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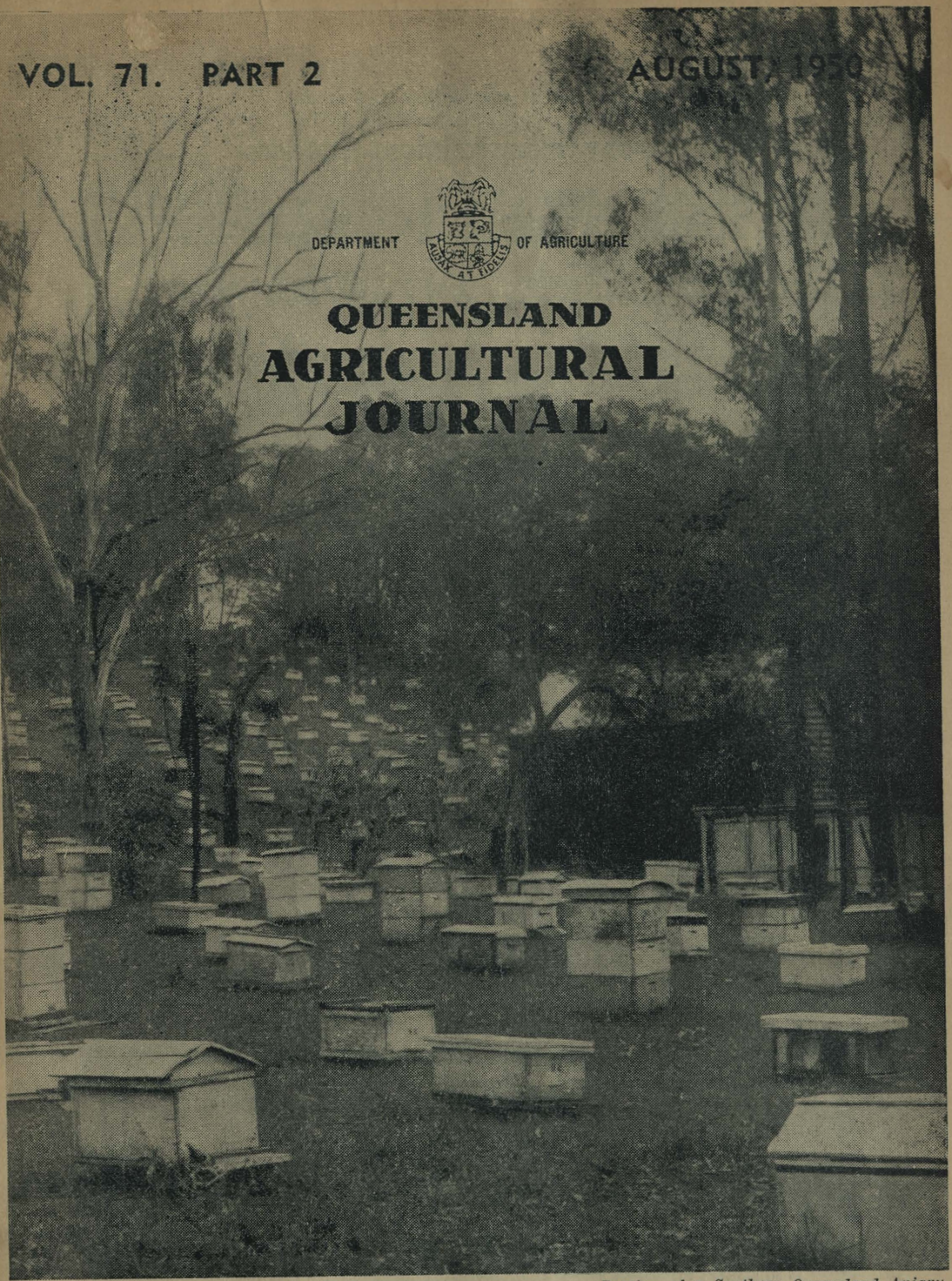

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Contents

Soil Conservation in Queensland.

J. E. LADEWIG, Senior Soil Conservationist, and A. F. SKINNER, Soil Conservationist.

5. Contour Banks.

In preceding articles in this series, due emphasis has been placed on the fact that soil conservation is essentially a commonsense matter of using land for purposes for which it is best suited, or, in other words, of making due allowance for the limitations to its permanent safety and security from erosion imposed by topographical and climatological conditions.

A second basic necessity for the defence of cultivated land against erosion is a sound system of soil husbandry. This is essential for the maintenance of its vitality and physical characteristics if it is to retain its capacity to rapidly absorb rainwater as it falls and thus reduce soil and water losses to a minimum.

These matters are of paramount importance in the prevention of soil erosion and have been repeated at the commencement of this section on contour banks, because of the tendency of farmers to accept the latter as a "cure-all" for erosion and often as a substitute for planned systems of rotational cropping and proper soil management.

Surface drainage schemes cannot be expected to do more than prevent for a time the accumulation of damaging concentrations of water in depressions down the slope and thus check the ultimate development of gullies. *Drainage schemes alone cannot control the insidious process of sheet erosion, which, although less spectacular than gully erosion, is often more serious.* A combination of contour drainage with soil protecting and soil building farming methods is, however, of maximum value in reducing soil and water losses from sloping cultivated land.

The type of drainage structure most commonly used on cultivated land is the *contour bank,* which is also widely referred to elsewhere as either a *graded bank* or a *contour terrace.*

Contour banks serve to intercept runoff water at frequent intervals down a slope before it gains erosive velocity, and then divert it at a very low rate around the slope to a safe point for disposal. They are so named because they closely follow level lines or contours. To obtain the necessary gradient for drainage to either one or both ends of a bank, a slight deviation from the true contour is made.

All ploughing, planting, and cultivating operations should be performed in strips between, and parallel to, the banks. *In no circumstances should tillage implements be operated over the banks* Contour working of the land is necessary, not only for the protection and maintenance of the banks, but also to assist in reducing runoff. Each implement tyne mark, being approximately level, acts as a small dam which serves to trap and hold some water that would otherwise be lost.

Plate 32.

A Contour Bank on the Darling Downs.—Note that tyne marks are parallel to the bank and so act as a number of miniature dams.

Contour banks on cultivated fields divert water from a short direct downward course to a much longer and indirect course around the slope. In addition to the advantages already indicated, two other benefits are derived from this drainage plan. Firstly, it helps to reduce the risk of damage to lower land and to watercourses by reducing the final concentrated volume of runoff.

By causing runoff water to follow a long, indirect course around contours, it will be apparent that by the time water from remote parts of a field arrives at the bottom the runoff from lower parts of the same field will have escaped. In such circumstances the load on drainage depressions (and the attendant risk of damage) will be appreciably less than it would be if the water followed the most direct course from the same field. In this way the rapid accumulation of water into turbulent torrents can be largely prevented.

The second benefit derived is the absorption of additional moisture by the soil along each contour bank channel due to the additional time that the water is held on the land.

TYPES OF BANKS.

Various types of contour banks may be utilised for soil conservation purposes, the type chosen depending on soil type, degree of slope, and prevailing agricultural practices.

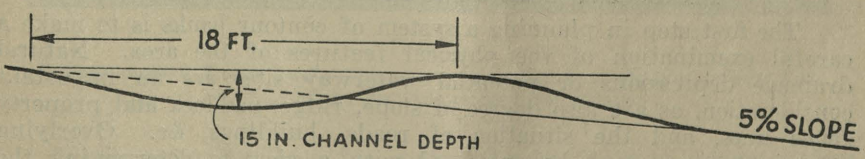
The one most commonly used is the broad base bank, usually constructed on gentle slopes, where soil for the bank is obtained almost equally from both sides of the centre line of the bank. This bank finds general application on soils which tend to crack when dry. It is particularly suitable for cereal-growing areas, where cultivation and sowing operations can be conducted along the length of the bank and channel.

Plate 33.

A Typical Broad Base Contour Bank on a 6 Per Cent. Slope.—This type of bank is well suited to cereal agriculture.

Where weed control presents problems, it is important that the dimensions of the bank be sufficient to enable standard farm implements to be worked along the bank and channel without "bridging."

The following diagram shows suitable dimensions for a bank of this type constructed on a 5 per cent. slope.



Under certain conditions narrower banks with a more abrupt upper face are justified because of lower construction costs. The cropping of the whole of such banks is usually not possible; to inhibit weed growth on banks of this type, they are usually sown to a permanent

cover of grass. In succeeding years it is often possible to gradually increase the size and shape to more closely approximate the type indicated above.

On the very steep arable lands of the State, where the construction of the orthodox type of broad base bank is a practical impossibility, a smaller bank with a deeper and narrower flat-bottomed channel is necessarily utilised (Plate 34).

Plate 34.

The Type of Bank Most Suitable for Slopes in Excess of 10 Per Cent.

PLANNING THE CONTOUR BANK SYSTEM.

The first step in planning a system of contour banks is to make a careful examination of the physical features of the area. Natural drainage depressions or potential waterway sites are an important consideration, as are also degree of slope, ridge, paddock and property fence lines, and the situation of roads, buildings, &c. Overlying catchment areas must be examined with a view to determining the need for diversion or other structures, and lower areas examined in respect of disposal of water. In the preliminary planning, all necessary contour banking for the whole farm must be considered, so that it can be dovetailed into the complete farm plan; any necessary rearrangement of fences, roads, &c., should be planned at this juncture.

In this planning, immediate consideration must also be given to the question of access for implements, stock, &c., to all parts of the farm; as a general rule the access to a field should be at a point most remote from the outlet or waterway end of the banks. This is to ensure that the banks will be crossed at their origin end, where they will be carrying a minimum amount of water; it will be apparent that banks carry a maximum flow at the outlet end and must not be weakened at this point by the passage of traffic.

The installation of a contour bank system should not go beyond the planning stage unless a stable outlet is available or until a waterway has been constructed and vegetated. With the water disposal systems in order, contour bank lines may be marked out and construction proceeded with.

MARKING OUT CONTOUR BANK LINES.

For marking out contour bank lines some kind of levelling instrument is necessary. Many simple devices have been designed for use by farmers in surveying contour bank lines, but in general it is unwise to utilise makeshift devices for the designing of permanent structures such as these. It is preferable to utilise accurate instruments even though the initial surveying cost may be higher; a reasonably accurate surveying instrument is now available at a cost of £40, which is within the reach of farmers on a group basis.

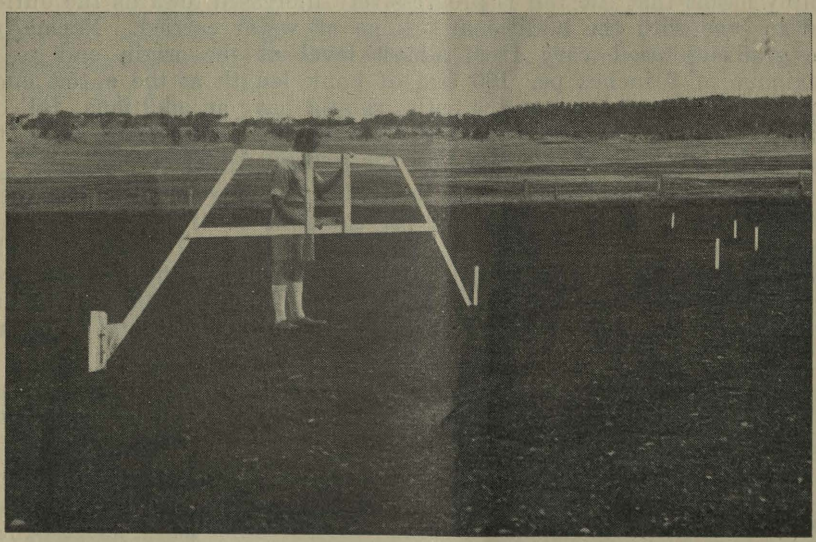


Plate 35.

A Home-made A Frame Level.—This was once used extensively but has now been superseded by accurate modern instruments.

When surveying lines for contour banks, it is necessary to first determine the slope of the land at the site of the first bank preparatory to selecting the proper spacing for the banks. Bank spacing is then determined by examination of Table 1. Wider experience under Queensland conditions may necessitate modification of this spacing table, but for the present it represents a safe, yet practical, spacing formula.

Provided that sound cropping systems are practised and that all ploughing and cultivating is done on the contour, it is possible to increase these spacings under certain conditions.

TABLE 1.

DISTANCES BETWEEN CONTOUR BANKS ON VARIOUS SLOPES.

Slope.	Vertical Interval.	Horizontal Distance.
Per cent.	Feet.	Feet.
2	4·00	200
3	4·50	150
4	5·40	135
5	6·00	120
6	6·30	105
7	6·65	95
8	6·80	85
9	7·20	80
10	7·50	75

Having decided upon the correct spacing of banks for the particular area, the next matter for consideration is the gradient or fall which will be required to safely transport the anticipated runoff without risk of either scouring the channel or of overtopping the bank.

For agricultural areas of moderate slope, and particularly where long banks are intended, a variable grade is recommended. This simply means that the fall is progressively increased towards the outlet end to cope with the additional volume of water carried. Normally, the gradients used vary from almost level at the origin end to a maximum of 6 inches per 100 feet of bank length at the outlet end. The last 20 feet of bank at the outlet should have an additional fall of from 9 to 12 inches to compensate for the channel excavation and to ensure the free escape of water into the grassed waterway.

As an example of the above, a bank 900 feet long would be designed with a fall of 1 inch per 100 feet for the first 300 feet, 2 inches per 100 feet for the second 300 feet, and 3 inches per 100 feet for the third 300 feet, with an additional fall of 9 inches in the last 20 feet. A bank 1,500 feet long would have a fall of 1 inch per 100 feet in the first 300 feet, 2 inches per 100 feet in the second 300 feet, and so on up to 5 inches per 100 feet in the last 300 feet.

In special cases, particularly on the very steep horticultural areas, steeper gradients than the above are utilised. These will be dealt with in a subsequent article.

With respect to bank length, it is preferable that they should be of maximum safe length to facilitate cultural operations by reducing the amount of turning to a minimum. On the other hand, short banks do not have to carry nearly as much water as long banks and are therefore safer and need not be as large. In normal practice a bank length of 2,000 feet should not be exceeded. Where a bank is divided in the centre and drains both ways, the total length can obviously be doubled.

With the design features decided, the first bank is marked out at the necessary distance (as shown in the table) below the protective diversion bank or crest of the slope.

As far as practicable the bank should be surveyed from the outlet end.

Plate 36.
Surveying a Bank Line Using a Simple Levelling Instrument Costing About £10.

Having established the starting point of the top bank at a site near the outlet end, the line is run back across the paddock, readings being taken every 100 feet in even country and every 50 feet where the topography is irregular.

The method advocated is the use of a suitable surveying level and staff. The staff-man places the staff on the peg near the outlet end, and with the level set up about 300 feet along the anticipated bank line a reading is taken and the target on the staff moved to the desired position.

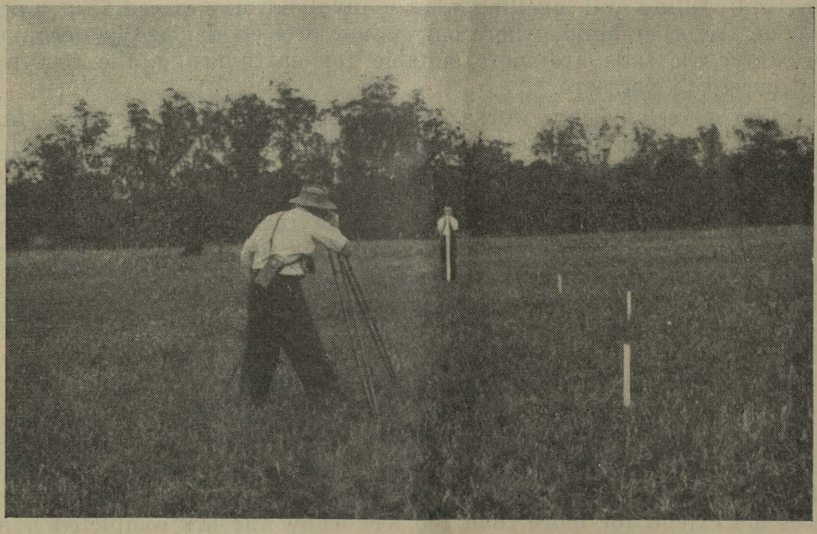


Plate 37.
Surveying a Bank Line with an Accurate Modern Instrument.

The staff-man now paces 100 feet towards the level, moving the target on the staff downwards the number of inches of gradient to be used; a reading is taken and the staff-man moves up or down slope until the target on the staff is in line with the cross-hair of the level. This procedure is repeated across the field until the staff-man is 300 feet on the other side of the level. At this point the level is set up a further 300 feet beyond the staff-man and a backsight reading taken on the staff, the target being moved up or down on the staff until it is in line with the cross-hair of the level. The process is repeated until the bank is marked out completely. To mark the site of the next bank the level is set up at the outlet end, the per cent. slope determined, and the distance measured as before. This is pegged, and the second bank marked in the same manner as the first.

A target on the staff is not a necessity, as direct readings may be taken on the staff with the level and the gradient allowance made by the man operating the level. Farmers contemplating this work are advised to request the advice and assistance of the nearest officer of the Department of Agriculture and Stock.

THE CONSTRUCTION OF CONTOUR BANKS.

The anticipated time and cost involved in the construction of contour banks often act as a deterrent to their adoption on many of the farms where they are most required; however, experience has indicated that they can be constructed quite satisfactorily with a very wide range of implements and the cost factor varies accordingly. The method to be adopted will depend largely on the topography and the extent of gully erosion present on the land prior to treatment, and upon the financial and equipment resources of the landowner.

Where large earthmoving plant is utilised, the construction of contour banks and the associated gully filling and land levelling work can be carried out efficiently and expeditiously; immediate expenditure may be high, but the speed and ease of execution usually justifies this outlay. The cost of reclamation on severely eroded fields where extensive gully filling and levelling work is involved may exceed £5 per acre, but on the other hand, where only minor erosion damage has occurred or where the soils are more suitable for earthmoving, the cost may not exceed £1 per acre.

These reclamation works can be effectively executed by farm tractors of suitable horse-power either with farm dozers attached or drawing either a multiple furrow plough or a small grader. When the work is done with this equipment it is much slower than with large earthmoving plant, but it possesses the saving advantages that it can be executed in sections, at times convenient to the farmer, and for a much lower "out of pocket" expenditure. Although different types of light dozer attachments for farm tractors are now on the market, many farmers in Queensland have successfully designed and constructed their own.

Banking a Gullied Field.

Before contour bank construction is commenced on a badly eroded field, it is usually necessary to at least partly fill the gullies and carry out some initial levelling work. Care should be exercised to ensure that the filling and levelling is done in sections so that the levelled area does not extend for more than 150 feet below the last completed bank; this will avoid serious losses should erosive rains fall before the banking programme is completed.

Plate 38.

A Home-made Dozer Attached to a Farm Tractor being used in the Construction of a Diversion Bank.

Where large gullies are to be filled, a dozer unit is usually necessary; small dozers attached to farm tractors will execute this work satisfactorily if the gully edges are ploughed beforehand. The final levelling of the field can be most effectively done with the various types of "levelling boards" normally used to level land for irrigation purposes.

Building Contour Banks with a Plough by the Island Method.

The construction of contour banks with any type of implement can usually be most efficiently performed where the Island system of construction is adopted, and this applies particularly where farm ploughs are the implements used. When this system is utilised a strip of unploughed soil is left, on which the contour bank is finally built; by adopting this method a considerable amount of earthmoving work is avoided.

On the steeper arable lands of the State, or where slopes exceed 6 per cent., it is most economical to form the banks by moving the entire mass of soil from the upper or channel side. The Island method will not apply to these slopes, and construction methods for these will be described later.

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

The number of rounds to be made will depend on the size of the plough and the efficiency of operation; a five-furrow disc plough has been used for the purposes of this publication, but appropriate allowances can be made where ploughs of other dimensions are used. In order to more clearly describe the construction method the pegs have been replaced after each round of the plough so that the published photographs will illustrate the relative position of the bank to the pegged line.

First Series of Three Rounds:

The first trip of the plough is made with the tractor centreing on 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, a point about half-way up the top side of the bank will correspond to the original survey line.

When the far end of the bank has been reached, the stakes are moved downhill to mark the width of a uniform island illustrated in Plate 39; if desired, the island can be marked at the time the upper line is being surveyed. The width of the island varies according to slope and width of bank desired, as is indicated in Table 2.

Plate 39.

A uniform width for the island may be marked by two men carrying a rope or stick of the required length, one tracing the path of the original survey line, the other placing stakes below it at the other end of the measuring device. A modification of this method may be adopted by utilising an implement of the appropriate width, and the bottom edge of the line marked by that implement becomes the guide line for the return trip.

TABLE 2.

SUGGESTED ISLAND WIDTHS FOR DIFFERENT SLOPES.

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

Plate 39 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, fifteen furrows have been turned downhill on the top side and 15 furrows uphill on the lower side of the island. If a two-disc plough were used, this would represent seven rounds; for a three-disc, five rounds.

Second Series:

After completing three rounds (15 furrows), the plough is utilised to roll the soil on to the island; the plough is advanced 12 inches closer in on the island to commence this round.

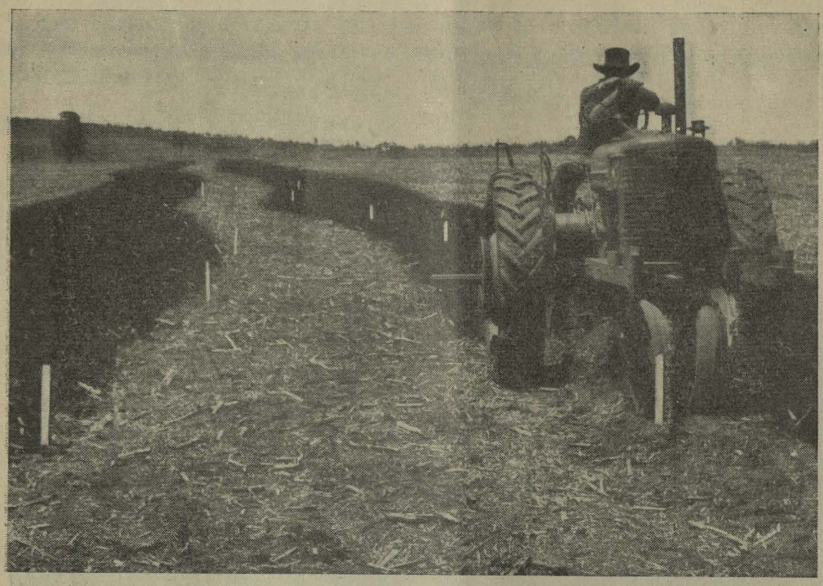


Plate 40.

Plate 41.

Plate 40 shows this being done on the upper side, and Plate 41 indicates the same procedure on the lower side.

A further two rounds advance the soil mass 12 inches closer to the island, and complete a total of 15 furrows (seven rounds with a two-disc plough) for the second series.

In a previous publication, "Building Contour Banks with a Plough by the Island Method," a system was described in which there was no "step in" to the island on the bottom side for rounds 4, 5 and 6; whilst that method is quite effective, it tends to leave a hollow on the lower side of the bank which is reduced in the method now being described.

Plate 42.

Plate 43.

Third Series:

For the third series the plough is again advanced 12 inches further on to the island on both the upper and lower sides; the first half of this round (upper side) is illustrated in Plate 42, and the second half (lower side) in Plate 43.

A further two rounds are necessary to complete the third series of 15 furrows; a total of seven rounds for this series if a two-disc plough is used.

Fourth Series:

In this series the plough is again advanced 12 inches further on to the island on the upper side, but in this series no "step in" is made on the island on the lower side; ploughing is simply continued out into the field on the lower side. The operation on the upper side is shown in Plate 44.

Plate 44.

A further two rounds follow, moving soil in towards the island on the upper side, and ploughing out into the land on the lower. This completes 15 furrows for the fourth series, representing seven rounds for a two-furrow disc plough.

Fifth Series:

The plough is again advanced 12 inches on to the island on the upper side, as illustrated in Plate 45, and with a "step in" of 12 inches on the lower side, shown in Plate 46.

The channel begins to form as the dead furrow widens on the upper (right) side, and the island of unploughed soil has almost disappeared; a further two rounds on upper and lower sides complete this series.

Plate 45.

Plate 46.

Sixth Series:

In the opening round of this series, the plough is advanced so that the soil from upper and lower sides meets as a crown. In this series the opening run is done on the lower side to reduce the difficulty of throwing soil up slope against the crown (Plate 47); the return run of this round then completes the crown for the upper side (Plate 48).

Plate 47.

Plate 48.

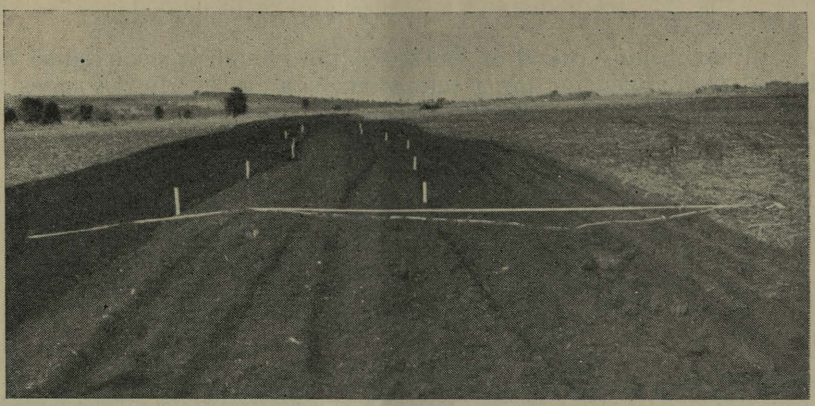


Plate 49.

Plate 50.

The remaining two rounds of this series complete the bank insofar as plough work is concerned.

Plate 49 shows the completed bank at the end of the sixth series, including a total of 18 complete rounds with a five-disc plough; this represents 42 rounds with a two-disc or mouldboard plough, and 30 rounds with a three-disc plough. When a sundercut is used, similar principles apply, though the "step in" allowed is usually less and a slightly wider area is ploughed.

The appearance of plough built banks may be improved by the use of a light grader drawn by a farm tractor, to trim off irregularities, provide a better cross-section, and to improve the capacity of the bank. Plate 50 shows the completed bank after two trimming rounds with a grader ditcher.

[TO BE CONTINUED.]

Agriculture in the Fassifern Area.

W. G. STEELE, Senior Adviser in Agriculture.

THE area to be discussed in this article extends from Harrisville, sixteen miles due south of Ipswich, to the McPherson Range on the Queensland-New South Wales border, a distance of approximately thirty miles. The western boundary, except for a few miles at the northern end of the district, is the Main Dividing Range, which along this section contains some of the highest peaks in southern Queensland. Spicer's Peak, Mt. Huntley and Mt. Roberts are all over 4,000 feet. On the eastern side, the hills of the Teviot Range, halfway between Boonah and Beaudesert, form the boundary of the district. Thus the district is actually situated in the angle formed by the junction of the McPherson and Main Dividing Ranges, and consequently the greater portion of the area consists of more or less elevated country interspersed with small valleys and creek flats.

The railway line from Ipswich branches at Munbilla, approximately 25 miles from the city. One branch traverses the hills and terminates at Dugandan, one mile beyond Boonah, and the other swings a little to the west, descends fairly rapidly to the floor of the valley, and passes through Kalbar, Fassifern and Aratula to Mt. Edwards.

Settlement of the district commenced shortly after 1840, when grazing selections were first taken up. Sheep were tried in the early days but gave way to cattle after a few years. About 1900, dairy cattle were beginning to increase in numbers and a butter factory was established. By 1910, with the introduction of closer settlement, farming had become the main agricultural industry; dairying, pig raising and the cultivation of field crops were the major forms of production, and these still hold pride of place.

The bulk of the land to-day is held on a freehold basis, and very little scope exists for further subdivision. The area is well watered by four main watercourses. Warrill and Reynolds Creeks traverse the district from south to north, and after joining at a point near Kalbar, empty into the Bremer River. The Teviot Creek flows from Wilson's Peak northwards to Boonah and then turns to the east, where it passes through the Teviot Range and runs into the Logan River. Burnett Creek has its source close to the Teviot but does not follow the same direction, as it swings to the east and passes through the Maroon district to near Rathdowney, where it joins the Upper Logan.

CLIMATE.

The average annual rainfall at Boonah over a period of 45 years is 32.68 inches. This can be taken as a fair indication of the registration for an area within a radius of six miles from Boonah, but there appears to be a gradual falling off towards the north, where the Kalbar average is about an inch less than Boonah, with Harrisville two inches lower. In the foothills below the ranges the average yearly rainfall is probably over 40 inches, as rain frequently falls there in the wet season when the bulk of the district receives no rain.

It is interesting to note that records of Coochin Coochin Station, about six miles in a straight line from Boonah, which commence about 1880, show annual falls of up to 50 inches, with an average for the first ten years of about 45 inches. This average gradually declined until by about 1905 it was very close to that shown for Boonah.

Plate 51.

Farms on Brigalow-Softwood Scrub Country near Boonah.

In common with the general trend for this section of the State, the bulk of the rain falls in the December to March period. In most years, however, the month of June, with an average of about 2½ inches, provides good moisture for winter fodder crops. Generally speaking, periods of actual drought are rare compared with many other districts of Queensland. While summer temperatures are sometimes high, the scrub areas with their moisture retaining subsoils can support crops for fairly long dry periods without serious growth checks. The rainfall in September, October, and November varies considerably from year to year, but storms in this period usually provide sufficient moisture for most crops. Early planted maize crops, however, sometimes suffer as a result of this irregularity. In the winter, frosts are consistent, and these may continue well into August and occasionally September. In the scrub areas, the elevation minimises the risk of late frosts and permits the planting of a number of frost susceptible crops, such as maize, tomatoes and cucurbits, much earlier than on the alluvial country.

SOILS AND VEGETATION.

The area can be broadly divided on the basis of soils and vegetation into three main types of country, which very largely influence the particular types of farming activities carried on in the various districts. These are discussed in the following sections.

Elevated Brigalow-Softwood Scrub Country.

This area extends from just north of Roadvale to Mt. Alford, a distance of approximately 17 miles, and has a width varying from two to eight miles. Roadvale, Teviotville, Kulgun, Kalbar and Templin are the main centres to the north of Boonah, and Dugandan, Milford and Bunjurgen to the east and south.

The soils, which vary in colour from light brown to dark grey, are clay loams overlying stiff clay subsoils; the depth of the surface soil is from four inches to eight inches as a rule. On some of the upper slopes, lighter loams, varying in colour from red to dark brown, are found in small areas. Practically no timber remains on the lower and middle slopes, but is found only on the upper slopes where the land is too steep for cultivation. On the eastern and western upper slopes of Mt. French, between Boonah and Aratula, a heavy cover of lantana exists, but on the main scrub areas this pest is not widespread.

Holdings in the scrub districts are small, generally between 90 and 100 acres, but with many smaller areas down to 60 acres. Dairying, combined with pig raising and the growing of maize, pumpkins and occasional vegetable crops, is the main industry.

The fertility of the soils is high and little use is made of artificial fertilizers.

While steeply undulating in places, the bulk of the land can be ploughed; at times slopes of over 15 per cent. are cultivated. Paddocks as a rule are small, from 2 to 12 acres in extent, and this fact probably accounts for the low rate of soil erosion. Considering the length of time some of the farms have been cultivated, it is surprising that serious erosion has not occurred. The probable explanation is that with the small paddocks there are no long runs of water and with row crops interspersed with cover crops, such as lucerne, cowpeas, oats and other grazing crops, a modified form of strip cropping is achieved. Furthermore, the surface soil for the most part has a well developed structure (that is, it has a good tilth) which favours rainfall absorption and minimises run-off.

Erosion has occurred and is still occurring, however, as evidenced by the yellow, stunted patches frequently seen in sorghum fields in summer and oat paddocks in winter, indicating that the subsoil has been reached. If general soil deterioration is to be prevented, measures must be taken by the farming community to check further loss. The ploughing-in of maize stubble and similar organic material should be adopted by all farmers and burning-off should be discontinued. Cultivation should follow the contours, and gullies should be left in grass. If these methods are followed, it is likely that extensive earthworks will not be necessary.

The Alluvial Flats.

Soils in these areas range from deep sandy loams to heavy clays, varying in colour from light brown to dark grey. The lighter alluvials generally are found along Reynolds Creek in the Charlwood area, and along parts of Warrill Creek near Aratula and Tarome. These are good potato soils. Other sections of the Warrill Creek lands are of a heavier nature and in places the alluvial merges into a heavy "black earth" type. This is particularly so below Kalbar, where the prevailing soil types are clay loams to clays, except for a few chains adjacent to the creek. While such soils are heavier than the normally recognised potato soils, nevertheless they are capable of producing good crops of potatoes. Further down Warrill Creek, on the eastern side near Wilson's Plains and Harrisville, an extensive area of black soil occurs on which lucerne, wheat and oat crops are grown for making into chaff.

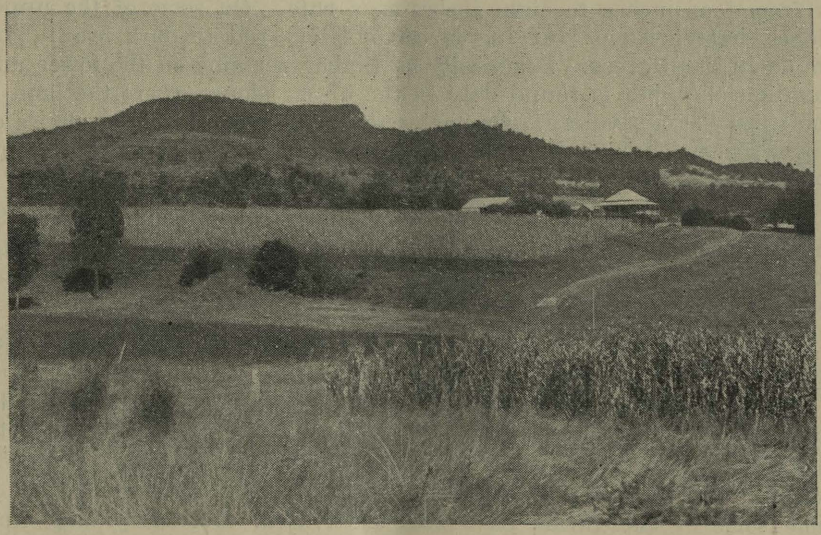


Plate 52.
Maize Growing Below Mount French.

Teviot Creek in its upper reaches traverses the heavy clay loams of the Coochin and Bunjurgen areas where lucerne is extensively grown. Cuts of up to 30 cwt. of hay per acre are taken off and in the flush of the season crops may be ready for harvesting four weeks after the previous cutting. Although water is available from the Teviot, most of the lucerne is grown under dry farming conditions.

The total area of first class alluvial soil is estimated at approximately 10,000 acres. The average size of properties in these sections of the district is about 120 to 130 acres. Such farms are usually made up of about 60 to 70 acres of good alluvial soil and the balance of "back" country which runs up onto poorer ironbark ridges or in some cases onto brigalow scrub. In odd cases where potatoes and other vegetables are grown 30 acres constitutes a living area.

Ironbark Ridge Country.

These areas are not cultivated to any great extent, being used mostly for grazing dairy or beef cattle. The soil in the main is shallow, light brown or grey in colour, and with a clay subsoil; sometimes it overlies sandstone at a shallow depth. Narrowleaf ironbark (*Eucalyptus crebra*), spotted gum (*Eucalyptus maculata*) and Moreton Bay Ash (*Eucalyptus tesselaris*), with pitted blue grass (*Bothriochloa decipiens*) wire grasses (species of *Aristida*) and black spear grass (*Heteropogon contortus*), are the main native plants.

A variation occurs near Harrisville, where the low ridges are composed of dark brown to black clay loam to clay soils. This area extends from Harrisville towards Peak Crossing and in places along the main Warwick Road to Amberley. The dominant vegetation comprises silverleaf ironbark (*Eucalyptus melanophloia*) in association with Queensland blue grass (*Dichanthium sericeum*) and pitted blue grass.

WATER FACILITIES.

The four creeks in the district provide ample water in most seasons for stock and irrigation. Practically all farms along Warrill and Reynolds Creeks are equipped with irrigation plants which pump water from the creeks. In most cases the banks are comparatively low and the water is easily reached. Plants are usually 3–4-inch systems, with the spray lines equipped with butterfly sprinklers, although lately some fixed types have been installed. Power for the pumps is usually supplied by tractor or stationary engine, but the extension of power reticulation along Warrill and Reynolds Creeks is permitting the replacement of these units with electric motors. On a number of farms wells have been sunk at various distances from the creeks and ample water obtained for irrigation. These wells enable irrigation to be carried out during dry periods when watering from the creeks is restricted because of low supply. They also permit additional areas of land to be brought under irrigation without increasing the length of main lines required.

The quality of water in Reynolds and Warrill Creeks is good, as also is that of Burnett Creek. The latter passes through a limited area compared with the other creeks but all farmers along its course utilise the water for irrigation.

Along Teviot Creek, irrigation plants are not so numerous. As mentioned previously, the soils for some distance along the creek are of a heavy nature and not ideal for irrigation. Potatoes are not grown extensively in this area and in most seasons lucerne is apparently able to obtain its water requirements without supplementary irrigation. Salt springs entering the creek at several points also apparently affect the quality of the water for some distance and impair its suitability for irrigation.

In the scrub areas water at times is short. In most cases, dams are the main source of supply, with supplementary supplies from bores. Very often the quality of water in the bores is poor and many samples submitted for analysis have shown from 500 to 1,000 grains of common salt per gallon. Bores generally are from 90 to 150 feet deep and yield 500 or more gallons per hour. The majority of dams are of the overshot type and of small capacity; two or three are usually found on each farm. In the winter months, if autumn rains have been less than usual

or have been of a steady nature, run-off is low and dam water becomes short. However, with the assistance of local boring plants and bull-dozers, conditions are improving.

PASTURES.

Native Pastures.

The bulk of the pastures consist of native species, mainly Queensland blue, rare blue (*Bothriochloa intermedia*), pitted blue and windmill grasses (species of *Chloris*). Three-awned spear grass (*Aristida ramosa*), other wire grasses (species of *Aristida*) and black spear grass are found mostly on the poorer ridge country and the blue grasses on the alluvial soils. Other grasses include kangaroo grass (*Themeda australis*), rat's tail or Parramatta grass (*Sporobolus berteroanus*) and love grasses (species of *Eragrostis*). On the scrub areas, where the acreages are small, most of the land is cultivated and the pasture area frequently consists of the poorer and more broken sections.

Plate 53.

Fassifern Valley Alluvials, from Charlwood.

Introduced Pastures.

Little has been done to improve the carrying capacity of these areas by the development of better pastures and stock owners generally rely on cultivated fodder crops for supplementary feed. Paspalum, however, has become established over a considerable portion of the scrublands and now forms a high proportion of the available pasture on all but the poorest country. It has spread in a similar manner on the better soils of the forest land, particularly adjacent to the watercourses. In most seasons this grass provides a good bulk of feed but is inclined to grow rankly under good conditions, particularly if understocked. This results in the production of a mass of seedheads which are heavily infested with ergot. On scrublands, Rhodes grass (*Chloris gayana*), introduced about 1905, has established itself on country too poor or too dry for paspalum. It appears to be spreading slowly.

Both paspalum and Rhodes grass swards, particularly the former, have become heavily matted and would benefit greatly by renovation and topdressing. Carrying capacity of the better class scrub pastures is estimated at about one beast to three acres, and that of the poorer pasture types one beast to six acres. Beef cattle on the flats and lower slopes are grazed at the rate of about one beast to four or five acres, with one beast to ten acres on the ridges. On several scrub farms small sowings of kikuyu grass (*Pennisetum clandestinum*) have made excellent showings and this grass could be planted more extensively. Odd patches of Para grass (*Brachiaria purpurascens*) have also done well. In the winter, Toowoomba canary grass (*Phalaris tuberosa*) grows rapidly and provides a good body of feed. Trial sowings of Wimmera rye grass (*Lolium rigidum*) have not produced encouraging results.

Pasture Legumes.

Native species include two twining types—rhynchosia (*Rhynchosia minima*) and glycine pea (*Glycine tabacina*)—and tick trefoils (species of *Desmodium*), none of which gives sufficient bulk to be of much benefit; a species of Lespedeza also occurs which shows some promise and is readily eaten by stock. The naturalised burr medic (*Medicago denticulata*) and a small species (*Medicago minima*) are the outstanding legumes in the winter and spring pastures. If ample rain falls in the autumn, a very large body of feed is provided by these species, particularly on the heavier soils.

A species of vetch (*Vicia* sp.) introduced into the Maroon district about fifty years ago also appears regularly in the late autumn and provides a good body of feed which is readily eaten by stock. Isolated patches of this plant have been noted in other parts of the district. White clover (*Trifolium repens*) was first grown in the district at Coochin some years ago. It is now well established on parts of the Coochin flats but apparently requires regular topdressing with superphosphate to make maximum growth. Recent attempts to establish several types of clover have not been very successful, though red clover (*Trifolium pratense*) has made good growth in places.

WEED PROBLEMS.

The main weed problems are associated with cultivated fields and include nut grass, noogoora burr, Johnson grass, bell vine, woolly-top Rhodes grass, star thistle and swamp dock.

Nut Grass (*Cyperus rotundus*).—This weed is confined mostly to the alluvial country, though in places it has become established in scrub areas. While remaining a constant menace, it is kept more or less in check by cultivation and careful management. Lucerne planted in the autumn usually has made sufficient growth by the spring to check the growth of the weed. Spring planted potatoes normally are not troubled because cultivation commences before the "nuts" have made much growth. The autumn potato crop is sometimes affected by excessive growth of the pest if wet weather is prolonged after planting. Small patches are usually dug out by hand and carried off and burnt.

Noogoora burr (*Xanthium pungens*).—Seasonal conditions affect the development of this weed, which is worse in some years than in others. Usually it is controlled by mowing, cultivation or chipping, but increased use is now being made of hormone weed killers.

Johnson grass (*Sorghum halepense*).—In some localities this pest has a good hold. Control has sometimes been obtained by intensive cultivation and fallowing, followed by lucerne or some other cover crop. Sodium chlorate weedicides have been used on isolated patches with good results, and the treatment is expensive for large areas.

Bell Vine or Convolvulus (*Ipomaea plebeia*).—This pest is particularly bad in some scrub areas, where it grows prolifically in maize crops in very wet seasons. The only forms of control practised are cultivation, chipping, and rotating maize with cover crops such as cowpea. Bell vine is susceptible to hormone weedicides.

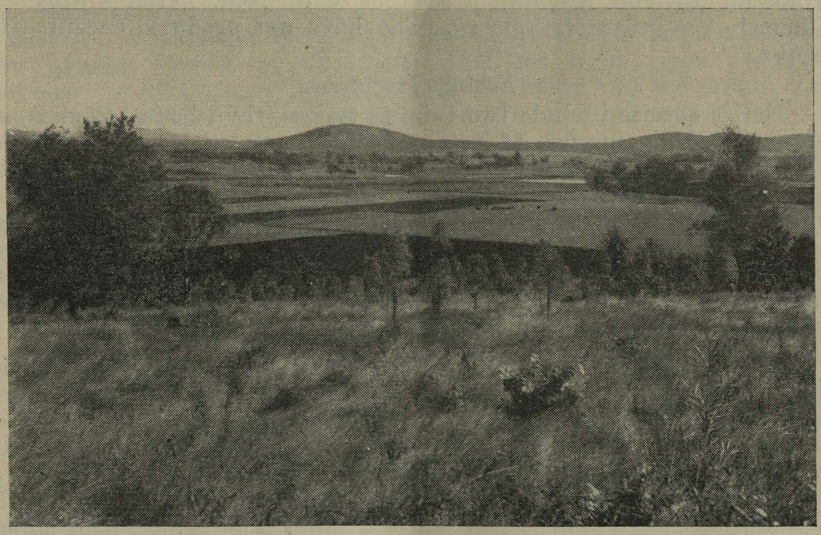


Plate 54.

Alluvial Flats Along Reynolds Creek.—This is an extension of the alluvial country shown in Plate 53.

Woolly-top Rhodes or Feather-top Chloris (*Chloris virgata*).—In alluvial country, woolly-top Rhodes grass often becomes established in declining lucerne stands. Renovation of lucerne paddocks is of considerable assistance in controlling the grass, and topdressing with superphosphate, by keeping the lucerne in active growth, also helps.

Star Thistle (*Centaurea calcitrapa*).—This plant is a new weed which has recently been discovered in lucerne crops in the district. So far it has not spread widely, but is a potential danger.

Swamp Dock (*Rumex brownii*).—This weed has become a common pest of lucerne fields in the last few years. In addition to robbing the lucerne of moisture and plant foods, it also, because of its succulence, makes curing of the hay difficult. Chipping and treating patches with power kerosene are methods used to eradicate the pest.

AGRICULTURAL CROPS.

Potatoes.

The Fassifern district grows an appreciable proportion of the State's crop of potatoes. Practically the entire crop is grown under irrigation along Warrill, Reynolds and Teviot Creeks and to a lesser

extent Burnett Creek. Small areas are grown in the scrub country from Roadvale to Dugandan, but these are non-irrigated and usually do not exceed half an acre in extent. The crop from these plots is used for home consumption and only in good seasons does it add much to the output from the district. In the main producing areas of Aratula, Tarome, Charlwood, Fassifern Valley and Kalbar, the average area is about eight acres, with some growers handling up to 20 acres.

Irrigation from the creeks or wells allows planting to be carried out at the required time without being dependent on rain; all watering is by means of the spray system. Planting times are normally July for the spring crop and February for the autumn crop. Difficulty is sometimes experienced in establishing the autumn crop if wet weather is continuous at planting time. Mid-March is considered to be about the limit for late planting owing to the danger of frost damage. On the other hand, it is not considered advisable to plant later than mid-August for the spring crop, as the later stages of development of the crop will be taking place under conditions of high temperature. Potato crops usually follow lucerne, pumpkins or fodder crops, or are planted following the ploughing-in of a green manurial crop, usually Poona pea. Because of the practice of planting with irrigation, seed for the spring crop is usually cut into fairly small setts so that a planting rate of about four bags per acre is used. Rows are usually placed 27 to 33 inches apart, with plants spaced at 12 to 15 inches in the row. Whole setts are recommended for planting the autumn crop because then there is less risk of rotting under excessively wet conditions. Seed for this latter crop is saved from the spring crop.

In recent years, the use of fertilizers has increased and now most growers use some form of artificial fertilizer for potatoes. Proprietary mixtures containing a high proportion of nitrogen are commonly used with good results. Tests by the Department of Agriculture and Stock have shown that straight sulphate of ammonia gives equally good results. The fertilizer is sown in the drill when planting by hand. Increasing use is being made of mechanical planters, some of which are equipped with fertilizer hoppers.

Factor is the most popular variety and has given excellent results on all farms. Katahdin is probably next in order of popularity, though its tendency to set tubers close to the surface makes it disliked by some growers. The recently introduced Sebago variety appears promising; small areas of Manhattan and Bismarck are also grown.

The handling of the potato crop is highly mechanised in the Fassifern, due chiefly to the fact that an efficient elevator type digger is manufactured in the district. Practically every grower of three acres or more has a mechanical digger of some type. Planters and spray machines for the application of insecticides, of both local and outside manufacture, are also extensively used.

Yields vary with soils and season, but crops of six tons per acre are normally expected on good, well prepared potato land, and 8-10 ton crops are frequently dug.

Lucerne.

Approximately 10,000 acres of this crop are grown and about 75 per cent. of the area is used for grazing dairy cattle or for making hay for consumption on the property. In the scrub areas lucerne fields

rarely exceed five acres in area, and excess growth made during the summer is stored in sheds or stacks. On the alluvial lands larger areas of up to 50 acres or more are grown for hay and chaff. Three pick-up baling machines are now operated in the district and are available for a limited amount of contract work, but most of the hay is cut into chaff. Spray irrigation is used on the crop on Warrill and Reynolds Creeks. Yields vary from 15 cwt. to 30 cwt. per acre and usually average about 18 to 20 cwt.

Maize.

This crop is grown on most farms, but the bulk of approximately 8,000 acres is in the scrub districts. Nearly all the maize grown in the area is used for feeding stock on the growers' own farms and comparatively little is exported.

Yellow Dent strains predominate, but Leaming and Ninety-Day varieties are also favoured. Red maize is not largely grown and there are very few growers of white maize. Hybrid maize is gaining popularity, the strain Q716 having given particularly good results. Yields vary from 24 to 30 bushels per acre in poor seasons to 60 bushels or more under more favourable conditions. Planting may commence as early as July in the elevated scrub areas, but on the alluvial flats August and September are the earliest months for planting. Planting may be continued up to late January but November appears to be the safest month.

Pumpkins.

Both table and cattle types of pumpkins are grown in quantity. On the alluvial country they are grown in rotation with potatoes and irrigated when necessary. In the scrub areas early planting of this crop and other cucurbits sometimes allows the farmer to realise good prices on the market when these vegetables are in short supply.

Grain Sorghum.

Small areas of grain sorghum are grown. Yields of up to 90 bushels have been obtained on good soils and in an average season 60 bushels per acre is a reasonable crop. Wheatland is the variety most widely grown. With the introduction of more headers into the district the area under grain sorghum will probably increase.

Wheat.

The area under this crop has increased over the last few years but probably does not exceed 1,000 acres. Yields as high as 60 bushels per acre have been obtained but the restricted size of properties and the ability to grow more profitable crops limit the expansion of this crop. Warput variety has given good results to date.

Broom Millet.

The area devoted to this crop has declined over the past ten years due mainly to labour shortage. Excellent samples of the crop are still grown, though the Moogerah district is the only one now producing broom millet. The average yield is about 8 cwt. of broom per acre.

Miscellaneous Crops.

Winter and summer fodder crops are grown extensively. Of the former, oats, barley and wheat are the main types, with oats the most widely grown. Field peas are occasionally grown with wheat or oats. Algerian is the most popular variety of oats, while Belah and Buddah are favoured for later sowing.

Summer fodder crops include millets or panicums, Sudan grass and sweet sorghums, the last being the most widely grown. Plantings are made as soon as frost danger is past, and are carried on until the autumn. Cowpeas are used with panicum (millet) or may be planted without any other crop.

Onions are cultivated on a few farms in the irrigated areas, particularly near Harrisville, where one grower has about 20 acres.

HORTICULTURAL CROPS.

Vegetables are grown mostly in the winter on the scrub area from Roadvale to Boonah. Tomatoes are probably the most popular of the small crops and several growers make a specialty of this crop. Marglobe and Break-o-Day are the main varieties. Cauliflowers, cabbages, cucumbers, beetroot and peas are also grown in smaller areas.

With the exception of several isolated patches of bananas, fruit crops are not commercially grown.

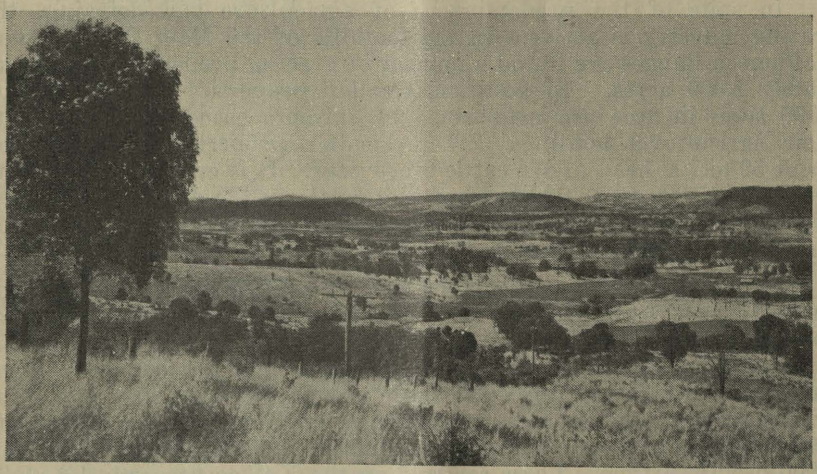


Plate 55.

View From Mount Alford Towards Boonah, Across Bunjurgen Flats.

DAIRYING AND MIXED FARMING.

Dairying is the main form of agricultural activity in the district. Practically every farm in the scrub areas depends on dairying and pig-raising for its existence. On the alluvial country the proportion of dairy farms is slightly less, as crop growing is the major occupation of some farmers. Approximately 750 suppliers send cream to the Boonah Butter Factory, which is a branch factory operated by the Queensland Farmers' Co-operative Association. At the northern end of the district some cream is despatched to the same Association's factory at Booval, while milk is also supplied for the bottled milk trade in Ipswich. One of the Brisbane bottled milk companies also obtained supplies from this part of the district.

Production of butter at the Boonah factory varies from about 22 tons per week to over 50 tons. The average size of herds is from 20 to 30 head of milkers, with slightly smaller numbers in the scrub districts. A.I.S. and Jerseys are the most popular breeds and there are several good herds of Friesians. Pig-raising combined with dairying is an important industry.

Conservation of fodder, usually in the form of hay (mostly lucerne), is carried out on many farms, while a number of scrub farms are equipped with silos. Shortage of labour has been responsible for a number of silos remaining empty, but a silo-filling unit has recently been organised by a local contractor. This consists of an ensilage harvester and two trucks fitted with extended sides to follow behind the harvester. With this unit available it is hoped that greater use will be made of the present silos and that more silos will be constructed. There are no machinery pools in the district, but a number of contractors are available for ploughing, planting, cultivation and harvesting of all crops normally grown in the district.

GRAZING INDUSTRY.

In spite of the predominance of agriculture and dairying, the grazing industry is active. In the foothills of the Main Dividing and McPherson Ranges are found a number of grazing properties of approximately 5,000 acres. In addition, smaller properties of from 600 to 1,000 acres in area are maintained by farmers as additional areas to their agricultural holdings. These smaller properties each turn off about 50 to 100 head of fat cattle every year. It is estimated that there are about 15,000 to 18,000 head of beef cattle in the district. Carrying capacity of the pastures grazed varies from one beast to ten acres on the poorer ridges to about one beast to four or five acres on the flats.

An interesting departure is the grazing of sheep on a property near Kents Lagoon, Kalbar. The area of 640 acres is composed mainly of poor ridgy country carrying black spear grass. Approximately 100 acres adjacent to the lagoon, mostly heavy clay loam and silty loam, have been sown to lucerne. The sheep are pastured on this for a short time every day in addition to grazing outside. The owner has a property near Richmond, North Queensland, and brings down mobs of about 2,000 head at a time. These are held on the Kalbar property for about six weeks before being marketed in top condition.

TOBACCO SEED FOR SALE.

The Department of Agriculture and Stock now has fresh stocks of tobacco seed for sale to Queensland farmers.

The following varieties are available:—Cash, Gold Dollar, Virginia Brightleaf, Mammoth Gold, "400", Yellow Special, and Hicks.

Owing to a limited supply of Hicks, no more than one ounce can be supplied to each buyer.

The price of seed is three shillings per ounce cash with order or C.O.D.

Pruning Shy Bearing Grape Vines.

F. A. L. JARDINE.*

SOME varieties of grapes do not set satisfactory crops of fruit. They are regarded by growers as shy bearers which, if grown to any appreciable extent, depress the annual crop output from the vineyard. The quality of the fruit carried by some of these varieties is very good and the market pays high prices for it. However, the area planted is small and is not likely to increase until methods of improving yields are discovered.

In the Stanthorpe district, the two varieties Purple Cornichon and Waltham Cross do not yield well, the former being the worse offender. The fruit of both is excellent and finds a ready sale.

EFFECT OF PRUNING.

Certain varieties of grapes are known to be most fruitful when pruned to one particular system. In Queensland, pruning systems in vineyards have followed current practices in other Australian States and overseas and may not be the best available for local conditions. It was therefore decided to compare three systems of pruning on the Purple Cornichon and Waltham Cross varieties. The two methods of pruning most widely practised at present on these varieties are the Unilateral Cordon system of short pruning and the Bordelaise Espalier method of long pruning. The systems selected for trial were:—

(*a*) Unilateral Cordon short pruning, a system in which the vine is trained to one arm with two canes at each spur. One of these bears the current season's crop and is completely removed in winter; the other is shortened to two buds at the same time (Plate 56).

* Mr. Jardine died in April last at the age of 57. He joined the Department shortly after World War I., in which he served with the 5th Light Horse Regiment, and was engaged in advisory and experimental work in Queensland orchards and vineyards up to the time of his death. The numerous articles on grape growing published in this journal by the late Mr. Jardine indicate the special interest which he took in the crop, and Queensland viticulturists in particular will feel the loss of this experienced and enthusiastic officer.

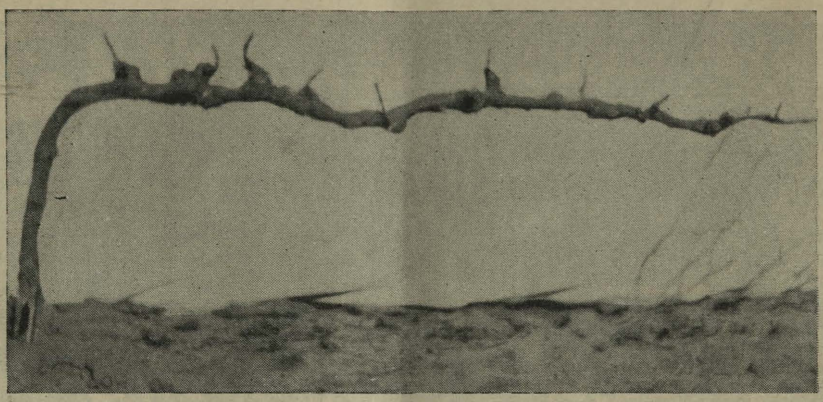


Plate 56.
Unilateral Cordon Short Pruning.

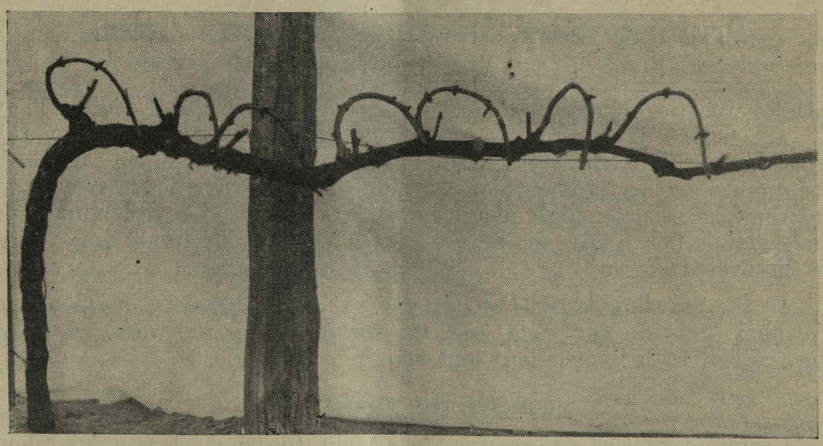


Plate 57.
Casanave Cordon Long Pruning.

(*b*) Casanave Cordon long pruning, in which the vine is trained as a Unilateral Cordon until the spurs are established. The upper of the two canes at each spur is then pruned to a rod of five or six buds and tied down to the main arm; the lower cane is cut back to two buds (Plate 57).

(*c*) Bordelaise Espalier long pruning, which is suited to over-vigorous vines. A short spur is retained on each side at the top of the main stem. The upper cane at the spur is cut to a rod of four or five buds and tied to the bottom wire as a bow. The lower is cut to two buds and supplies the spur wood for the following season (Plate 58).

The trial commenced at Stanthorpe in 1945 and continued for a period of four years. Yields were taken in summer, and each winter both the weight of the prunings and the lengths of the canes removed were recorded.

Plate 58.
Bordelaise Espalier Long Pruning.

Results.

The crop yields and growth data are summarised in Tables 1 and 2.

TABLE 1.

Effect of Pruning Methods on Yield—Cases per Acre.

Method of Pruning.	Waltham Cross.				Purple Cornichon.			
	1946.	1947.	1948.	1949.	1946.	1947.	1948.	1949.
Short Pruning (Unilateral Cordon)	446	*	898	128†	606	479	679	59†
Long Pruning (Casanave Cordon)	1,004	*	982	159†	740	598	811	40†
Long Pruning (Bordelaise Espalier)	878	*	749	140†	769	463	620	36†

* Crop completely ruined by grey mould.
† Vines severely damaged by late frosts in September, 1948.

TABLE 2.

Effect of Pruning Methods on Plant Vigour (Growth per Vine in Inches.*)

Method of Pruning.	Waltham Cross.			Purple Cornichon.		
	1946.	1947.	1948.	1946.	1947.	1948.
Short Pruning (Unilateral Cordon)	1,410	1,751	1,678	1,032	750	701
Long Pruning (Casanave Cordon)	1,289	1,395	1,648	1,023	740	689
Long Pruning (Bordelaise Espalier)	855	805	1,139	894	617	644

* Recorded at each pruning period in winter.

Yields.

The yield data reflect two of the hazards associated with grape growing in the Granite Belt. In 1947 excessive rain during the later stages of bunch maturity coincided with a severe outbreak of grey mould. In the Waltham Cross variety the wastage reached such proportions that little or no fruit was harvested from the vines. The Purple Cornichon vines suffered less, but the harvested crop was much below normal.

In 1949 late spring frosts occurred when the vines were in full growth. Though repruned to dormant eyes as soon as the full extent of the damage to the canes was apparent, only a very light crop set and the crop harvested in 1949 was extremely small. The yields in 1947 and 1949 are therefore of little value for comparative purposes. However, two points may be inferred from the records. Firstly, Waltham Cross yields more heavily than Purple Cornichon regardless of the pruning system used. Secondly, the Casanave Cordon system of long pruning seems more suitable for both varieties than the two alternative systems at present practised, namely Unilateral Cordon short pruning and Bordelaise Espalier long pruning.

Vigour.

Any loss of vigour associated with faulty pruning methods would be reflected by a drop in both the length and weight of the prunings during the later part of the experimental period. No such drop is apparent in 1947 and 1948, by which time the vines had been trained and the annual treatment stabilised.

RECOMMENDATIONS.

It would be premature to draw final conclusions from a grape vine pruning project extending over only a few seasons, and more detailed work is now in hand. However, the data already available suggest that both the Waltham Cross and Purple Cornichon varieties should be pruned to the Casanave Cordon system. The method certainly deserves a trial in vineyards containing any considerable number of vines of these varieties.

Further, the yields obtained from the Waltham Cross variety indicate that further plantings should be worthwhile in the Stanthorpe district; grower returns should be satisfactory.

European Foul Brood of Bees.

C. R. ROFF, Apiary Inspector.

EUROPEAN foul brood, an infectious disease of bees, was found for the first time in Queensland in one hive of an apiary near Warwick during April of this year. The disease has caused heavy losses, particularly amongst black bees, in other parts of the world.

The disease is caused by a bacterium (*Bacillus alvei*) which infects young larvae of all three castes. The infection may cause a serious reduction in the number of workers emerging from the combs, with consequent decline or death of the colony. Nurse bees play an important part in spreading European foul brood within the hive. In a dearth period, the juices of dead infected larvae are sucked up by the nurse bees and incorporated with food, which is then fed to other larvae. The practice of equalising colonies by exchanging brood combs spreads the disease within the apiary. Robber bees, by taking new honey placed in cells which recently contained diseased larvae, are also responsible for hive-to-hive infections. Contaminated honey after storage for three months has not proved a fruitful source of infection. Overseas experience indicates that the disease is unlikely to be transmitted by equipment such as hives and tools or by the clothes or hands of the beekeeper unless infected honey is directly robbed from such sources.

Features of the Disease.

European foul brood is essentially a disease of weak colonies of common black and hybrid bees. Italian bees are seldom affected, and this is one of the reasons for the early popularity of this race.

Brood is likely to be infected during any season of the year. However, the severity of the disease in a colony is governed to some extent by the quantity of food available. In regions where the main honey flow is experienced during spring or early summer, European foul brood causes practically no losses. A honey flow supplying nectar continuously tends to hasten recovery of infected colonies; the bees are more vigorous and will quickly remove diseased material from the hive. In colonies where self-recovery has apparently taken place, re-appearance of the disease the following year often occurs, and in the meantime spread to other colonies is likely.

Infected honey is not injurious to humans.

Symptoms.

In diagnosing the disease the following points should be checked before coming to the conclusion that European foul brood is present. It is obvious that a newly infected colony will not exhibit all the points enumerated.

1. The colony is noticeably weak.

2. Decaying larvae and scales are removed by the bees, with the result that a frame of brood assumes a speckled or mottled appearance, due to the presence of empty cells. This irregular appearance becomes more pronounced as the disease develops.

3. This disease is essentially one of unsealed brood, the majority of larvae dying usually within five days after hatching from the egg. Occasionally some larvae survive until the cells are sealed. Sunken and perforated cappings may be observed, but this is by no means common.

4. Instead of remaining in the normal coiled positions typical of young healthy larvae, those infected become restless, move about inside the cells, and occupy a variety of unnatural positions. The irregularity of the positions of larvae is an important symptom.

5. The plump glistening appearance of healthy brood disappears. The earliest noticeable change in diseased larvae is a slight yellowish or yellowish-grey discolouration accompanied by the collapse of the larvae. At this stage larvae are translucent and watery, before becoming pasty and sticky or porridge like. Occasionally decayed material may rope; the thread of the material that ropes out is coarse and lumpy in consistency. Finally, diseased material dries into a yellowish, greyish or nearly brownish-black scale. A very distinct characteristic of this disease is the lack of adhesiveness of the decomposing material, especially of the scale to the cell wall. This feature enables strong colonies to remove the diseased material from the cell.

6. The odour of diseased material may be slightly sour or yeasty, or the material may develop a repulsive carrion odour.

Preventive Measures.

If the following measures are carried out very little loss will be incurred from European foul brood.

1. Introduce a hardy strain of the Italian race of bees.

2. Requeen at least every two years.

3. Maintain colony strength by providing the food, hive space and protection required for each particular period of the year.

Treatment of Infected Colonies

Several methods of treating the disease are practised overseas where the disease is firmly established. Where the disease is widespread, methods adopted are those of minimisation and not of eradication. In Queensland, effective eradication is desired. The present negligible losses caused by this policy are justified in view of the substantial losses that would be suffered by the industry generally if the disease became established.

Diseased hives should be handled in the following manner, which is the safest and most economical:—

1. The destruction of diseased colonies should take place in the evening when all the bees are in the hives.

2. Dig a pit of a size suitable for the number of colonies to be destroyed.

3. Kill all bees in the diseased hives with calcium cyanide; about two teaspoonfuls of the poisonous powder should be put through the entrance of each hive before closing it. *Extreme care should be taken to avoid inhaling the poisonous gas given off by the cyanide.* If calcium cyanide is not readily available, the hive entrance should be closed, a pint of petrol sprinkled over the top frames, and the top cover replaced.

4. Build a fire in the pit, and as soon as it is burning well, add the dead bees and combs. The only parts of the hives not to be burnt are the bottom boards, the hive bodies of the brood nests, the bodies of the extracting supers, and the top covers.

5. Scrape the inside surfaces of the unburnt parts of the hives and burn the debris.

6. After all diseased material has been burnt, spade the ground down, refill the pit, and pack well.

7. Sterilize the undestroyed, contaminated hives and hive parts by either boiling for half an hour in 1 per cent. caustic soda solution or scorching to a dark-brown colour with a blow torch all the inner surfaces and edges.

Legislative Requirements.

Under *The Apiaries Act of* 1947 it is provided that any beekeeper in whose apiary any disease appears shall immediately notify, in writing, the Under Secretary, Department of Agriculture and Stock, Brisbane.

Irrespective of the legal requirements, any beekeeper who notices unusual brood symptoms in his apiary should, for his own sake, communicate with the Department in order that assistance may be rendered in treating the infection.

OPEN SEASON FOR WILD DUCK AND QUAIL.

An Order in Council has been issued declaring open seasons for wild duck (except Burdekin duck) and quail in various districts.

In District No. 1 (which includes the Pastoral Districts of Moreton, Darling Downs, Wide Bay, Burnett, Maranoa, Warrego, Gregory South, and that portion of Leichhardt south of latitude 25), an open season has been declared for the period August 1st to September 30th, 1950. There will be no open season for quail in this district.

In the rest of Queensland, an open season for both duck and quail has been fixed for three months, from August 1st to October 31st, 1950.

No person may take more than 20 wild ducks and 25 quail during a period of 24 hours.

Wool and Its Classing.

C. J. PAYNE, Senior Wool Classer, Sheep and Wool Branch.

IN Australia wool is sold by auction, and the object of classing is to present the clip in a form which will will be most attractive to the buyers and which will assure maximum competition at the sales. As quality in its widest sense, staple length, tensile strength, colour and condition are the main characters influencing the way in which the wool will be utilised, due regard must be paid to them in deciding upon the class in which any fleece will be put.

Buyers prefer "bulk" (five bales and over) to star lots (under five bales) and accordingly it is advisable, when classing a clip, to make as few lines as possible. If a buyer can fulfil an order from one line the manufacturer is assured of raw material which is uniform in quality as well as containing a comparable amount of dust, seed and burr. As similar wools require the same treatment in manufacture, this is a distinct advantage.

If the wool is badly classed and contains fleeces of various staple lengths and of different colours, handle and condition, the buyer has no option other than to value the whole line according to the quality of the worst wool it contains. Because of the amount of work in re-sorting, a badly classed line might be passed over as an uneven lot, and is not likely to command a reasonable price.

SKIRTING.

After the wool is shorn, the shed hands pick up the fleeces and throw them out on the wool tables. Picking up and throwing the fleece is an important operation, as badly spread fleeces are hard to skirt, either too much or too little wool being removed. The picker-up should take hold of a "breech" in each hand, lift them up and draw them around the fleece. It is then thrown out on the rolling table, with tip upwards and neck forward.

The edges of the fleece usually contain most of the burr and seed, and the fatty ends and stained pieces which result from the accumulation of wax under the front legs and from urine stain. These are separated while the fleece lies on the table, and this process is known as skirting

(Plates 59-61). If the fleeces are free from seed and burr, only the fatty ends and stains have to be removed. If burr and seed are spread extensively through the fleece, they are ignored, and fatty ends and stains alone are removed. Excessively heavy skirting would spoil the bulk of the fleece, and the seeds and burrs can be removed during manufacturing by a process known as carbonising.

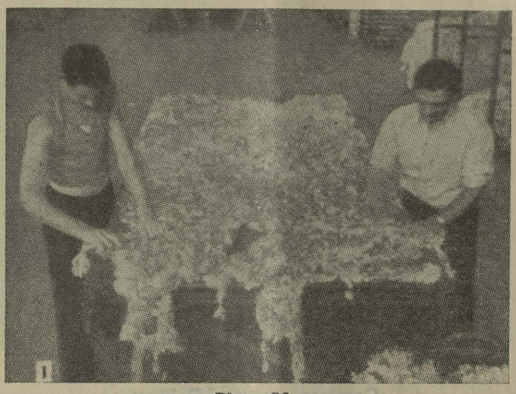


Plate 59.
Commencement of Skirting.

Plate 60.
Shoulder Wool Turned In.

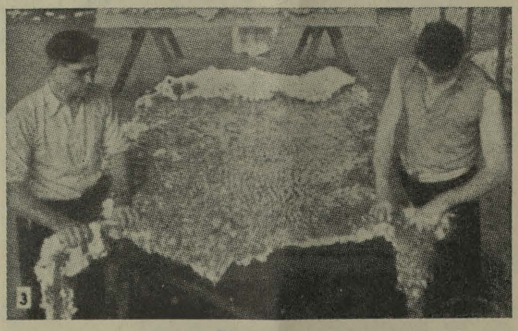


Plate 61.
Skirting the Breech End.

Rough breeches should be skirted off all fleeces, whether seedy or burry.

CLASSING MERINO WOOL.

After the skirtings have been removed from the fleece, the neck wool is thrown in and the two sides are folded across. The fleece is then rolled into a ball, from breech to neck, with the cut end out and leaving the shoulder wool showing (Plates 62-66). The fleeces are then presented to the classer, who classifies them and puts them in their appropriate bins.

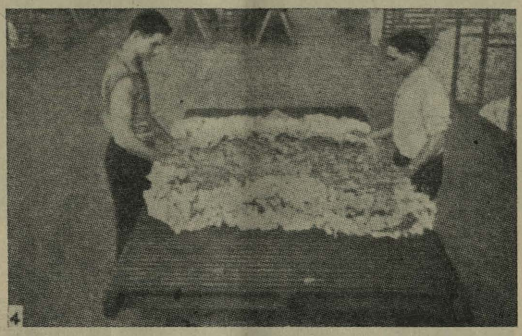


Plate 62.
Commencement of Rolling.

Plate 63.
Second Movement in Rolling.—The fleece has been folded once.

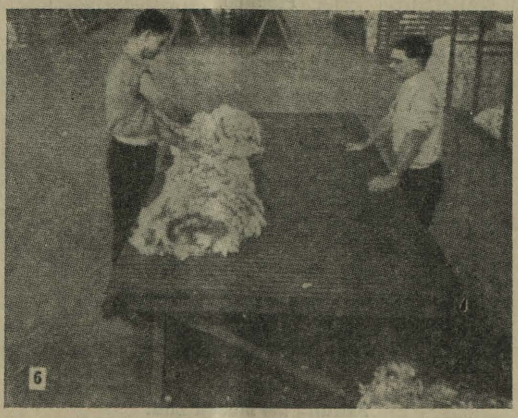


Plate 64.
Fleece Folded the Second Time in the Same Direction and Rolling Commenced from the Breech End.

Plate 65.

Rolling Completed, Exposing to View Rib and Shoulder Wools.

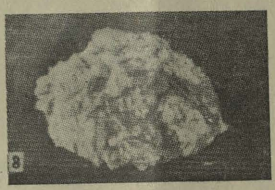


Plate 66.

Fleece Incorrectly Rolled and Showing Unattractive Portions of Fleece.

When classing Merino wool the most important features to consider are staple length, quality, tensile strength, colour and condition.

Staple Length.

Staple length determines whether the wool is suitable for the worsted or the woollen trades. The longer stapled wools go into worsted, while the shorter wools can be utilised for woollen manufacture. The staple length of Merino wool may vary from 1½ inches to 4 inches, but wools which are excessively long, through being overgrown, are at a disadvantage in manufacture because special machinery is required to handle them. English or Bradford combs can handle wool from 2½ inches to 4 inches in length, while wools as short as 1½ inches may be processed on French combs.

Quality.

Quality in Merino wool connotes count in relation to handle. The number of crimps per inch is usually accepted by the trade as a reasonable guide to the count, and therefore as being indicative of the number of hanks of yarn which can be spun from one pound of clean scoured tops. One hank contains 560 yards of yarn and up to 80 hanks might be made from one pound of clean scoured tops produced from fine Merino wool. Such a wool is referred to as 80 count, or as an 80's Merino. If only 60 hanks of yarn could be spun from a pound of clean scoured tops, the wool would be classed as a 60's. The usual range of counts in Merino wool is from 60's to 80's, though some are finer and a few may be coarser, or stronger, as they are called. The range of counts is shown in Plates 67-69, and a fine Merino fleece in Plate 70.

Handle is an important characteristic of all wools, which should be soft, but full. Wools which combine soft handle with fine fibre diameter are in demand by the manufacturer. Those which are harsh in handle and coarse in fibre diameter are not so popular, though soft handling, medium to strong wools are always in demand.

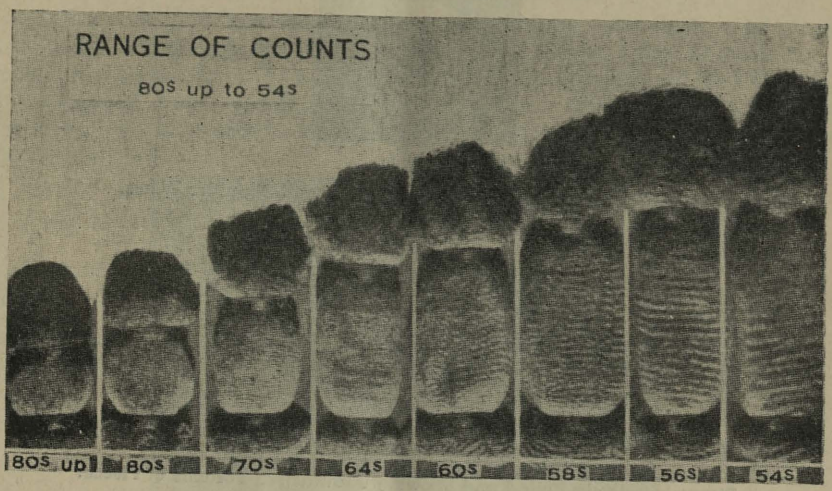


Plate 67.

Wool Samples Showing Counts from 80's to 54's.

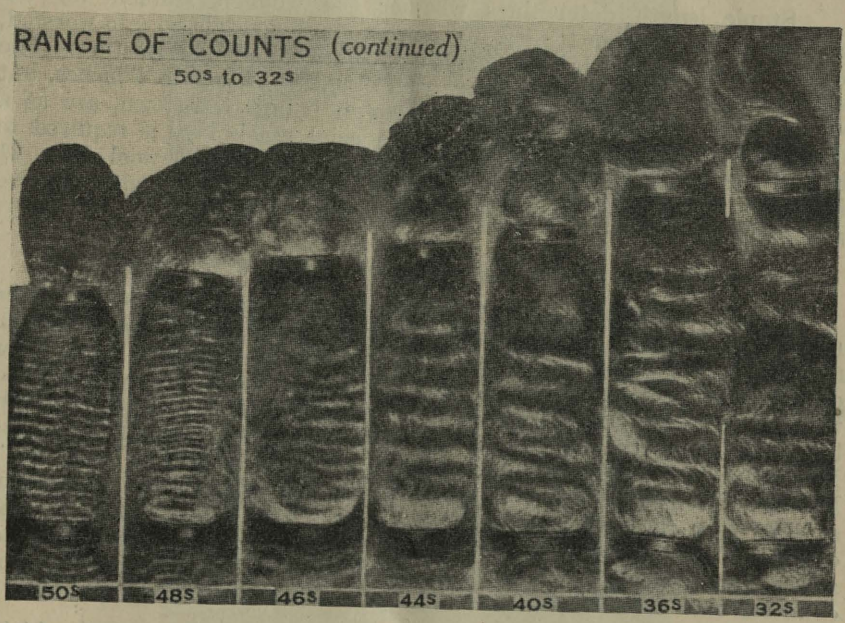


Plate 68.

Wool Samples Showing Counts from 50's to 32's.

[*Illustrations for Plates 59-68 are from a booklet of the Victorian Department of Agriculture.*]

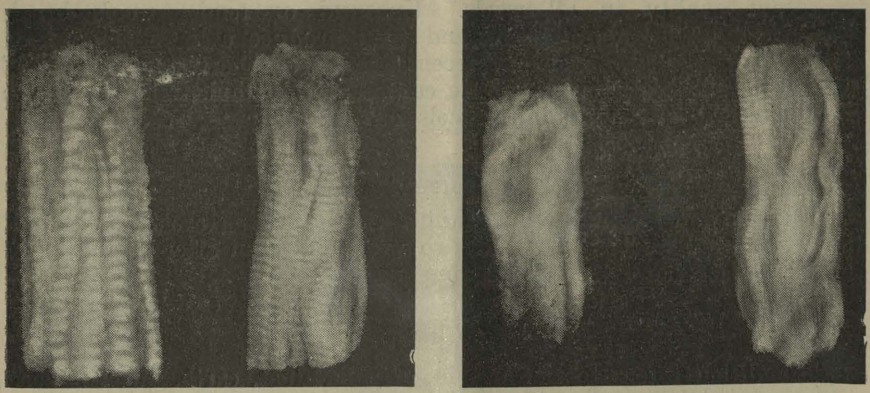


Plate 69.

Merino Wool Samples.—From left—strong (60's); medium (64's); fine (70's); superfine (80's).

Plate 70.

A Fine Merino Fleece.

Tensile Strength.

Tensile strength is also referred to as soundness, and it is an important quality in all wools. Unsound or tender wools break frequently during manufacture and they produce a large amount of noil. Long stapled wools may become, in effect, short stapled ones if they have a "break" at about the centre of the staple, and may have to be handled as short stapled wools during manufacture.

Colour.

Bright wools which will be white after scouring are ideal. Dull, heavy coloured wools will not dye so well, and even after dyeing they do not reflect the light to the same degree.

Condition.

Condition refers to the amount of yolk, dust, earth, burr or seed contained in the wool. As wools are bought on a calculated clean scoured basis, a high percentage of foreign matter will decrease the yield and lower the price.

Lines of Fleece.

Supposing a grower shears 2,000 to 5,000 Merinos, the following lines could be made:—AAA, AA, A, FLEECE (cast line), A1 (long and strong), COMBING (short and strong).

AAA.—AAA would comprise wool of good combing length (2½-4 in.) and good colour, sound and light in condition, and of a good medium to fine quality.

AA.—AA is wool of combing length (but not as long as AAA), sound, of fair to good colour, and of medium to fine quality.

A.—A will consist of medium to short wools (carding type), of good colour and condition, and medium to fine in quality.

These two classes—AA and A—are the medium to fine wools.

Fleece.—The fleece line would be termed the cast line and may be somewhat irregular in length. It would contain the dull, heavy, shabby and unattractive fleeces.

A1.—A1 is strong wool of a 60's spinning count, of good combing length, sound and bright in colour, and medium to light in condition.

Combing.—Combing comprises the short strong wools which are not of a combing type. They are dull in colour, and heavy in condition. Any wools of a doggy nature should be kept out of this line and baled separately.

Tender Wools.—Tender wools, appearing in small quantities, should be kept out of all combing lines and placed in lines containing wools of shorter length but of comparable colour and condition to these lines.

When tender wool appears in large quantities, it must be kept separate from sound wools, and classed on similar lines. The length of staple will be determined from where the break occurs.

Merino Skirtings.

The skirtings receive special treatment. They are usually "picked" into two or three lines, comprising "Broken," 1st and 2nd Pieces; or Pieces and Stained Pieces.

Broken.—Broken (Plate 71) includes the bulk of the skirtings. They are wools of good length and colour, fairly light in condition, and with the rough edges, fatty ends and stains removed.

Plate 71.
A Sample of "Broken" Wool.

Plate 72.
1st Pieces.

Pieces.—Pieces (Plates 72 and 73) would not be as bulky as the broken, but are of fair to good length. They are heavier in condition, duller in colour, free from stains, and with the worst of the fatty ends skirted off.

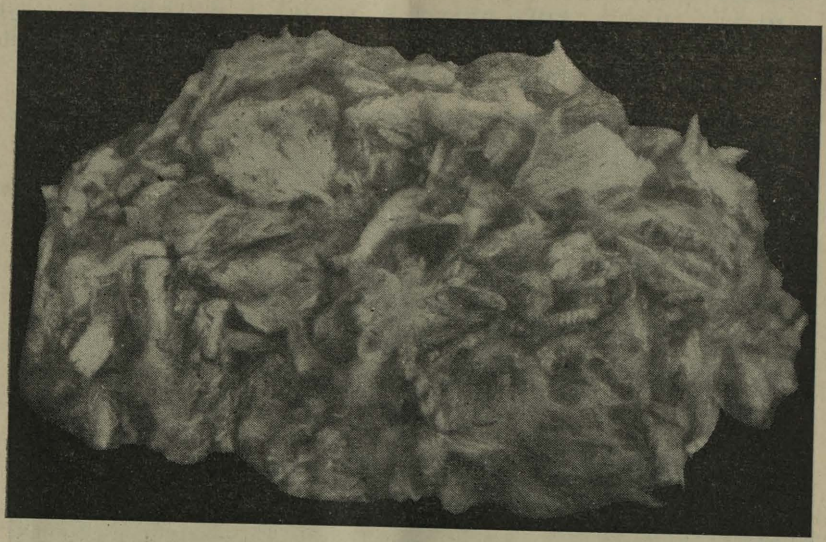


Plate 73.
Pieces.

Plate 74.
Stained Pieces.

Stained Pieces.—If a large amount of the wool from the crutch or pizzle carries urine stain, it may be sorted into a second line, which is referred to as the second or stained pieces (Plate 74).

Bellies and Locks.

Bellies.—Pizzle stains and fatty ends are removed from bellies (Plate 75).

Locks.—Locks (Plate 76) are the short pieces from the shearing boards as well as the wool which falls through the spokes of the wool rolling, piece picking and classing tables.

Plate 75.
Bellies.

Plate 76.
Locks.

CLASSING CROSSBRED CLIPS.

Quality within the range of spinning counts is the most important factor taken into consideration in classing crossbred clips. Crossbred fleeces are more variable in quality and condition than Merino.

In classing a clip of crossbred wool from a flock numbering from 2,000 to 5,000 sheep whose spinning counts range in quality from 36's to 60's comeback, the following lines could be made, provided there are sufficient wools of 58/60 spinning counts shown in the clip.

AAA CBK.—This would include wool of 58/60 spinning count, good combing length, light in condition, sound, and of a good colour.

AA CBK.—This line would comprise wool of shorter CBK lengths, of the same spinning count, but duller and heavier in condition; any odd tender CBK fleeces may be placed in this line.

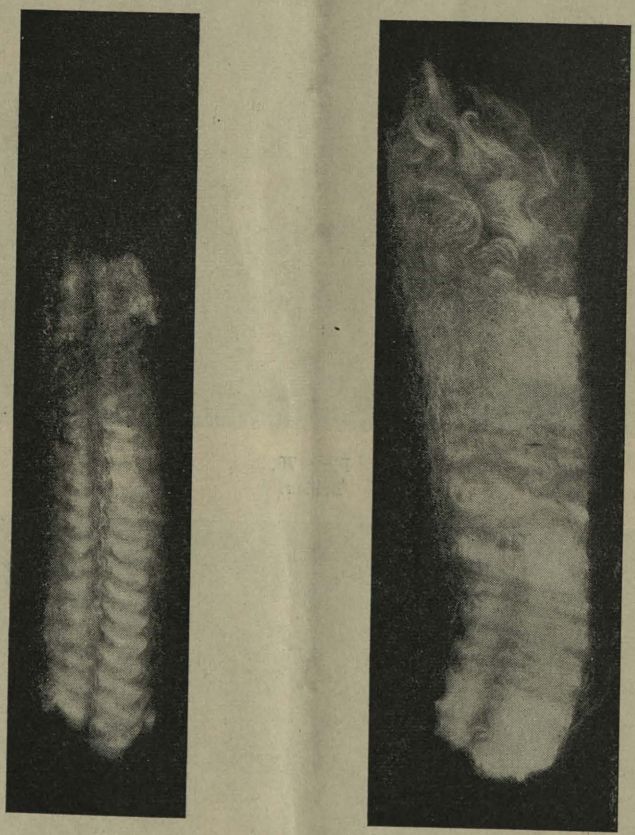


Plate 77.

Corriedale 56's (left); **Romney Marsh 44's to 46's** (right).

AAA XBD.—This class would contain fine wool of a 50's-56's quality, of good colour and condition, sound, and even in length.

AA XBD.—Included here are medium quality wools of 46's-48's spinning count which have the same features as AAA XBD. It must be sound, even in length, and with good colour and condition.

A XBD.—This line contains all strong fleeces ranging in quality from 40's-44's spinning count.

Strong fleeces with spinning counts less than 40's should be baled separately and branded L. FLEECE. Any unattractive, badly discoloured fleeces, or odd tender fleeces, should be kept out of the above lines and a cast line made as in Merino. This line will be irregular in length, quality and condition, and the line could be branded FLEECE.

When XBD clips range in quality from 36's to 50's spinning count, the same lines would be made as in qualities ranging from 36's to 60's, but there would be no CBK lines. The same features of length, colour and condition would prevail.

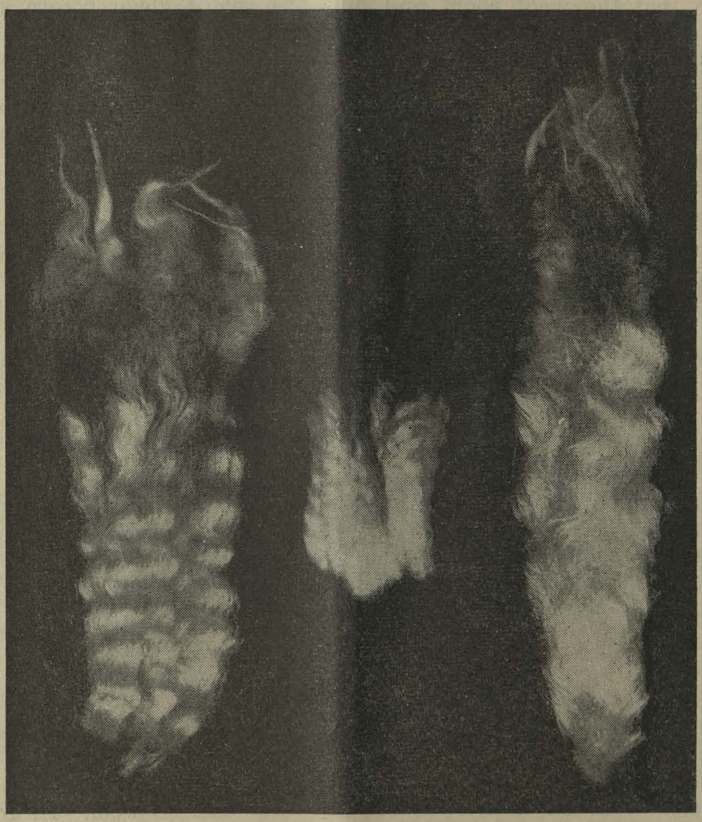


Plate 78.

Border Leicester 44's to 46's (left); **Doggy** (centre); **Leicester 40's** (right).

AAA XBD.—This line would consist of wool with a count of 46's-50's.

AA XBD —This includes wool with a count of 40's-44's.

A XBD.—This is wool with a 36's spinning count and fleeces too rough for AA XBD.

The skirtings from an XBD clip should be treated similarly to those from a Merino clip.

Breeches often run very strong in XBD clips. It is advisable to keep these separate from broken and pieces and place them in a line of their own. They could be branded A, Pcs. XBD.

All ram fleeces from Merino and XBD clips should be skirted lightly and baled separately. Because of their distinctive smell, they need severe treatment in scouring.

WOOL PRESSING.

A great deal of damage may be done to any clip if the wool room is dusty and untidy, as the wool may be contaminated by string, dirt or other foreign matters which will depreciate its value. It is advisable to see that the wool room and bins are swept clean before shearing commences. The press should be overhauled, screws tightened, and all joints and pulleys oiled.

If packs have to be cut down to fit the bottom box, the work should be performed some distance from the wool press, as the loose cut twine may get into the wool. This interferes with the combing and dyeing processes.

Packs should be placed in the press with the sewn seams facing the fixed side. The sewn seams are those which run along both sides and the bottom of the pack. The fleeces should be placed in the press as carefully as possible, and the bottom box tramped tightly, taking care that the four corners are well filled. This will ensure a neat bale. If necessary, the corners should be neatly sewn. No less than four bale fasteners should then be placed firmly through both flaps and cap.

BALE BRANDING.

The bales should be branded distinctly with the name of the property, the quality or class of wool, the sex mark and the number of the bale. These four marks should be placed directly beneath one another (as shown below) on the square or narrow side of the bale—that is, the side that has been stitched across the bottom.

Kincraig.
AAA
E
159

Prospective buyers will look for neatly pressed and branded bales, as these will usually contain more carefully classed wool. In addition, evenly filled and well pressed bales are easier to handle and transport.

Agricultural Chemistry

Contour Furrowing of Claypans.

C. R. VON STIEGLITZ, Officer in Charge, Plant Nutrition Section.

FOR some years past, Mr. G. W. McIlroy, General Manager of Comongin Proprietary Limited, has been carrying out experiments on a grazing property near Quilpie, with a view to reclaiming claypan country, and the writer was privileged recently to see the results of this enterprise.

Method of Treatment.

The method of treatment is simple, the cost low, and the results outstanding. The method consists of ploughing a number of furrows on the contour with a twin-disc plough, and then running a Britstand grader along the edge of the furrow to form a better bank to hold back the water. The type of country that is being treated is shown in Plates 79 and 80; it will be noticed that the land is bare of vegetation despite the fact that seasonal conditions had been extremely good.

The water which can be seen lying in the furrows had accumulated from 72 points of rain in two falls about the same period. The last fall was four days prior to the time of inspection. The land generally has a very slight slope, and contours, spaced about a chain apart, have a half-inch vertical interval. The levels are carefully taken by means of a dumpy level. In slightly flatter areas, where the surveyed furrows are spaced at greater horizontal intervals, an additional furrow is put in by eye.

Trapping of Moisture.

The first effect of the furrowing, the trapping of the water so necessary with this type of soil, is shown clearly in Plates 79 and 80. (If these are examined closely it will be noticed that the surface of the soil appears to be covered with small pebbles. This is not so, however; the surface covering is in fact small curled-up pieces of silt which have taken this shape on drying.) Trapping of the water in the furrows has resulted in water being held temporarily in the space between the furrows. Normally it runs off immediately.

The next stage in the reclamation is the gradual establishment of herbage in and near the contour furrows. Finally the herbage occurs over the whole area. The type of herbage to appear first is comprised of wire burr, soda bush and red top burr. These plants have the effect of gradually accumulating fine wind-blown soil material on the polished claypan surface. This layer of dust serves as a seed-bed and allows grass to germinate and gradually displace the rough herbage. Plates 81 and 82 show an area that was furrowed in March, 1949. In Plate 82,

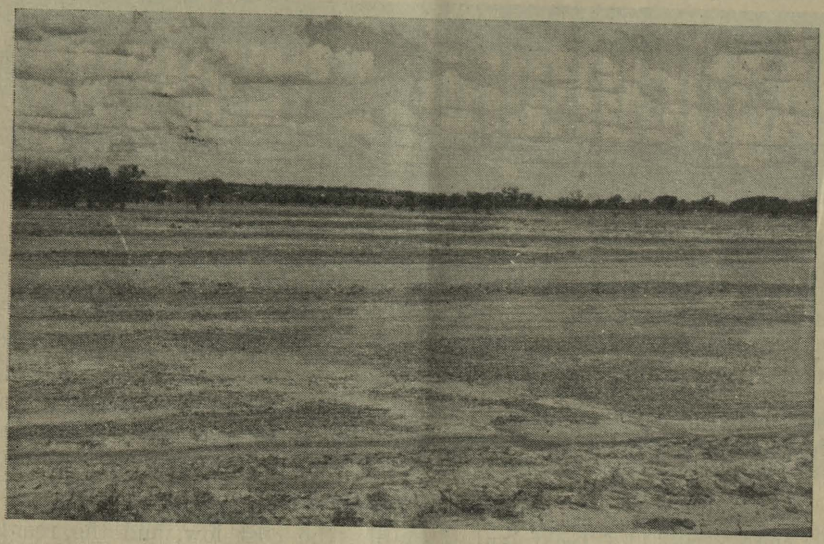


Plate 79.

Claypan Area Recently Furrowed on the Contour.—Note the surface covering of curled pieces of silt between the furrows.

Plate 80.

A Recently Furrowed Claypan.—The furrows contain water from rain which fell a few days previously.

which is a close view of the surface, it will be noted that the soil is cracking and the structure coming back. The recently treated area, shown in Plate 79, has a hard polished surface.

Plate 83 shows an area that was contour furrowed 4½ years ago. The contrast between the treated area carrying grass and the untreated area in the immediate foreground, showing rough herbage, is most

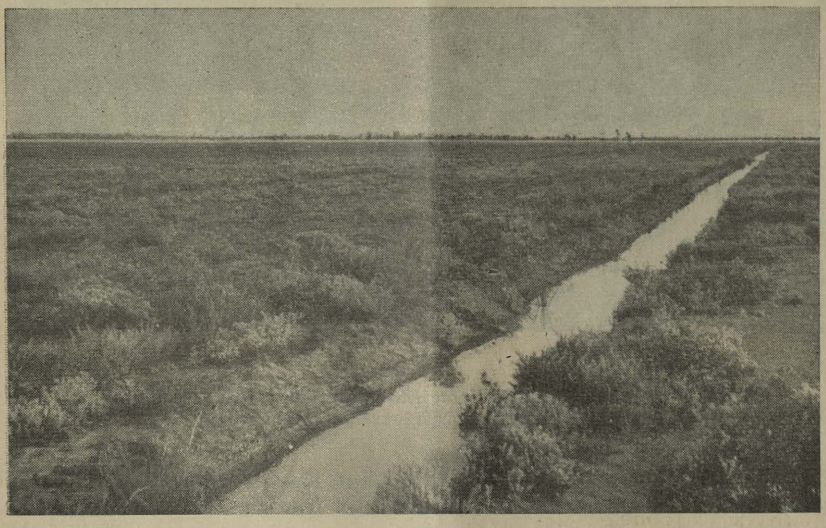


Plate 81.

A Furrowed Claypan Photographed a Few Months After Treatment.—At this stage the vegetation is composed mainly of herbage, with little grass. Abnormally high rainfall was experienced after the furrows were made.

Plate 82.

A Close View of Portion of the Claypan Shown in Plate 81.—Note the cracking, which indicates some improvement in soil structure.

Plate 83.

A Well Grassed Claypan 4½ Years After Furrowing.—The section in the foreground, carrying rough herbage, was not treated.

marked. It is Mr. McIlroy's opinion that this area in the foreground would have been devoid of vegetation but for the fact that the season has been an exceptionally good one.

Effect on Salt in Soil.

Soil samples were taken from the areas treated in October, 1949, and in the spring of 1944, respectively, and the field descriptions, as well as the figures for pH (acidity index) and salt, are given below.

Recently furrowed area—		pH	Salt as NaCl Per cent.
0″–16″	Fine yellow-red silty clay loam—structureless	7·5	0·257
8″–16″	Fine yellow-red silty clay	6·5	0·020
16″–18″	Fine yellow-red silty clay	6·1	0·252

Area furrowed in 1944, *now covered with grass*—		pH	Salt as NaCl Per cent.
0″–8″	Yellow-red silty clay—nutty structure ..	6·2	0·003
8″–16″	Yellow-red silty clay—massive	7·0	0·322
16″–24″	Yellow-red silty clay—massive	6·7	0·193
24″–30″	Grey-red silty clay—massive	6·9	0·495

In the case of the newly furrowed area, the soil was so dry at 20 inches that it would not remain in the auger, but that from the area covered with grass was moist to about two feet and no great difficulty was experienced in obtaining samples to 30 inches.

The distribution of chlorides, estimated as common salt, through the soil, is illustrated in Plate 84. It will be noted that recently furrowed areas show a high concentration of salt in the surface soil, while in the areas which were furrowed several years previously only a trace of salt is found when the surface soil is sampled to a depth of eight inches.

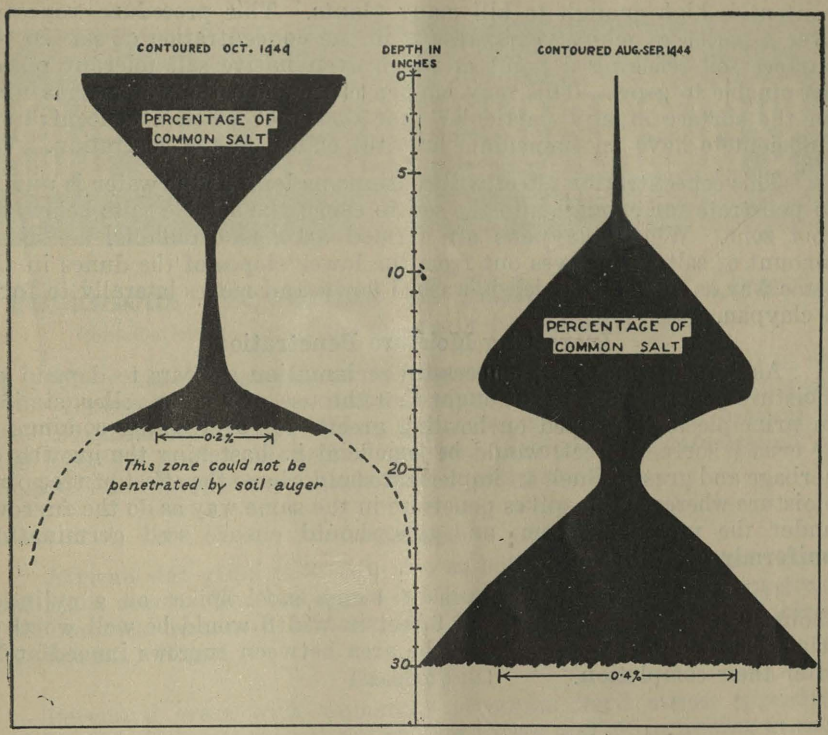


Plate 84.

Salt Concentration in Claypan Soils.—This diagram shows how contour furrowing has caused the leaching of soluble salts (calculated as common salt) from the top few inches of soil. Most plant die when the salt concentration reaches 0.3 per cent., while many are adversely affected at 0.1 per cent.

On recently treated claypans the surface soil is so high in salt that only plants which are salt tolerant are able to germinate and flourish. The presence of these plants helps to reduce the salt content of the surface soil, firstly by lowering the evaporative rate and secondly by improving the soil structure, thus enabling the water to penetrate to the subsoil. The amount of moisture which reaches the subsoil of undisturbed claypans by vertical penetration is negligible even in seasons of relatively heavy rainfall. Once water begins to move down into the lower horizons of the soil the soluble salts are carried with it. After a few seasons so much salt has been removed from the surface that plants which are much less salt tolerant than those which grow in the first year begin to establish themselves.

The high concentration of salt in the surface soil prior to any treatment is due mainly to the high rate of evaporation. In south-western Queensland, the evaporation from a free water surface is several times greater than the rainfall. Thus, wherever there are conditions which result in water, whether it be fresh, rain water or run-off from another area, remaining on the surface for some time, the volume is reduced by evaporation. Consequently, water which originally had no adverse effect on plant growth soon reaches a stage at which the salt

content is high enough to kill many plants. This procedure, repeated over a period of many years, results in the concentration of salt in the surface soil reaching a point at which even native salt tolerant plants are unable to grow. This may happen even when the water remaining on the surface at any particular time does not reach a concentration sufficient to have an immediate harmful effect on the vegetation.

This concentration effect will continue as long as the water is unable to penetrate far enough into the soil to carry the soluble salts below the root zone. Where claypans are formed amongst sandhills, a certain amount of salt also moves out from the lower slopes of the dunes in the same way as the clay, which is washed down and moves laterally to form a claypan.

Increasing Moisture Penetration.

As the chief factor in successful reclamation appears to depend on moisture penetration, it is thought that the use of a spike roller, similar in principle to that used on bowling greens for overcoming a drummy or crusty surface effect, would be beneficial in hastening the growth of herbage and grass. Such an implement should have the effect of trapping moisture wherever the spikes penetrate in the same way as do the furrows under the present system, and this should ensure seed germination uniformly over the area.

It is suggested that the use of 4-inch steel spikes on a cylinder about 12 inches in diameter and 6 feet in width would be well worth a trial. This could be drawn over the area between furrows immediately after their completion.

APPLIED BOTANY

Poisonous Properties of African Star Grass.

Contribution No. 16 of the Queensland Poison Plants Committee.

A FEW years ago, samples of African star grass were examined in the Chemical Laboratory of the Department of Agriculture and Stock for prussic acid content. Since then, observations on the grazing of this grass by stock have been made, and the following information on the grass and its poisonous properties is now presented.

Names.

African star grass is known also as budgee grass, giant star grass, and giant couch. The last name is also used commonly for Para grass. The botanical name of African star grass is *Cynodon plectostachyus* (K. Schum.) Pilger.

Description.

Perennial grass with numerous prostrate hard stems, spreading widely and rooting at the joints; tufts of leaves and stems arising at each joint and sometimes sending up long slender seed stalks; leaf sheaths flattened, leaf blades bright green, spreading, 2-5 inches long, $\frac{1}{8}$ in. to $\frac{1}{6}$ in. broad, tapering gradually from the base to a fine tip; seedheads consisting of several branches spreading star-like from the top of a stalk 6 in.-15 in. long, each branch with numerous "seeds" (spikelets) closely packed in two rows along the lower side.

Distribution.

African star grass is a native of Africa introduced some years ago as a possible fodder grass. The plant is now found in a number of localities widely spread over the State from the Atherton Tableland to the southern border and in some enclosed areas as far west as Barcaldine.

Seasonal Occurrences.

Though the grass is a perennial, it makes most of its growth in the warm weather following spring or summer rains. It dries off during the winter but never becomes completely leafless.

Poisonous Properties.

(*a*) Field Evidence.—On only two occasions has trouble been reported with this grass in Queensland. In one case a cow was found dead after it had been on the grass for about 24 hours. The paddock had not been grazed for three months and the grass was very green and succulent because of an abnormally wet season. In the other case 10 cows grazing on the grass showed symptoms of poisoning. They were drenched with photographic hypo (sodium thiosulphate) and recovered.

(*b*) Chemical.—Table 1 indicates that African star grass grown near Brisbane can produce a prussic acid level up to three times as high as that usually regarded as the danger level (20 milligrams prussic acid per cent., or 200 parts per million). The only figure from a low rainfall area (specimen from Blackall) is above the level and a specimen of old growth from Rockhampton was slightly below it. In the Brisbane material young leaves gave consistently higher values than old growth taken at the same time and the same place.

(*c*) Feeding Tests.—No feeding tests with this grass have been reported from Australia. In India, feeding tests gave negative results and analysis showed the prussic acid level to be below the danger point.

TABLE 1.

PRUSSIC ACID CONTENT OF SPECIMENS OF AFRICAN STAR GRASS.

Date.	Moisture.	HCN (as received)	HCN (water-free material).	Locality.	Remarks.
	Per cent.	mgm. HCN per 100 gm. plant.			
3–3–41 ..	67·1	23·0	69·9	Blackall ..	A very hairy form
5–12–41 ..	76·6	12·6	53·8	Moggill ..	Sample of young leaf blades
5–12–41 ..	76·6	32·5	138·5	Moggill ..	Sample of young runner growth
20–5–42 ..	48·0	14·0	27·0	Moggill ..	Old growth. Partially dry
20–5–42 ..	67·0	18·6	56·4	Moggill ..	New growth. Very dark green
9–6–42 ..	66·0	16·2	47·6	Moggill ..	New growth. Very dark green
10–7–42 ..	60·0	5·9	14·8	Moggill ..	Old growth. Partially dry
10–7–42 ..	69·0	14·0	45·1	Moggill ..	New growth. Dark green
23–7–42 ..	58·0	21·3	50·7	Moggill ..	Old growth
23–7–42 ..	68·0	42·1	131·6	Moggill ..	New growth
5–8–42 ..	48·9	10·9	21·3	Moggill ..	Old. Partially dry
5–8–42 ..	58·7	22·4	54·2	Moggill ..	New. Mostly green
21–8–42 ..	61·9	18·0	46·2	Rockhampton	Old growth. In seed
23–9–42 ..	35·0	44·5	58·8	Moggill ..	Partly dead with some new green growth
23–9–42 ..	49·8	68·5	117·1	Moggill ..	New growth. Fairly green
20–10–42	29·4	3·6	5·9	Moggill ..	Old growth, mostly dry
20–10–42	56·5	10·1	23·4	Moggill ..	Mostly green
19–11–42	75·7	18·9	77·8	Moggill ..	New, mostly green
20–12–42	58·9	20·7	53·4	Moggill ..	Green, but somewhat wilted
21–1–43 ..	68·7	17·0	54·2	Moggill ..	New growth. Green but somewhat wilted

All analyses were made in the Chemical Laboratory of the Department of Agriculture and Stock, using the method described by H. Finnemore and C. H. Williams in Australasian Journal of Pharmacy, January 30, 1935. p. 41.

Symptoms.

Symptoms in animals poisoned by this grass have not been recorded. Other plants which produce prussic acid have been reported to cause accelerated breathing and pulse, laboured breathing and muscular twitching.

Post-mortem.

No post-mortem findings are on record for the grass. With other prussic acid yielding plants there are usually few lesions to be seen on post-mortem, except for reddening of the paunch and the development of a blue colour in the visible mucous membranes.

Prevention and Treatment.

Prussic acid formation occurs in a great many different plant species but in relatively few to the extent that poisoning becomes a danger. It may be seasonal or transitory and the amount present at different times is often subject to considerable fluctuation.

As a general rule, prussic acid formation in plants is greatest during a period of active growth following on a period during which the plant has had a set-back consequent upon drought, frost, grasshoppers or perhaps fire. It is in such circumstances that prussic acid containing plants are prone to be specially dangerous.

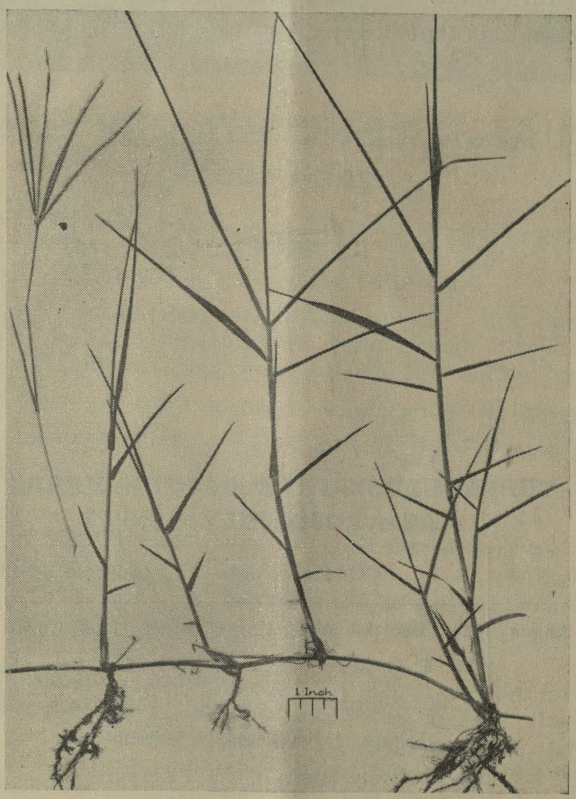


Plate 85.
African Star Grass.

On the other hand, plants which make smooth even though rapid growth from germination to maturity will usually fail to produce prussic acid in sufficient amount to be dangerous to stock. As plants mature the danger in general is considerably lessened, although it cannot always be entirely discounted.

As some doubt exists about the safety of African star grass when recovering quickly from a set-back, it is a wise plan under such conditions to test it first by allowing two or three animals access ahead of the herd or flock. In any event, hungry stock should never be placed on the grass.

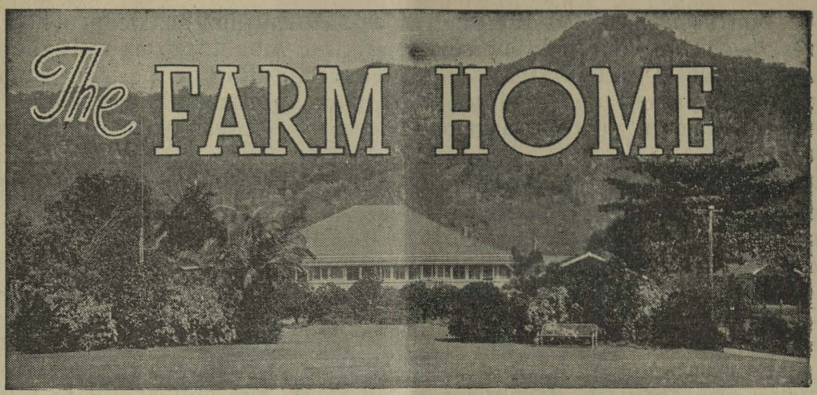
Care in the grazing practices used makes it unlikely that any trouble will be experienced. This grass has valuable properties as a fodder plant, and it is considered that these qualities more than outweigh the risk of poisoning.

Should cases of poisoning occur, antidotal treatment is usually very effective, always provided it is carried out with the utmost expedition after symptoms are first noticed. It consists of the administration, for cattle, of 2 oz. of sodium thiosulphate (''hypo'') dissolved in about one pint of water followed by further doses of 1 oz. in water at intervals of 20 minutes until recovery occurs; for sheep, about one quarter of these doses will suffice.

It is essential that ''hypo'' be kept on hand ready for the emergency.

TUBERCULOSIS-FREE CATTLE HERDS (AS AT 13th JULY, 1950).

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas.
Jersey	W. E. O. Meier, ''Kingsford'' Stud, Rosevale, via Rosewood.
A.I.S.	F. B. Sullivan, ''Fermagh,'' Pittsworth.
Ayrshire ..	L. Holmes, ''Bencecula,'' Yarranlea.
A.I.S.	D. Sullivan, Rossvale, via Pittsworth.
A.I.S.	W. Henschell, Yarranlea.
A.I.S.	Con O'Sullivan, ''Navillus Stud,'' Greenmount.
Jersey	J. S. McCarthy, ''Glen Erin Jersey Stud,'' Greenmount.
Jersey	J. F. Lau, ''Rosallen Jersey Stud,'' Goombungee.
A.I.S.	H. V. Littleton, ''Wongalee'' Stud, Hillview, Crow's Nest.
Jersey	G. Harley, Hopewell, Childers.
Jersey	Toowoomba Mental Hospital, Willowburn.
Jersey	Farm Home for Boys, Westbrook.
Jersey	F. J. Cox and Sons, Crawford, Kingaroy Line.
Friesian ..	C. H. Naumann, '' Yarrabine '' Stud, Yarraman.



Reasons Why You Should Breast Feed Your Baby.

HAVE you just been blessed with the most priceless possession it is possible to have—a young infant son or daughter? Or maybe it hasn't arrived yet but you are expecting one soon.

Whatever it may be, it is certain that you are determined that your infant is going to have the best start it can possibly have in life, and the greatest gift you can contribute towards this end is breast milk.

There is an old French proverb, which runs like this:

"The most loving act a mother can do is to nurse her baby.

Nothing can ever replace the milk and the heart of a mother."

This is as true to-day as it was hundreds of years ago. So as soon as you have a baby, make a resolution to nurse him at your breast for as long as possible up to 9 months of age. Let nothing deter your determination—neither old wives' tales, nor grand-parents, nor in-laws, nor stupid social conventions, nor convenience, nor even a previous failure with another infant.

After all, nature usually knows best what is good for us and in breast milk she supplied the perfect food for all infants. Its constituent nutrients of protein, carbohydrate and fat, minerals, vitamins and water are all perfectly proportioned to suit the young infant's digestive powers, so if anyone suggests that your milk does not agree with your baby you can dismiss the suggestion with the contempt it deserves. Of course, some difficulties in feeding may arise, but these are nearly always related to one or more of three factors, namely:—

(*a*) The *quantity* of milk supplied by the mother;

(*b*) Faults relating to the mother herself or to her feeding technique;

(*c*) Faults relating to the baby.

These difficulties will be discussed at a later date, but in the meantime it is well to point out that a certain degree of anxiety is natural to nursing mothers until suckling is well under way and you have learned to enjoy the experience, as you undoubtedly will if you cultivate the right attitude of mind.

You should regard suckling as a natural, instinctive process, of great benefit to your baby and yourself, and your approach to it should be calm, placid and matter-of-fact. Your handling of the baby should be gentle, patient and loving. With this approach things should go smoothly and a perfect harmony develop between your infant and yourself.

It is all wrong to develop an intense emotional attitude towards breast feeding and to regard it as a formidable task which requires the assistance of professional experts to make it a success. It must be admitted that this attitude in nursing mothers, especially those nursing their first babies, has been fostered to some extent by doctors and nurses. Naturally enough, the clockwork regularity of the feeds and the frequent test weighings seem very impressive to young mothers who are keyed up at the thought of having a first child; if suckling is turned into a solemn rite, they are deeply interested in it, but half afraid to touch their babies in case of doing wrong!

So don't be too dependent on the advice and management of others. The doctors, nurses and clinics are there to help you and guide you, not to control and manage you. Use your own common sense and maternal instincts as much as you can.

Now to continue further with the advantages of breast feeding.

Breast milk not only contains the optimum proportion of nutrients for baby's digestion, growth and development, but it also contains certain antibodies, derived from the mother, which help to protect baby against the various infectious diseases of childhood, such as measles, whooping cough, and diphtheria, for varying periods averaging about 6 months after birth. This is an important factor, for these infections assume their most serious proportions during the first year or so of life.

What is more, the infective type of gastro-enteritis, which is a most serious disease in infancy, is very rarely found in breast-fed babies, for breast milk is sterile and the risk of contamination is small. All that is required is the normal cleanliness of breasts and hands—you do not have to worry about boiling your milk, scalding all your utensils and laboriously making up your mixtures. The incidence of infection and gastro-intestinal upsets is still significantly less in large groups of breast-fed infants as compared with those artificially fed, although the difference has become less marked with a higher standard of artificial feeding.

Successful breast feeding is also known to exert a favourable influence on the child's later emotional development. Infants in the first year of life are not dull of feeling or unconscious of their surroundings. On the contrary, they are sensitive to all kinds of impressions, and their habits of reacting to early experience of pleasure and distress are formed to last. The comfort enjoyed by the infant in contact with a soft breast instead of a hard bottle, and the confidence gained by the mother in supplying the infant's needs herself, are factors in the successful rearing of infants which may be assumed to have real importance.

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

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

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	6.03	5.33	Cairns	29	29	Longreach	35	35
6	5.58	5.36	Charleville ..	27	27	Quilpie	35	35
11	5.52	5.38	Cloncurry	50	50	Rockhampton ..	10	10
16	5.46	5.40	Cunnamulla ..	29	29	Roma	17	17
21	5.40	5.42	Dirranbandi ..	19	19	Townsville ..	25	25
26	5.35	5.45	Emerald	19	19	Winton	40	40
30	5.30	5.46	Hughenden ..	35	35	Warwick	4	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	9.48	8.21
2	10.44	8.53
3	11.40	9.27
4	..	10.06
	a.m.	
5	12.37	10.50
6	1.32	11.40
		p.m.
7	2.25	12.35
8	3·14	1.35
9	3.58	2.37
10	3.37	3.39
11	5.13	4 42
12	5.47	5.44
13	6.20	6.48
14	6.53	7.53
15	7.29	9.00
16	8.08	10.09
17	8.52	11.19
18	9.44	..
		a.m.
19	10.42	12.26
20	11.46	1.29
	p.m.	
21	12.52	2.24
22	1.56	3.10
23	2.58	3.50
24	3.58	4.25
25	4.54	4.56
26	5.50	5.25
27	6.44	5.53
28	7.39	6·22
29	8.34	6,52
30	9.30	7.25

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	13	24	29	40	3	15	32	46
6	8	31	24	46	0	22	25	54
11	14	23	29	39	4	14	33	45
16	26	12	43	26	18	1	50	29
21	30	9	45	24	20	0	53	26
26	19	19	34	34	10	10	39	41
30	11	27	26	43	0	18	29	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	15	40	40	58	25	43	14	34
3	6	49	35	63	20	49	6	41
5	3	56	34	67	18	53	4	46
7	2	56	33	67	17	53	3	46
9	8	49	36	63	21	49	8	41
11	17	38	41	57	26	42	15	33
13	28	26	50	47	34	33	24	22
15	41	13	57	39	42	24	34	13
17	52	4	66	33	50	19	43	5
19	57	2	69	32	53	17	47	3
21	54	3	67	32	51	18	44	4
23	43	11	60	38	45	23	36	11
25	33	23	52	45	37	30	27	20
27	22	33	45	54	30	38	19	29
29	12	43	38	59	23	45	11	36
30	8	48	36	62	21	48	8	40

Phases of the Moon.—Last Quarter, 4th September, 11.53 p.m.; New Moon, 12th September, 1.29 p.m.; First Quarter, 19th September, 6.54 a.m.; Full Moon, 26th September, 2.21 p.m.

On 24th September at 1 a.m. the Sun will cross the equator, and on this day seen from anywhere on earth it will rise and set at true east and true west respectively. On the 13th and 26th the Moon will rise and set at true east and true west respectively. On 12th September there will be a total eclipse of the Sun visible from Northern Asia and Alaska and the North Pacific Ocean; while on the 26th there will be a total eclipse of the Moon, which also will not be visible from Australia.

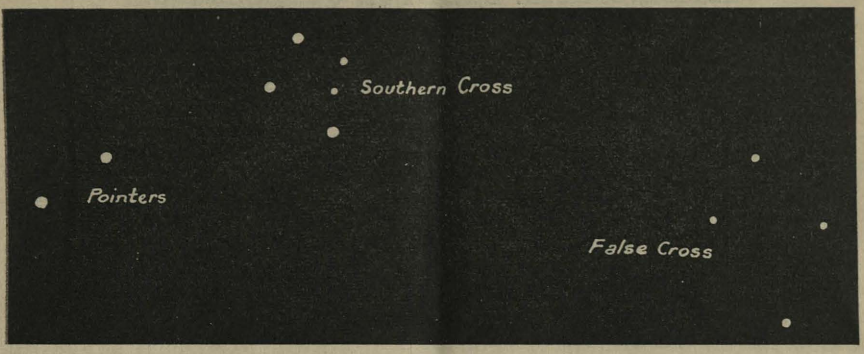
Mercury.—An evening object at the beginning of the month, when it will set over 1¾ hours after the Sun. By the 17th it will be in line with the Sun, after which it will pass into the eastern sky, and at the end of the month will rise ¾ hours before sunrise. On the 24th it will pass 2½ degrees to the south of Venus, after which it will be higher in the sky than Venus

Venus.—In the constellation of Leo; will rise less than 1 hour before the Sun at the beginning of the month; at the end of the month it is too close to the Sun for observation.

Mars.—In the constellation Virgo at the beginning of September, will set between 10.30 p.m. and 11.45 p.m., while at the end of the month it will set between 10.00 p.m. and 11.15 p.m.

Jupiter.—Will rise during the daylight hours and be well up in the eastern sky at nightfall. On the 1st it will set just before sunrise, but by the end of the month it will set between 3.45 a.m. and 5 p.m.

Saturn.—Too close to the Sun for observation, being in line with the Sun on the 16th.

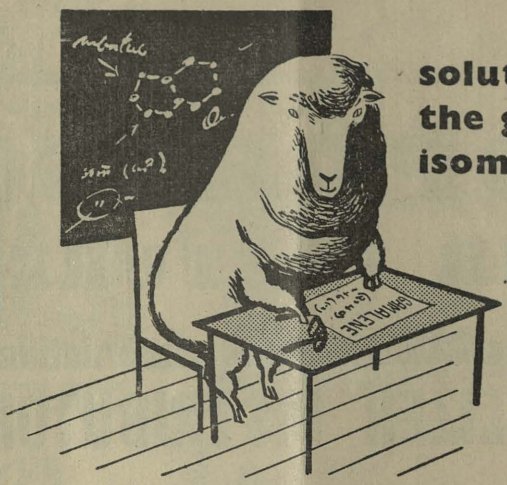


THE CONSTELLATIONS.

CRUX.

The constellation to be discussed this month is Crux, or Southern Cross as it is commonly called. It is perhaps the most outstanding group of the southern sky and particularly for Australians, for it has been embodied in our flag. However, it is surprising how few Australians can point out this constellation in the sky, confusion often being caused with the false cross in the constellation of Argo not far distant. There is, however, a very simple way of locating the Cross by the two very bright stars in the constellation of Centaurus, which "point" to the Southern Cross and are always associated with it, being known as the "pointers." In fact, to the ancients the Southern Cross formed part of the constellation of Centaurus, but became a separate constellation during the 15th century, though exactly when and by whom is not known. The relation of the "pointers," Southern Cross and False Cross is shown in the diagram. The Southern Cross is visible as far as latitude 20° or 30° north, when it is seen rather low on the horizon at certain times of the year. Vasco da Gama mentions seeing it on his journey round the Cape of Good Hope in 1493, and Mollineaux showed it as a cross on his celestial globe in 1592. It is situated in one of the richest parts of the "Milky Way" and is a splendid conspicuous object at some time of the night for almost the whole year from anywhere in Queensland. It is seen in the early evening sky from January to September, being on the Meridian or North-South line about midnight on the 31st March. It will reach this position about 2 hours earlier each month, so that on January 31st it will reach the Meridian at 4 a.m. During that month it is seen on its side in the south-eastern sky during early evening, with the "pointers" below it and nearer the horizon. By the end of August the cross reaches the meridian at 2 p.m. (daylight) and is then seen at nightfall on its side in the south-western sky, with the "pointers" above it, the Cross then being nearer the horizon. From Queensland the Cross is below the horizon in the evening only from about the middle of October to the middle of December, thus tracing almost a complete circle in the sky, the centre of which is the South Celestial Pole, which is found by producing the long arm of the Cross about 4½ times its length.

There are a number of interesting objects in this region of the heavens, the brightest "star" of the cross being a triple, while the next brightest star is close to a cluster likened by Sir John Herschel to a collection of diamonds, rubies, sapphires and emeralds on a dark velvet interior of a jewel box. This "Jewel Box," as it is known, is on the edge of the "Coal Sack," the dark patch of apparently starless sky. The "Coal Sack" is really a mass of non-luminous obscuring matter called "dark nebulae" interposed between us and the starry background. Under high magnification, however, many stars are seen through this "dark cloud."



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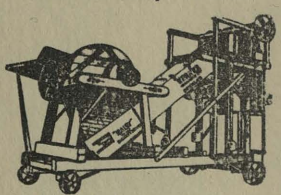

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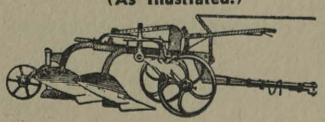

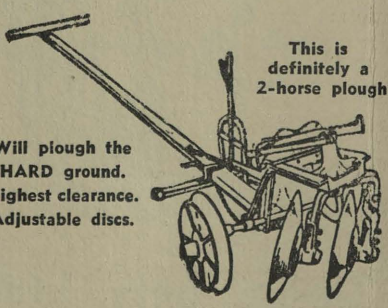

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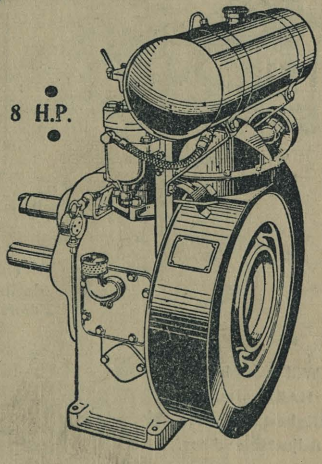

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