At the yards provide drinking water, shade and protection from prevailing winds.

5. Provide yards of adequate size to comfortably hold the cows. Dehorning makes cows quieter and reduces distress—especially of heifers.

6. Train the cows to pass quietly through the yards and shed. This means more milk and less labour. Gentle handling, rapid milking, and feeding after milking will assist training. The well trained cow regards milking as a pleasure. She comes into the bail of her own accord. She does not foul the bail. Cleaning problems are simplified and the dust menace is reduced.

7. As the cows come into the shed they are "bailed-up" and legroped where necessary. Both operations can be dispensed with when the cows are well-trained. This not only reduces labour, but also simplifies milk quality problems by avoiding potent sources of contamination.

8. Wash the hands thoroughly before commencing to milk the herd and rinse them before milking each cow.

9. When the cow comes into the bail, thoroughly wash and dry her teats and udder using warm water and a clean cloth. It is an advantage to use a hypochlorite disinfectant in the water. As the disinfectant action of hypochlorites is rapidly destroyed by organic matter, it is necessary to renew the solution during milking. Teats must be thoroughly dried—otherwise a drop forms on the sphincter muscle, thus localising contamination at the very spot where it is least desirable.

10. As soon as washing and drying are complete, take a few squirts from each teat on to a strip cup. Examine for abnormalities. If abnormal, the cow should be held back until last and hand-milked.

11. Place the cup on the cow's teats one minute after commencing to wash her teats and udder. This is important for rapid milking.

12. As milk is removed from the udder there is a tendency for the cups to creep upwards on the teat. This closes off the teat cistern from the udder cistern and stops the removal of milk from the udder. It also causes the delicate inner lining of the cistern to rub on itself. This may result in an injury which permits bacteria to enter and cause mastitis.

When the cups creep—gently pull them down.

13. As soon as active milk flow ceases (as indicated by the sight glass and the appearance and feel of the udder), *bear down gently on the cups.* Frequently milk flow becomes active again for a short time. Remove the cups as soon as this flow slows down. Never leave the cups on a cow after a free flow of milk has ceased. Leaving the cups on too long trains the cow to develop sluggish milking habits, which will decrease her yield and increase the cost of milking.

14. After milking each cow dip the cups in clean water and then in strong chlorinated water. This is particularly important where mastitis is troublesome. Never knowingly place cups on any quarter affected with mastitis.

15. Then place the cups on the next freshly prepared cow. This routine is carried on until all of the cows have been milked.

16. Start the separator at such a stage during milking that separation is almost completed when the last cow is finished milking. Separate to a fat content of not less than 34 per cent. in winter and 38 per cent. in summer. This has an important influence on cream quality as well as transport costs. Do not separate cream to contain more than 42 per cent. fat—very high fat creams mean high fat losses.

17. As soon as practicable after milking rinse the milking machine and all utensils with clean water. Then proceed with cleaning and sterilization.

18. Clean up the manure, sweep and hose the shed floors and leave everything clean, neat and tidy for the subsequent milking.

19. After milking feed the cows in clean, detached feeding stalls. The amount and nature of their supplementary feed depend on—

(*a*) Productive capacity of the cow.

(*b*) Nature and amount of the feed available in the paddock.

(*c*) Relative prices of feed and dairy product.

Non-stripping.

The majority of cows can be trained to milk out completely in 3 to 4 minutes and to maintain production without stripping.

The advantages of non-stripping are—

1. A very definite labour saving.
2. Faster milking; that is, more cows can be milked in a given time.
3. Milking becomes more attractive to labour.

Non-stripping causes no loss of production and drying-off is not accelerated. It has also been claimed that non-stripping leads to improved milk quality and lowered incidence of mastitis.

Cows must be trained to non-stripping methods. This training involves:—

1. Adherence to the modern milking methods already outlined. Cows must be efficiently milked before non-stripping is attempted.

2. Remove the cups 4 minutes after milking has commenced (or earlier if free flow ceases). Hand strip to determine the amount of strippings.

3. For several milkings remove the cups 4 minutes after milking commences. Bear down on cups before removal. *Do not hand strip.*

4. Then determine the amount of strippings recovered. It will be found that some cows have not milked out completely. These cows require further training. Treat them as follows:—

(*a*) Very thoroughly wash and massage the teats and udder before milking is commenced;

(*b*) Massage the udder gently during the last 2 minutes;

(*c*) Gently bear down on the cups during the last minute.

5. Check the effect of this treatment on the amount of milk remaining in the udder by hand stripping at weekly intervals. As soon as practicable progressively reduce the amount of udder massage and the duration of bearing down on the cups.

By these methods more than 80 per cent. of the herd can be trained to non-stripping. The remaining, apparently untrainable, cows are a problem. It is for the farmer to decide, on economic grounds, whether they are to be retained in the herd and milked last, or replaced by trainable heifers. Frequently, aged cows will only fully respond to training at the commencement of a lactation.

Summary.

Modern milking methods involve—

1. Correct stimulation of the cow.
2. Gentle handling and correct training of the cow.
3. Efficient milking machines.
4. Shed and yards designed to permit rapid milking.
5. No hand stripping.

Remember:

Slow milking makes a cow a "stripper."

Rapid milking makes a cow a "milker."

BETTER DAIRYING DEMONSTRATIONS.

The initiation of a series of dairy farm demonstrations has been announced by the Minister for Agriculture and Stock (Mr. H. H. Collins).

The purpose of the demonstrations, which are being financed by a Commonwealth grant, is to provide an object lesson for dairymen in what may be achieved by the adoption of improved production methods.

To date, arrangements have been made with 29 farmers to adopt various approved practices on their farms, and it is planned to extend the demonstrations throughout the main dairying districts. Special supervisors have now been appointed to the Moreton district and the Darling Downs.

Demonstrations will be made of the value of such measures as pasture improvement, culling of poor producers, improved feeding practices and fodder conservation in economically increasing milk and cream production. The effects of modern methods of milking will also be measured, especially the saving of time which would permit of greater attention being given to the growing and conservation of fodder.

Mr. Collins said that the dairy farms which have been selected are typical of those in their districts, and the results achieved should therefore be capable of duplication by dairy farmers generally.

The value of such demonstrations depends, said Mr. Collins, on the extent to which they are brought to the notice of those engaged in the industry. Accordingly, as the work progresses, field days will be arranged at which the results can be demonstrated to district farmers and their application discussed.

DIVISION OF DAIRYING.

GROUP HERD RECORDING SCHEME.

SUMMARY OF HERD RECORDING UNITS FOR JANUARY, 1949.

District.	No. of Herds in Group.	No. of Cows in Group.	Daily Average for all Cows in Group.			Average of Highest Herd in Group.		
			Milk. Lb.	Test. Per Cent.	Fat. Lb.	Milk. Lb.	Test. Per Cent.	Fat. Lb.
Beaudesert	17	955	15·52	3·92	·608	20·13	4·86	·978
Maleny, No. 1	19	835	17·47	4·86	·85	21·14	5·6	1·183
Maleny, No. 2	18	912	17·98	4·66	·839	29·52	5·1	1·506
Oakey, No. 1	22	760	21·47	4·47	·958	22·75	5·59	1·272
Oakey, No. 2	22	767	20·99	4·27	·895	22·29	5·56	1·239
Allora	9	282	22·76	4·23	·962	26·77	4·39	1·175
Goomeri	18	778	14·13	3·73	·527	22·22	3·5	·777
Cooroy, No. 1	22	831	14·38	4·17	·600	27·88	4·59	1·281
Cooroy, No. 2	22	760	12·27	4·19	·514	16·57	3·89	·645
Kingaroy, No. 1	20	846	19·74	4·16	·82	30·62	3·98	1·218
Kingaroy, No. 2	19	676	18·54	3·95	·732	26·03	4·07	1·06
Cedar Pocket	22	693	17·95	4·41	·791	22·73	4·56	1·036
Monto	21	813	20·14	4·06	·817	24·16	4·57	1·104
Pomona	19	815	14·55	4·15	·603	18·88	4·63	·874
Miva-Theebine	15	718	14·41	4·25	·613	17·5	4·61	·806
Warwick	20	759	24·54	3·95	·969	32·74	4·49	1·469
Kenilworth	17	835	13·27	4·07	·54	18·04	4·55	·82
Killarney	17	776	19·62	4·24	·832	30·76	3·95	1·216
Toogoolawah	16	812	15·71	3·88	·609	19·86	4·28	·85
Toowoomba, No. 1 ..	17	648	19·4	4·55	·883	21·29	5·07	1·08
Toowoomba, No. 2 ..	15	680	20·48	4·26	·872	33·00	4·03	1·328
Malanda	22	830	17·17	3·98	·682	28·9	4·02	1·162
Millaa Millaa	17	621	18·21	4·34	·791	18·05	5·51	·995
Kilcoy	20	921	14·49	4·17	·604	22·82	3·44	·784

Preparing for Shearing.

R. B. YOUNG, Senior Adviser in Sheep and Wool.

SHEARING might be regarded as "harvest time" in the sheepman's year and it is important that preparations should be carried out well in advance. This calls for attention to an infinite amount of detail and, while this may in some respects be boring, carefully made and executed plans will ensure smooth running of the shed as well as reflect efficiency of management.

With his part of the job thoroughly prepared the woolgrower need not fear trouble just around the corner and he can feel assured that he has reduced to a minimum the risk of loss of time and money from preventable delays. For those to whom the problem is comparatively new and to aid the memories of those to whom preparing for shearing is an old story, some of the main points requiring attention are detailed in this article.

Arranging to Shear.

Make arrangements for shearing well in advance, as many other flocks have to be shorn as well as your own. If the work is to be done by contract it is as well to compare prices and conditions submitted by several contractors.

The relative advantages of "price per head" and "cost plus" are worthy of consideration and might be summarised by saying that a price per head basis is advantageous to the grower if wet weather develops as he is not called upon to pay for the delay. If the weather remains favourable, however, "cost plus" is probably the cheaper.

In arranging to do the work, specify cost, advise the approximate number of sheep to be shorn, with dissected figures of grown sheep, lambs and rams, and if any preference is to be given as to the order of shearing. This is most important when the Mules operation is being practised. Stipulate if plant and machinery are to be supplied and specify details to the contractor. If part of the plant and machinery is supplied by the contractor and the remainder by the property, be sure that each party knows the items for which he is responsible, otherwise delay and/or duplication and additional expense may result. For purpose of record obtain the number of the contractor's Workers' Compensation Insurance Policy. Make arrangements with a reliable carrier to move the wool and order railway trucks.

Woolgrowers are obliged under the Shearing Industry Award to notify the Industrial and Machinery Inspectors of the intended shearing one week prior to the anticipated commencement of the work. However, their obligations do not stop there. Important preparations have to be made at the shed and amongst the flock.

Preparing the Flock.

Boundary and sub-division fences of all paddocks to be used at shearing and following shearing should be put in good order. Nothing is more annoying or detrimental to accurate counts than having shorn sheep in amongst the woollies, or worse still, woollies in amongst the shorn sheep.

Sheep mustered some time prior to shearing into handy concentrations towards the shearing point, so that easy cuts can be obtained for shearing from day to day, and carry-overs returned easily at week ends, will facilitate keeping the sheep up, and avoid danger of "no sheep."

It will be appreciated that the additional mustering will be a heavy tax on the horses and it is advisable to have them in good order prior to the commencement of the work. Pre-attention to trimming of feet and shoeing, if necessary, will ensure that sufficient animals are available for the work.

Provided the feed and water are good, the handiest paddocks possible should be used for shorn sheep. This makes the work easier and allows the animals a few weeks to pick up again before being returned to their usual paddocks.

No sheep should be kept in the yards more than one night and special care must be taken with ewes which are in lamb. In any case, carry adequate calcium-boro-gluconate and a hypodermic syringe on hand in case of milk fever.

Sheep must not be put in the shed yards less than four hours prior to shearing, except, of course, ewes with lambs or animals which are drought stricken. Reasonably empty they are easier to shear and less likely to suffer injury. In most instances sheep are put in to the shed the night prior to shearing, and accurate forecasting of sheep required for each day's shearing is an indication of good management.

Take particular note of the health of the sheep, particularly of the younger age groups, for a month or so before shearing, and if there is any apparent abnormality seek the advice of the nearest stock inspector or sheep and wool advisory officer.

Preparing the Shed and Yards.

It is advisable to have a general "spring clean" of all buildings concerned with shearing. This includes the shearing shed itself, classer's floor, wool bins and wool room. This should also include cleaning of the counting-out pens, and if necessary, underneath the shed, though this is a job which should always be done immediately after shearing is finished. All old wool, black wool, locks and crutchings, as well as skins, should be removed from the shed, as they are only likely to confuse the presser.

It is advisable to give the machinery a trial run, and check over the press. Replace any worn cores, ropes or boards, and oil and grease all working parts as required.

The spring cleaning should also extend to the shearers' accommodation, including mess room, baths and lavatories.

Check the yards to see they are sheep-proof and the counting-out pens to make sure they will hold lambs. Make sure all gates will swing and close properly. Some good clips are depreciated through dust. This can be reduced by watering the yards prior to shearing, and the working of the sheep through the yards will be greatly facilitated if they are free of dust.

On the day the shearers arrive an adequate supply of boiling water, sufficient fresh meat hanging ready for use in butcher's shop, clean cooking utensils, clean and filled lanterns and a general appearance of tidiness will give the impression of efficiency and thoughtfulness in preparing for the work in hand.

Check over the plant and materials and make sure that the items listed below are available.

Accommodation for Shearers and Shed Hands.

Stretchers
Mattresses and covers
Pillows and covers
Lanterns
Kerosene
Adequate water
Basins
Wash tubs
Water tins
Showers
Refuse boxes or drums
Disinfectant
Firewood
Brooms

Shearers' and Shed Hands' Mess.

Bread knife
Bread boards
Billy cans
Boiler
Bowls
Cake moulds
Crockery plates and dishes
Camp ovens for outside
Dipper
Egg slice
Egg whisk
Frying pan
Flour sifter
Funnels
Forks
Forks (cooking)
Hooks, wire, for lifting
Kettle
Knives (table and large)
Mincer
Mixing dishes
Meat dishes
Mugs (delf)
Rolling pin
Rolling board
Saucepans
Strainers
Spoons (table and cooking)
Salt and pepper shakers
Tea urns or large teapots
Tins for groceries, cake and biscuits
Tin openers
Bell
Clock
Broom
Cooler
Cupboards
Shelves
Stove
Tables
Forms
Carbide lights and spare burners
Carbide
Fly spray and atomisers
Mosquito net for food
Kerosene and pump
Disinfectant
Matches
Soap
Washing soda
Tea towels
Dish cloths
Washing-up dishes and mops
Firewood
Kindling
Newspaper
Meat house
Meat safe
Butcher's Block and counter
Butcher's knives
Steel
Meat saw
Tomahawk
Meat hooks for meathouse and safe
Coarse salt
Gambil
Water supply
Tins for water
Water bag
Tumbling Tommy and cover, or refuse bins and covers
All rations required under Award

Wool Shed.

Award
Clock
Bell
Tally board
Millet brooms
Wool baskets
Classer's table and wool-rolling tables
Necks table
Pieces table
Fleece bins
Sheep dip and tins and swabs
Wool press and cables
Press pins
Wool packs and caps
Bale fasteners
Bale branding ink
Brush
Tin
Stencils complete
Raddle
Pack needle
Twine
Scales
Wool book
Pencils
Wool hooks
Spares for wool press
Wool loading ramp or hoist
Overhead gear and spares
Down tubes
Handpieces and spare
Spare cores
Machinery oil
Shearers' oil cans, screw-drivers, brushes, and tins
Expert's bench
Vyce
Expert's tools
Shearing duplicates
Engine
Petrol
Oil
Water
Engine belt
Spare belt and clips
Spare spark plug for engine
Sufficient spares for engine
Grinder
Pendulum
Grinder spanner
Grinder belt
Spare belt and clips
Emery (coarse and fine)
Glue
Glue brush
First aid kit
Bandages, cotton wool, iodine, lint, scissors, antiseptic
Calcium boro-gluconate and syringe
Tar brands
Branding fluid and tins
Lamb marking knives
Ear pliers
Dagging shears
Raddle (blue and red)
Axe
Crowbar
Shovel
Posthole shovel
Rake
Saw
Claw hammer
Nails (clump head and wire)
Pliers
Wire
Tally book
Classer's abstracts
Pencils
Paper
Shearers' and shed hands' agreements
Check wool shed telephone
Check wool shed water supply

STATISTICS OF PRIMARY PRODUCTION.

The annual collection of statistics of agricultural, dairying and pastoral production is being made as usual by the police on behalf of the Queensland Government Statistician. Returns are for the 12 months ending 31 March, 1949, and any producer who does not receive a form by early in April should contact a Police Station or a District Statistician.

Accurately compiled returns are essential if the statistics collected are to have their fullest possible value, and producers are urged to make as accurate returns as possible. Individual returns are treated as strictly confidential.

Cattle Fattening in the United States.*

C. J. McKEON, Director of Agriculture.

A FEATURE of American agriculture is that practically all maize grain and also a large proportion of other grain and hay crops is retained on the farms on which it is produced for feeding to stock.

As an instance of the extent to which hand feeding of beef is practised, I might mention that on one property which I visited in California 2,300 head had been fattened and sold during the first nine months of the year and several hundred were in the yards in various stages of preparation. It was intended that the output for the whole year should be approximately 3,000 head. These cattle were well-bred Herefords and when brought into the yards would be from 18 to 20 months old. They were very intensively hand-fed for an average of three months before being marketed at from 900 lb. to 1,100 lb. live-weight.

On this particular property the ration consisted of 8 lb. grain (barley), 2 lb. molasses, 16 lb. lucerne chaff, and 2 lb. cottonseed meal. With the exception of the concentrates, the whole of the feed requirements were produced on the property on which the cattle were being fattened. The weight gain per head for the whole of the cattle which had been marketed for the year was 2.12 lb. per day, and the best gain was 2.5 lb. per day.

From observations that were made, it would appear that quite a large proportion of the choice hand-fed cattle which are marketed come from farms on which only a small number can be handled at a time. As in the case of the larger holdings, they are heavily fed on a grain and hay ration with a concentrate in the form of either cottonseed meal or soybean meal. The amount of flesh they carry is remarkable and as they are confined usually to small yards or pens they cannot lose any condition by undue exertion. As a matter of fact, they are so heavily fed that they show no desire to walk any further than is absolutely necessary. They are transported in motor trucks from the farms to the market and consequently are slaughtered very shortly after leaving the feeding pens.

* This note records some impressions of cattle fattening gained by Mr. McKeon on the occasion of a visit to the United States as a member of a committee investigating the soybean industry.

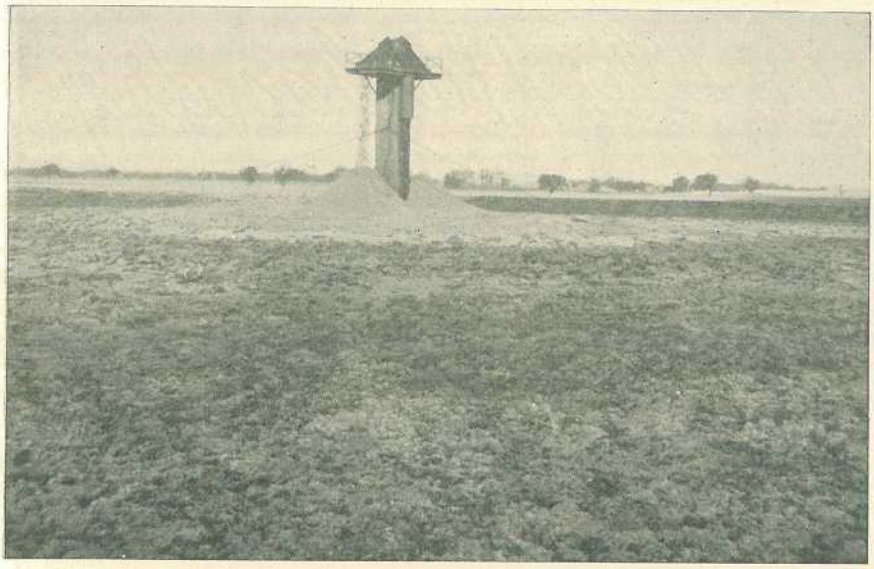


Plate 87.
SUGAR BEET PULP STORAGE TANK.

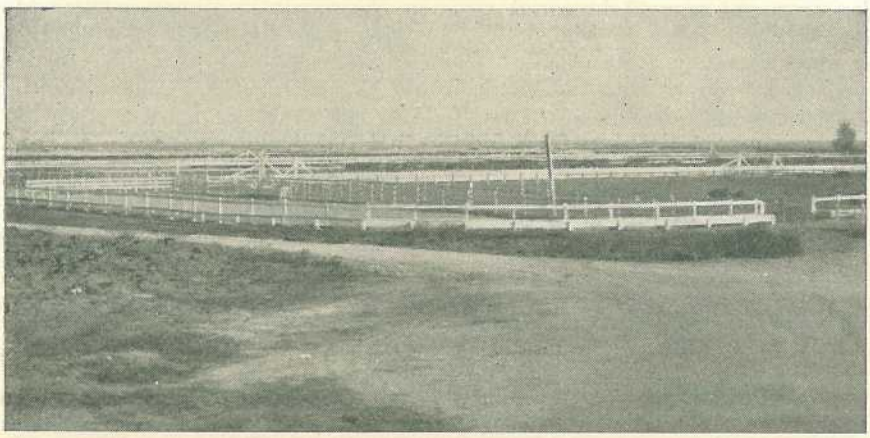


Plate 88.
CATTLE FATTENING PENS.

In the States in which sugar beet production is carried out, sugar beet pulp is used very extensively for cattle fattening. Plates 87 and 88 give some indication of the scale on which this is carried out. Plate 87 shows an enormous container with the beet factory in the background. The pulp is pumped from the factory and can be seen dropping into the container from the elevator in the centre. Some idea of the tremendous capacity of this container will be gained. Plate 88 shows the extensive pens in which cattle are fattened.

The market prices for hand-fed cattle at the time of my visit were as high as 32 dollars per 100 lb. live-weight—the equivalent of £100 Australian for a beast of 1,000 lb. live-weight. The price for this class of beef is naturally high when compared with Australian prices, but the quality is magnificent and it is easy to imagine people who are in a position to do so paying the high price.

After seeing the cattle fattening industry in the United States as it is carried out on both small and large holdings, I consider the possibilities of topping off good quality young beef cattle in Queensland should be thoroughly investigated. With present prices for grain and chaff, to say nothing of the shortage of concentrates, difficulties would be encountered, but it is considered that small trials might well be conducted to determine what price would have to be charged for hand-fed quality beef, and also to determine what the public reaction would be to the retail price of that class of beef.

On the Darling Downs, and in other districts where machinery is available for mechanical harvesting, grain sorghums can be produced at much the same cost per acre as wheat, with the yield for grain sorghum at least 50 per cent. greater than that for wheat. Lucerne can also be grown extensively in those districts and with modern haymaking and baling equipment can be produced cheaply. The provision of a protein-rich concentrate would be a more difficult matter and would depend largely on the expansion of seed crops yielding high-protein by-products.

QUEENSLAND SHOW DATES.

Barcaldine	May 13-14
Beaudesert	May 6-7
Biggenden	April 28-29
Blackbutt	June 3-4
Boonah	June 3-4
Bowen	July 6-7
Brisbane R.N.A.	August 6-13
Bundaberg	June 9-11
Charleville	May 18-19
Childers	June 6-7
Chinchilla	April 7-9
Crow's Nest	May 27-28
Dalby	March 31-April 2
Dirranbandi	May 27-28
Esk	July 1-2
Gayndah	April 21-22
Gin Gin	June 13-14
Goombungee	May 21
Goomeri	May 24-25
Goondiwindi	April 30-May 2
Gympie	May 26-28
Home Hill	July 1-2
Ingham	July 15-16
Ipswich	May 17-19
Jandowae	April 4-5
Kalbar	May 28
Kilcoy	June 24-25
Kilkivan	June 10-11
Kingaroy	May 5-7
Laidley	July 8-9
Longreach	May 3-5
Lowood	June 10-13
Mackay	June 28-30
Maleny	May 12-13
Marburg	May 13-14
Maryborough	June 2-4
Miles	April 12-13
Mitchell	May 11-12
Mount Morgan Show	June 2-3
Mt. Morgan Camp Draft	June 4
Mundubbera	May 6-7
Murgon	May 19-21
Nambour	July 7-9
Nanango	April 28-30
Proserpine	July 1-2
Rockhampton	June 22-25
Roma	May 4-5
Toogoolawah	June 17-18
Townsville	July 12-14
Wallumbilla	April 29-30
Warrill View	May 21
Wondai	May 12-14
Yarraman	April 22-23

Castration of Pigs.

F. BOSTOCK, Officer in Charge, Pig Branch.

THE castration of the male pig is a necessary and most important operation which must be attended to both by stud breeders and by farmers breeding for commercial purposes.

Castration is essential, not only because it enables the farmer to control the breeding operations at his piggery without hindrance, but because of the advantages to be gained in so far as pork and bacon are concerned, resulting in the production of a carcass free from sexual odours and flavours in the meat, while the flesh is much improved in grain and quality.

Unfortunately many owners feel that the correct methods of castration are too much bother and that "bush" methods are the most practical for general use, but one has only to visit the bacon factory or meatworks to realise the number of pigs which have been improperly castrated and which suffer partial condemnation as a result of abscess formation, &c.

Although no statistics are available to indicate the percentage of pig carcasses passing through these establishments suffering as a result of improper castration and from the effect of neglect following customary methods of performing this operation, it is certain the percentage is higher than it should be, or than the industry can afford.

Much can be done to minimise losses and ensure successful work by following the details as outlined herein, and if one item should be stressed more than another it is cleanliness in all operations. There is no reason why ill effects should follow such a simple operation if it is carefully performed, nor should there be any check in growth or development of the animal if the operation is carried out at the correct age before weaning.

Some overseas authorities refer to the term "castration" as applying to the removal of the testicles from the male, and also the ovaries from the female, but in Australia the term "spaying" is universally used in referring to the operation of surgical removal of the ovaries of the female. The pig farmer need not, however, be concerned with

spaying, for it is an unnecessary operation and is not recommended. It is unnecessary by reason of the fact that, under normal conditions of management, the sow pig under six to seven months of age will not be affected sufficiently in growth and development by her usual three-weekly periods of oestrum to warrant the operation, and not recommended because it is a risky and complicated operation which in general should only be performed by an experienced veterinarian.

In the case of male pigs a strong sexual odour is noticeable when a boar pig has been slaughtered, and this odour develops into a most unpleasant flavour in the meat, particularly during its preparation for the table. Fortunately these sexual odours and flavours disappear in the case of young pigs castrated two or three months before slaughter, but they are always more or less noticeable in the case of males that have been castrated late in life, especially in the case of boars that have been in active breeding for several years prior to castration.

These latter (stags) are a most undesirable class of pig from the standpoint of the manufacturer, and Departmental advice is to castrate all boar pigs not required for breeding purposes before they are weaned; run no risk, and utilise the feed to advantage rather than to disadvantage by feeding "old staggy sorts." It is certain that when castration is performed on an animal over three months old it will take much longer to recover, and the loss of condition and subsequent loss of time in fattening are items worthy of careful consideration.

It is interesting to note that before birth, and sometimes for a short time after, the testicles of the pig may be contained within the abdominal cavity. Under normal conditions they pass through comparatively narrow openings at the base of the abdominal cavity and continue through a small canal known as the inguinal canal to the scrotum or purse, pushing ahead of them folds of the lining membrane of the abdominal cavity, known as the peritoneum, which cover or envelope the testicles.

It is well known to all pig breeders that instances occur in which the testicles are not normal. There may be only one testicle showing (either the right or the left side), and in this case it is apparent that only one has descended into the scrotal sac. This is due to some unknown cause and is difficult to understand or describe. Pigs with only one testicle showing are known as "rigs." Their castration is unsatisfactory, for there is the fear that the other testicle will descend into the scrotum later and render a second operation necessary, or, if it does not descend, the animal may become a nuisance as it may become sexually mature or at least partly so.

When to Castrate.

Pigs may be castrated when four to six weeks of age and while they are still suckling the dam, as at that age there is considerably less shock to the nervous system and the growth of the pig will not be checked. A four to six weeks' old pig can be handled conveniently, and the testicles are large enough to render their removal quite simple. The older the pig is the greater the shock and risk and the more severe the after-effects. However, careful observations have indicated that there is no significant difference in the growth rate up to weaning age of a male pig castrated at birth or castrated at five to six weeks of age.

Treatment of Animal, &c., Prior to Operation.

No animal should be castrated without being properly prepared, hence the following rules should be strictly observed in order to avoid unnecessary trouble and loss:—

(1) The animal should be without food for at least six hours before the operation is to be performed. Clean drinking water, however, should be available.

(2) The knife (Plate 89) to be sharpened to razor-edge. Prior to the commencement of the operation and while not in use the knife should be kept in the disinfectant solution.

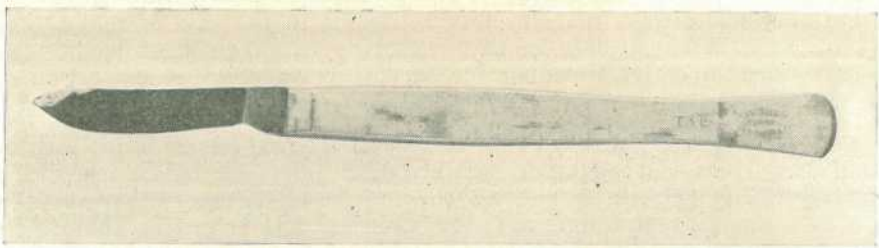


Plate 89.
KNIFE SUITABLE FOR CASTRATING PIGS.

(3) Select a dry, cool day. Castration should not be done during very cold, windy or rainy weather.

(4) Use a 2-3 per cent. solution of a reliable disinfectant (lysol, sheep-dip, Dettol, &c.)

Antiseptic Oils.

Suitable antiseptic oils for use after castration may be made from the following recipes:—

(1) Mix 1 part of carbolic acid with 10 parts of olive oil;

(2) Dissolve 1 ounce of iodoform in 14 ounces of eucalyptus oil, and when quite clear, add 30 ounces of olive oil.

These oils are in every way preferable to kerosene or other "bush remedies," not only from a humane point of view but because they stimulate the healing processes and repel flies.

The Operation Described.

The operation is best performed by two persons, although good results are being secured by the use of a one-man castration crate (Plates 90-93).

Everything should be in readiness before catching the pig, which should be held firmly on its back (Plate 94) to prevent wriggling and making it difficult for the operator to work. In whatever position the pig is held it must be held firmly, and so that the testicles may be handled freely. The next move is to wash the scrotum or purse and surrounding parts thoroughly with the disinfectant solution (Plate 95).

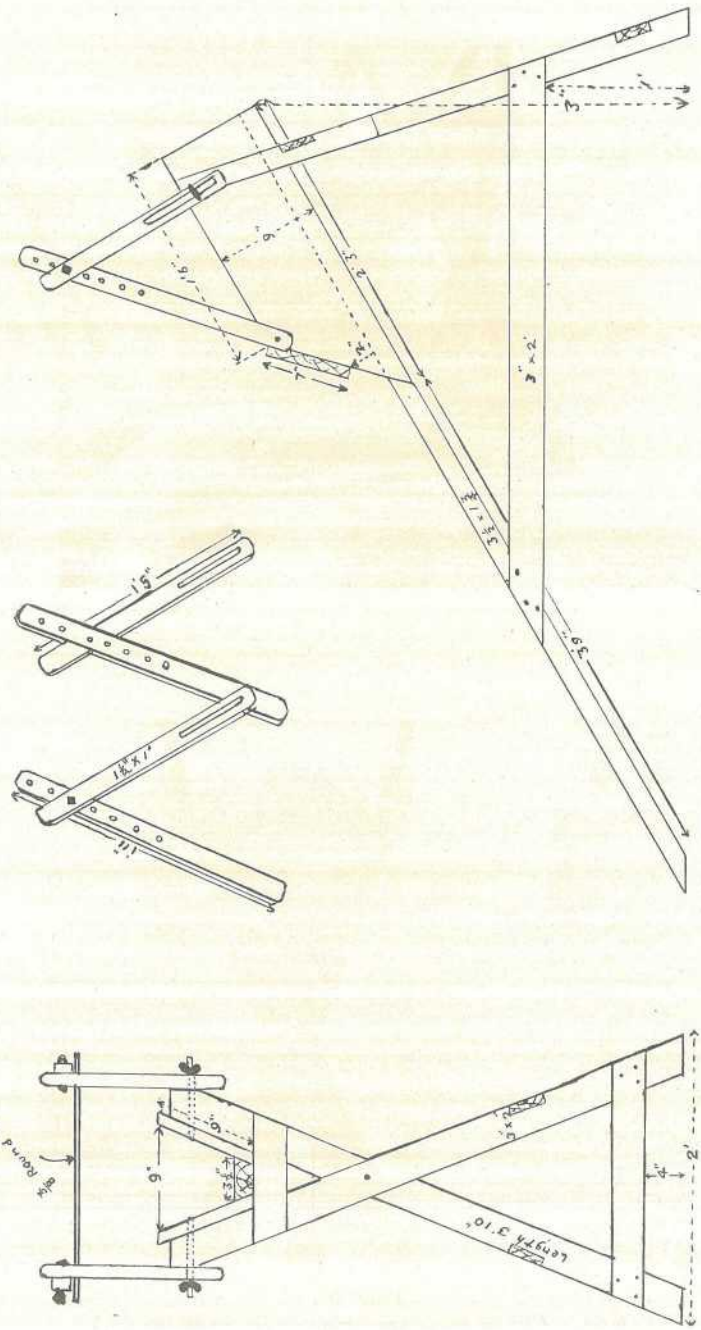


Plate 90.
Diagram of a Castration Crate.

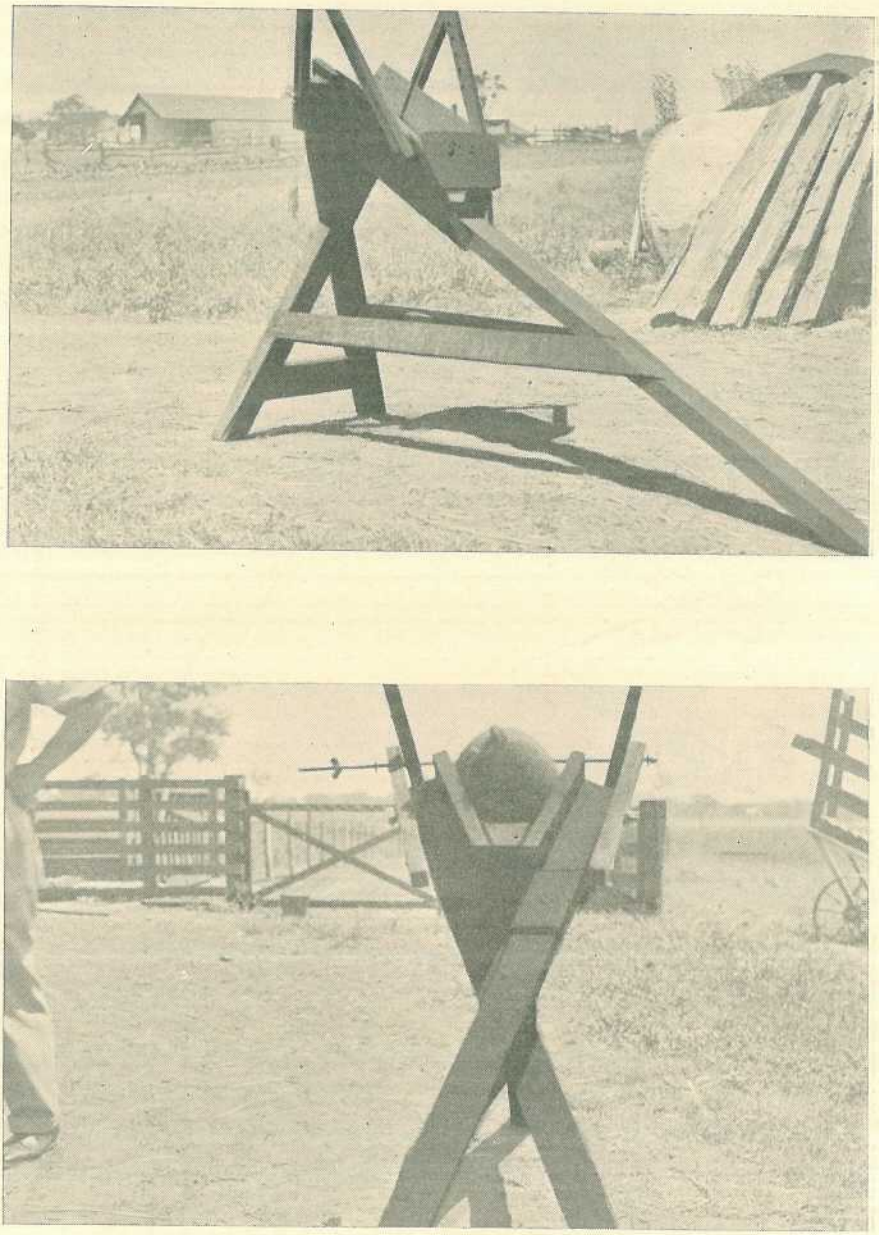


Plate 91.
TWO VIEWS OF THE CASTRATION CRATE OF PLATE 90.

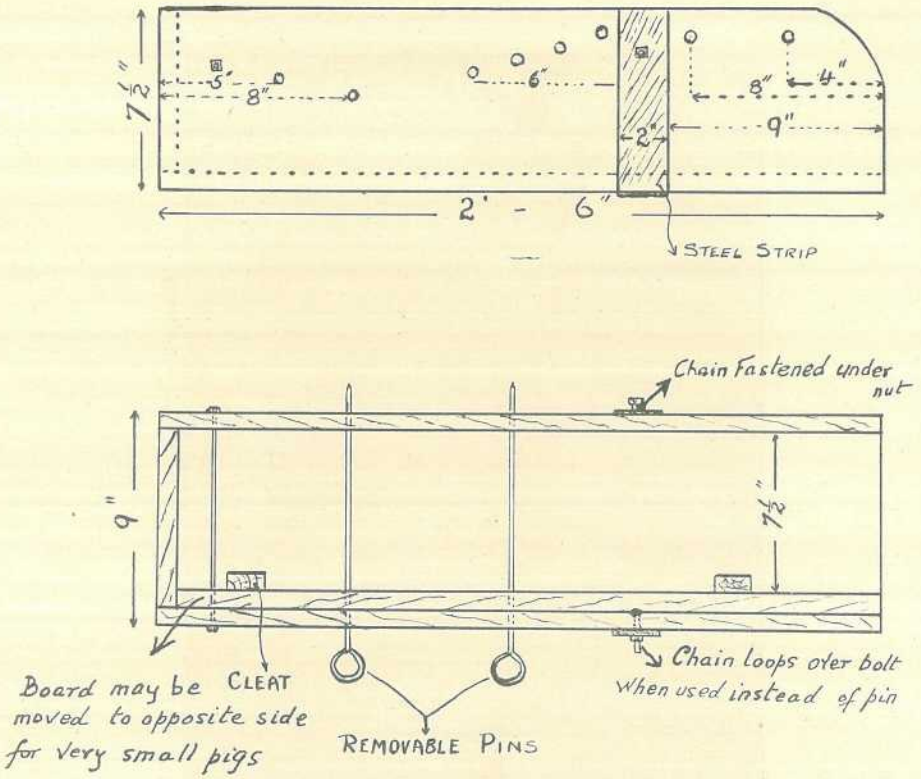


Plate 92.
DIAGRAM OF AN ALTERNATIVE CASTRATION CRATE.

When all is ready the operator seizes one of the testicles between the thumb and forefinger of the left hand, keeping the remaining three fingers closed (Plate 96). An incision is made through the scrotal sac (Plate 97) parallel with the middle line of the body and about half-an-inch to the side of this line, keeping the cuts low, or in such a position that when the animal stands up the blood, &c., will drain away and not collect in the scrotum, as would be the case where the cuts are made high.

The incision should be deep enough to enter the fleshy part of the testicle, thus liberating it from the envelope in which it is normally situated, and long enough to free the testicle without undue pressure and to allow for drainage. Care should be taken to see that the cuts are not made too close, across the middle line of the body or off the surface of the scrotal sac, as this may result in excessive bleeding and soreness.

The testicle is now drawn out and the thin tissue immediately under the testicle cut through, together with the spermatic cord (Plate 98); after which the testicle while being drawn away is scraped (not cut) free from its remaining attachments (Plate 99). The

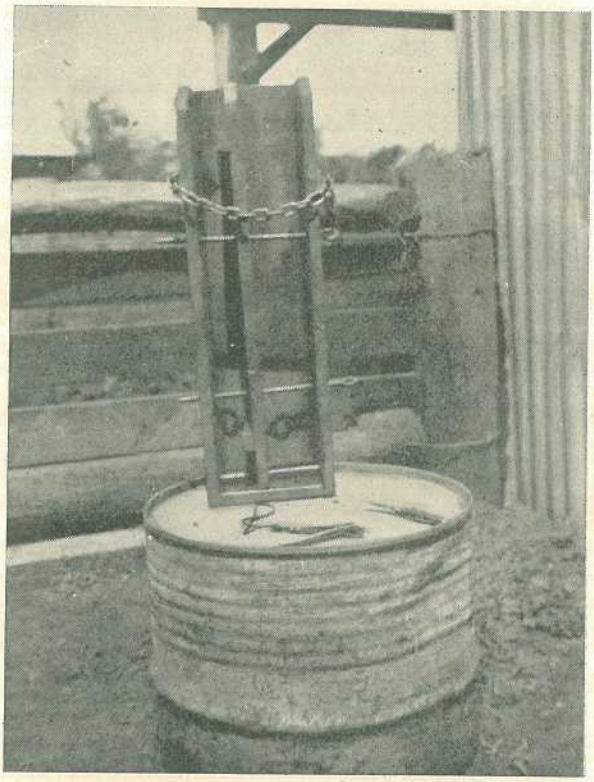


Plate 93.
TWO VIEWS OF THE CASTRATION CRATE OF PLATE 92.

blood vessels should never be cut off abruptly except when the emasculator is used (Plates 100 and 101), as to do so may cause severe haemorrhage. Jerking out the testicle is also dangerous, as it may result in rupture.

The first testicle having been removed, the second one is also taken out in similar manner, but through a second incision made for that particular purpose.

After-treatment and Care.

After the operation is completed (Plate 102), antiseptic oil should be poured into the wounds and the animal placed down, front feet first, to avoid contamination of the wound with dirt, into a clean dry pen or well-covered grass yard.

Complications following proper castration are rare, but when the work is not properly done, the parts not washed, or where the knife is not kept clean, abscess formation (Plate 103) is common. If this occurs, the abscess should be opened at its lowest point with a clean and properly disinfected knife, and the wound syringed out with a warm disinfectant solution, taking care not to use too much pressure. When found necessary, wash the wound twice daily until properly healed, using liberal applications of antiseptic oil each time.

Plate 94.
A METHOD OF HOLDING A YOUNG BOAR.

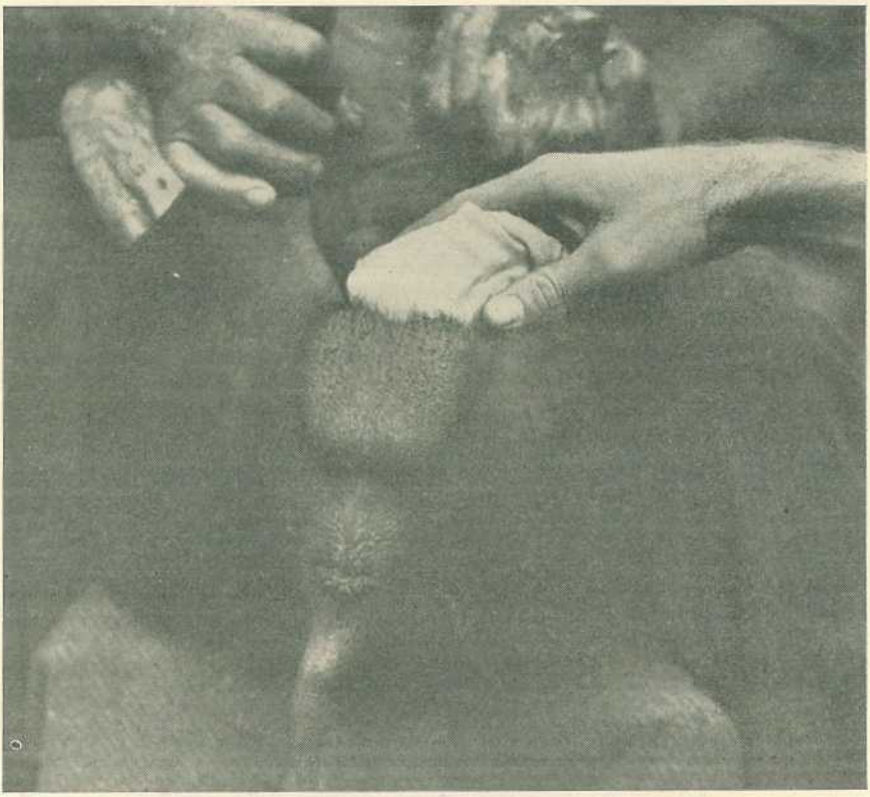


Plate 95.
WASHING THE SCROTUM AND SURROUNDING PARTS PRIOR TO THE OPERATION.

Castration of a Ruptured Animal.

The castration of a ruptured pig is a much more difficult operation than that of a normal animal, and must be performed by the "covered" method. This consists of cutting through the skin of the scrotum alone, the testicle and its covering envelope being taken out in one mass and drawn out as far as possible without undue strain; the cords at the base of the testicles are then tied with silk thread or surgical gut. The testicle is then removed by the aid of the emasculator.

After the second testicle has been removed in a similar manner, three or four stitches should be inserted in the scrotum so as to prevent risk of further rupture.

In the case of young pigs that are ruptured it would pay better to slaughter the animals and use as fresh pork. A veterinary surgeon should certainly perform the operation on a mature boar ruptured late in life.

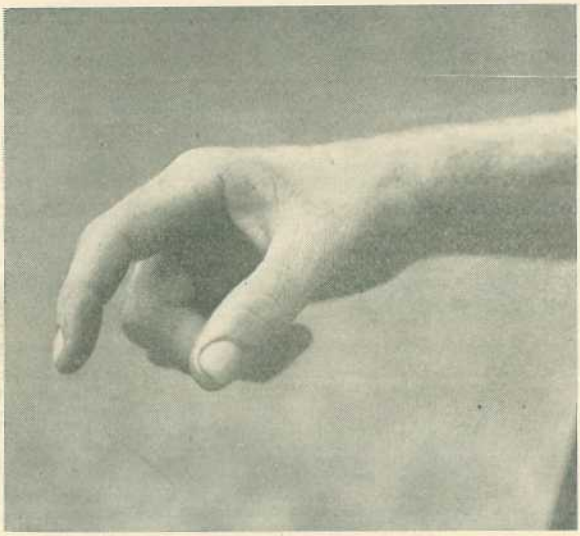


Plate 96.

SHOWING THE POSITION OF THUMB AND FINGERS WHEN HOLDING THE TESTICLE BEFORE REMOVAL.

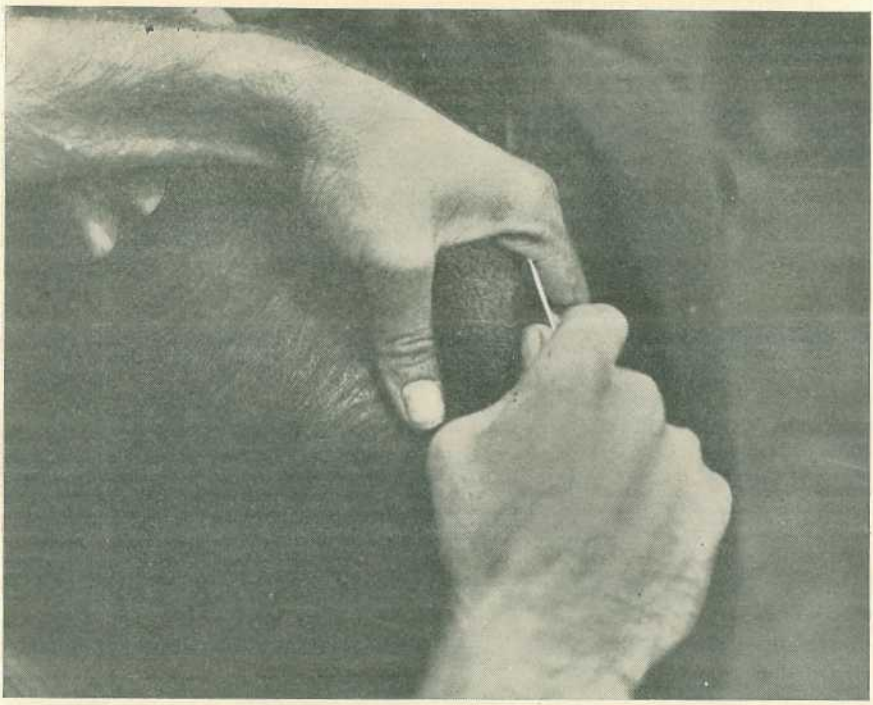


Plate 97.

SHOWING TESTICLE FIRMLY HELD IN THE SAC AND THE KNIFE IN POSITION READY TO MAKE THE INCISION.

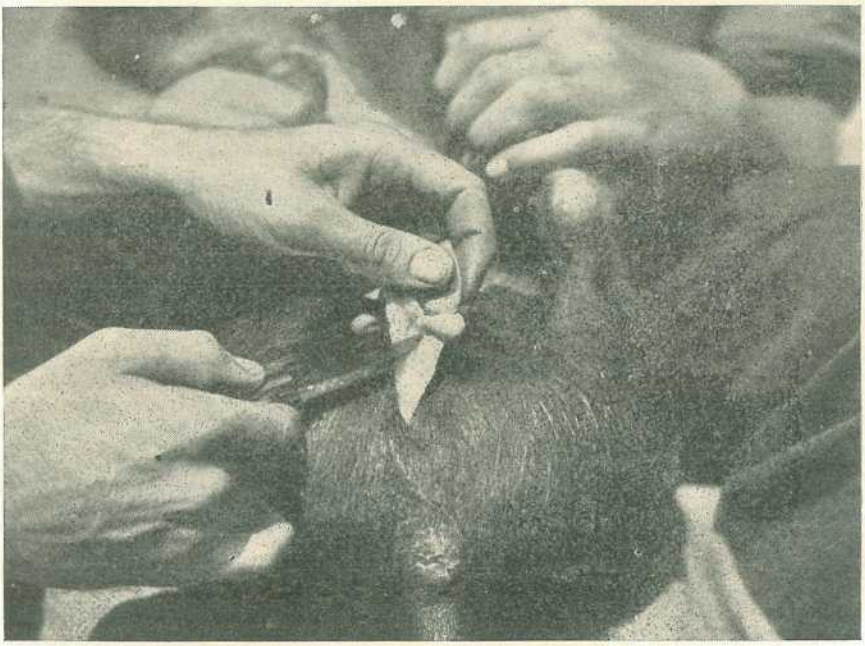


Plate 98.
CUTTING THROUGH THE THIN TISSUE BEFORE SCRAPING THE TESTICLE FREE.

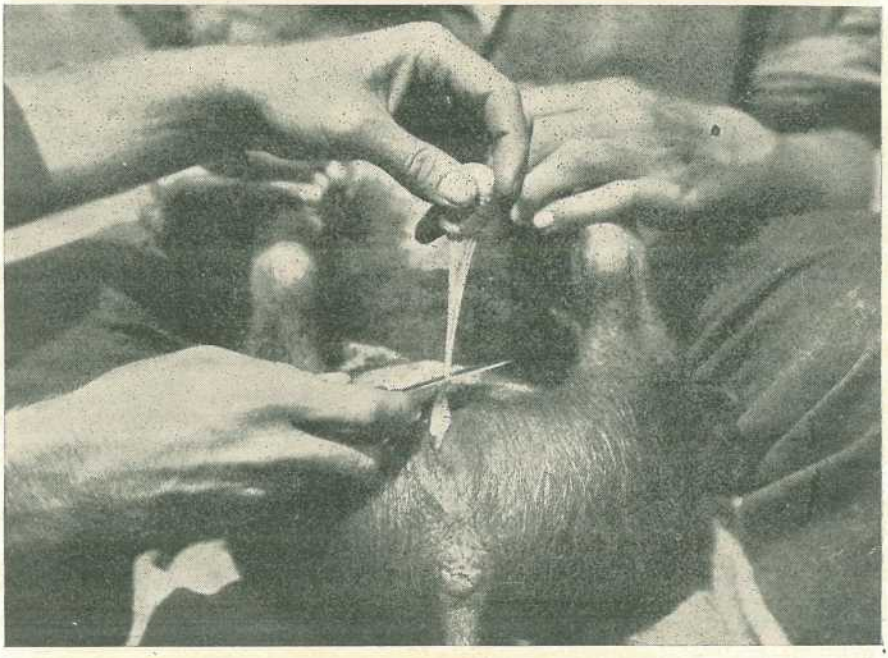


Plate 99.
SHOWING THE TESTICLE DRAWN OUT AND THE CORD BEING SCRAPED.

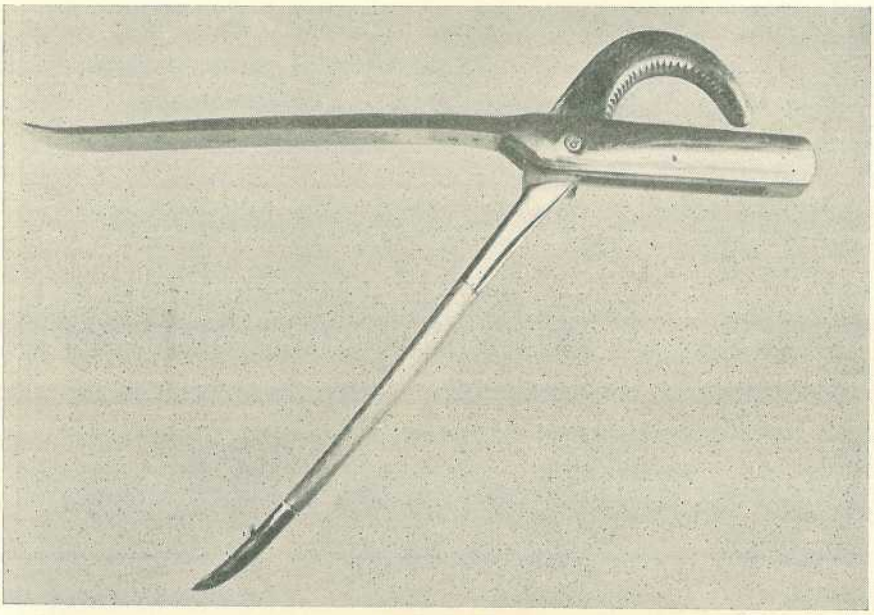


Plate 100.
AN EMASCULATOR FOR USE ON AGED BOARS.

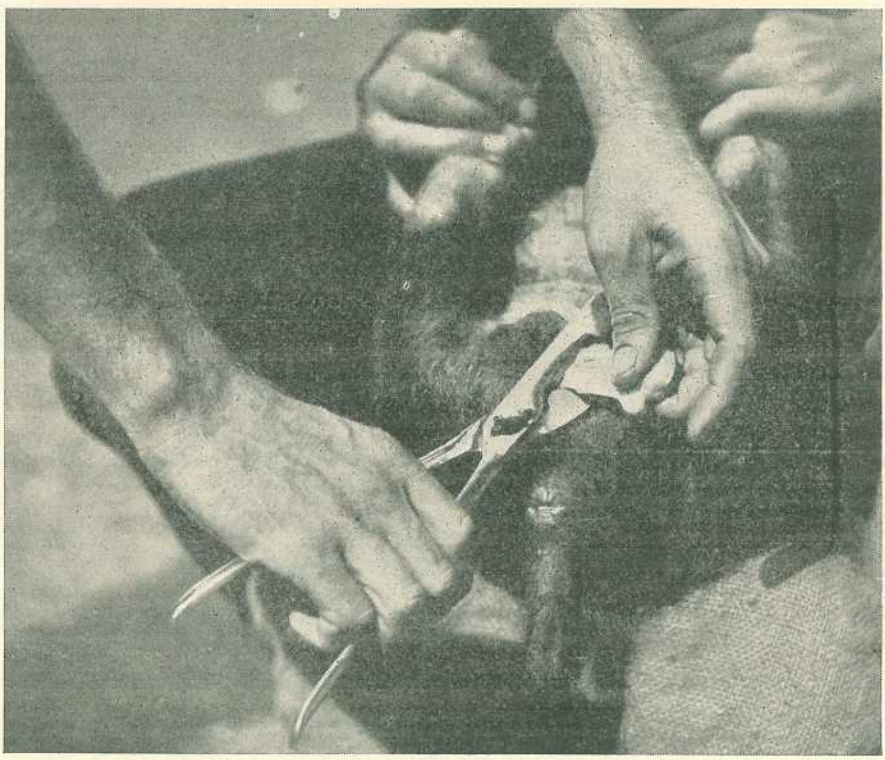


Plate 101.
USING THE EMASCULATOR AS IN THE CASE OF A WELL-GROWN BOAR.

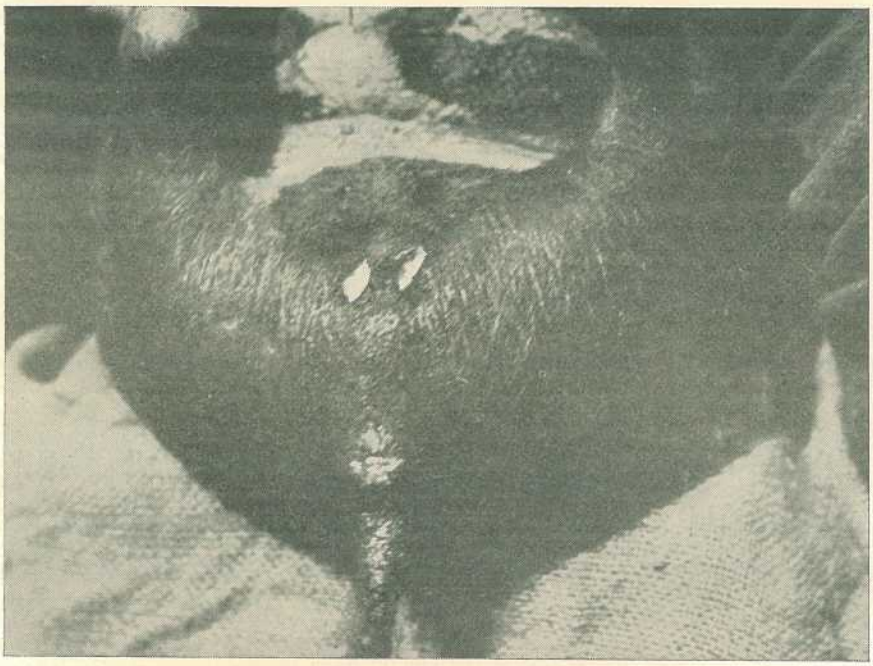


Plate 102.
SHOWING THE OPERATION COMPLETED.

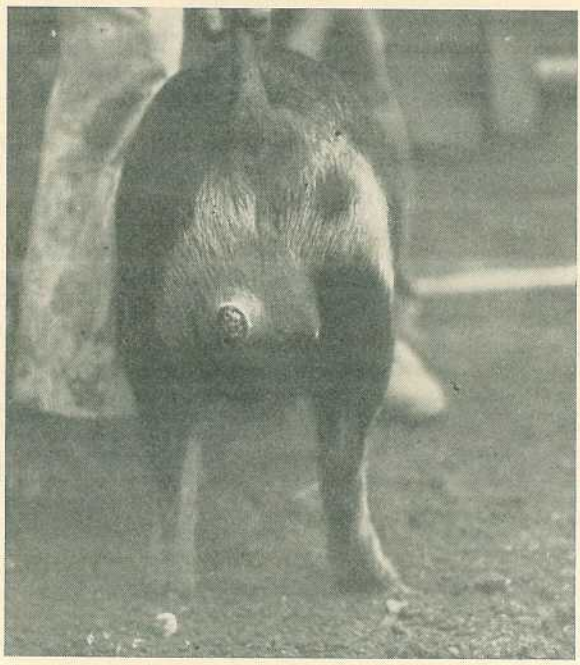


Plate 103.
ABSCESSED AREAS RESULTING FROM INCORRECT CASTRATION.

ASTRONOMICAL DATA FOR QUEENSLAND.

MAY

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

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.13	5.17	Cairns	12	46	Longreach	28	42
6	6.16	5.13	Charleville ..	25	29	Quilpie	36	34
11	6.19	5.09	Cloncurry	38	61	Rockhampton ..	2	18
16	6.21	5.06	Cunnamulla ..	30	28	Roma	16	18
21	6.24	5.04	Dirranbandi ..	21	17	Townsville ..	11	38
26	6.27	5.02	Emerald	13	26	Winton	31	50
31	6.29	5.00	Hughenden ..	23	47	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	8.43	7.06
2	9.43	7.56
3	10.41	8.53
4	11.35	9.56
	p.m.	
5	12.23	11.01
6	1.06	..
		a.m.
7	1.45	12.07
8	2.21	1.12
9	2.56	2.17
10	3.31	3.23
11	4.07	4.29
12	4.48	5.38
13	5.33	6.48
14	6.24	7.58
15	7.22	9.04
16	8.22	10.04
17	9.23	10.56
18	10.22	11.41
		p.m.
19	11.20	12.19
20	..	2.52
	a.m.	
21	12.15	1.21
22	1.07	1.48
23	1.59	2.15
24	2.50	2.42
25	3.43	3.11
26	4.38	3.43
27	5.35	4.20
28	6.35	5.02
29	7.35	5.52
30	8.35	6.48
31	9.31	7.49

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

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

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	30	25	45	0	21	27	53
6	12	26	27	42	2	17	30	49
11	24	15	40	31	15	6	46	35
16	30	9	46	23	21	1	54	26
21	24	15	40	31	15	7	46	35
26	13	26	29	42	3	17	32	49
31	9	30	25	45	0	21	26	53

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	5	55	35	67	19	52	5	45
3	2	56	33	67	17	53	3	46
5	7	50	36	63	20	49	7	42
7	17	45	41	60	26	46	15	37
9	28	33	50	54	34	38	24	29
11	41	20	57	44	42	29	34	18
13	52	8	66	36	50	21	43	8
15	56	2	68	32	52	17	46	3
17	53	4	67	33	50	19	44	5
19	44	11	61	38	45	23	37	11
21	40	21	57	44	42	29	33	18
23	30	31	51	51	35	36	25	26
25	20	40	43	58	28	43	17	34
27	10	49	37	63	22	49	9	41
29	3	56	34	67	18	53	4	46
31	2	55	33	67	17	52	3	45

Phases of the Moon.—First Quarter, May 6th, 7.33 a.m.; Full Moon, May 12th, 10.51 p.m.; Last Quarter, May 20th, 5.22 a.m.; New Moon, May 28th, 8.24 a.m.

On May 12th the Sun will rise and set 20 degrees north of true east and true west respectively, and on the 10th and 23rd the Moon will rise and set at true east and true west respectively.

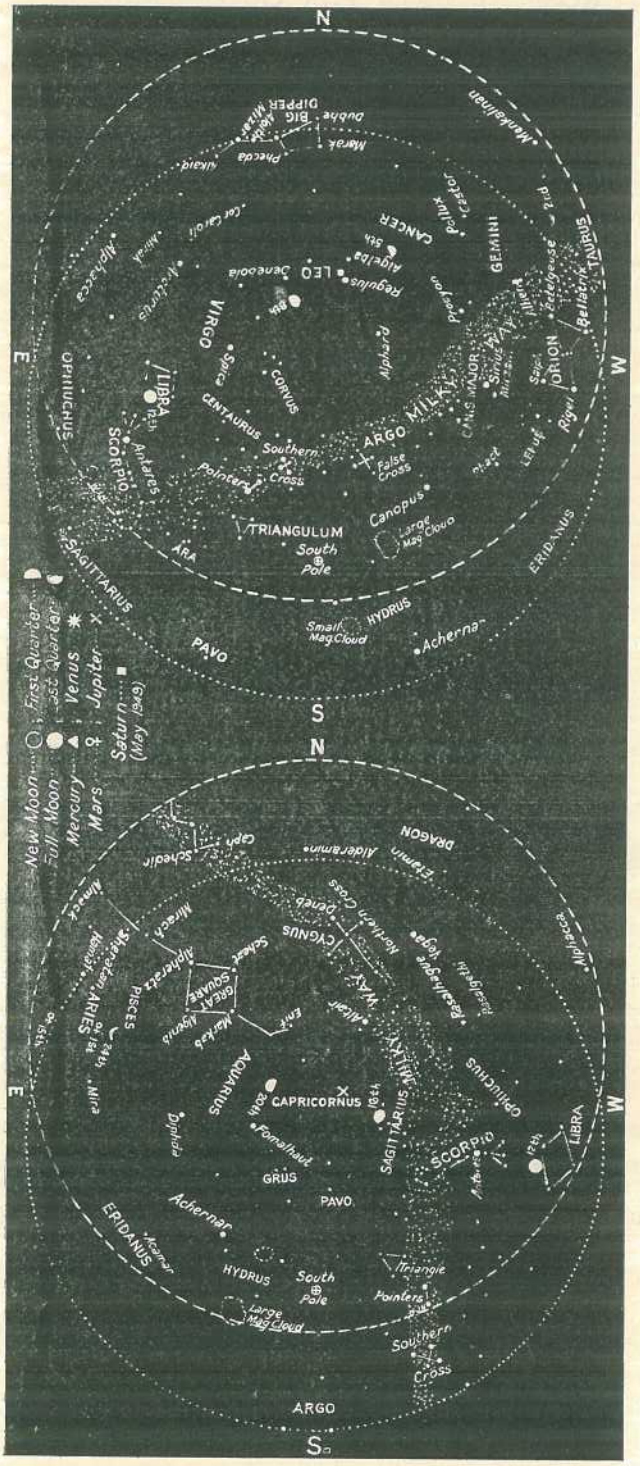
Mercury.—On the 1st, in the constellation of Taurus will set about 1 hour after sunset, and after reaching greatest angle east of the Sun on the 10th, when it will set 1 hour 10 minutes after the Sun, it will appear stationary on the 23rd, after which it will begin to approach the Sun and by the end of May will set less than half-one hour after Sunset. On the 27th it will pass less than one degree to the south of Venus.

Venus.—Too close to the Sun for observation at the beginning of the month but towards the end of the month, in the constellation of Taurus may be seen low in the west during evening twilight.

Mars.—In the constellation of Aries, will rise 45 minutes before the Sun at the beginning of the month and about 1¼ hours before the Sun at the end of the month.

Jupiter.—Now rising a couple of hours before midnight, in the constellation of Capricornus. By the end of May it will rise between 8.45 p.m. and 10 p.m.

Saturn.—In the constellation of Leo, not far from Regulus, will rise during the afternoon daylight hours, and by the end of the month will have reached the western section of the sky by nightfall. On the 31st it will set between 11 p.m. and midnight.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland, to 8.15 p.m. along the Northern Territory border on the 15th May. (For every degree of longitude we go west, the time increase by 4 minutes.) The chart on the left is for 10 hours later On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North hold "N" at the bottom; when facing South hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.