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DEPARTMENT OF AGRICULTURE

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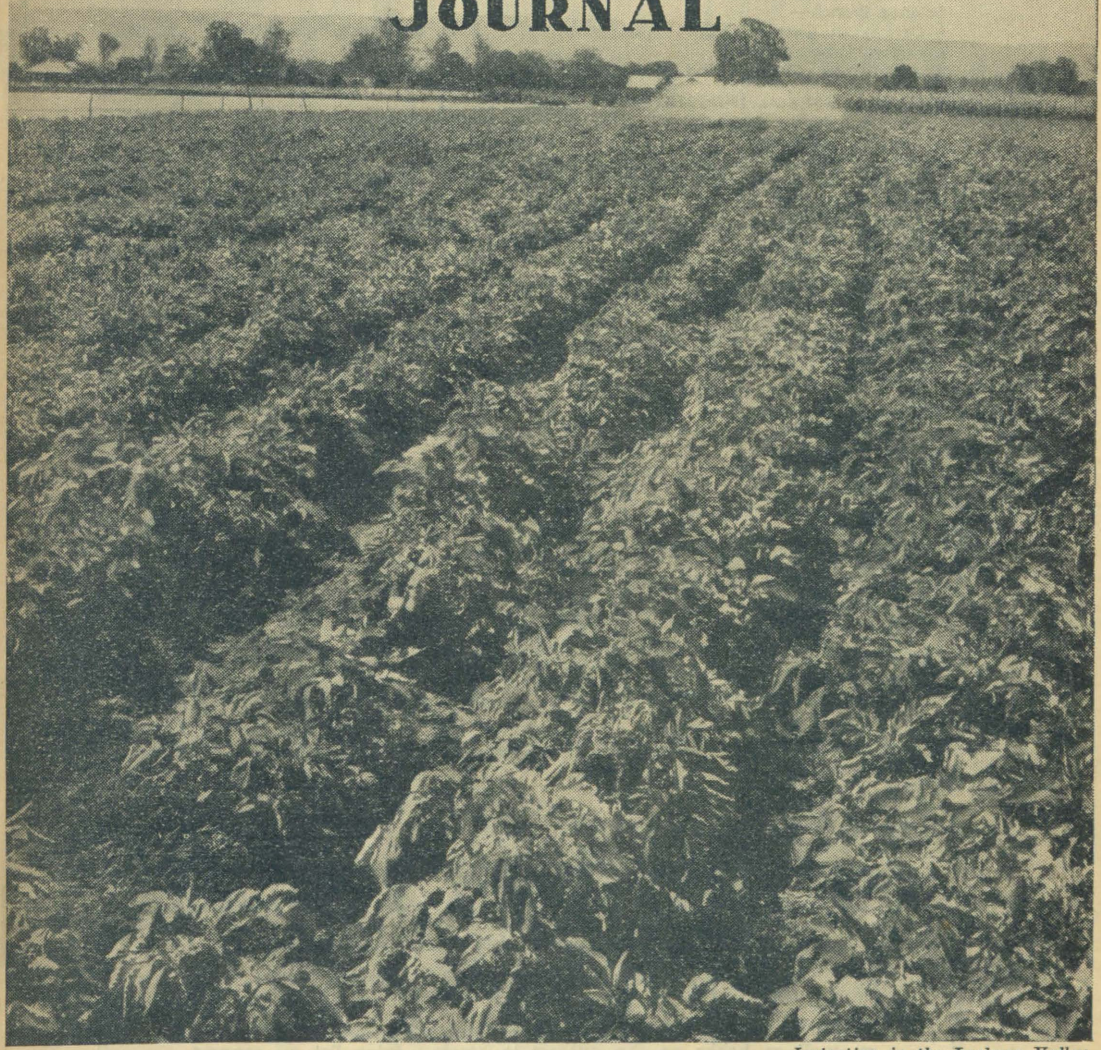


Irrigation in the Lockyer Valley.

LEADING FEATURES

Registered at the General Post Office, Brisbane, for transmission by Post as a Newspaper.

Contents

American Foul Brood of the Honeybee.

C. ROFF, Adviser in Apiculture.

AMERICAN foul brood is the most serious of the diseases affecting bees, and is responsible for losses in the beekeeping industry in many parts of the world. Economic management of bees is not possible in an infected apiary; however, the chances of serious losses are considerably reduced if beekeepers are familiar with the symptoms and with the correct procedure for dealing with an outbreak of the disease.

The causal organism of American foul brood is a bacterium* which, under suitable conditions, multiplies very rapidly. It is able to form resting bodies or spores which may remain viable and infective for long periods and are resistant to moderate heat and disinfection. The most common methods of spreading these spores are the utilisation of infected honey by nurse bees and the transfer of infected brood combs. The disease may also be transmitted by contaminated beekeeping equipment and the drifting of bees from diseased to healthy hives.

The Disease Position in Queensland.

Outbreaks of American foul brood during recent years at Pinkenba, Caloundra, Karara, Blair Athol and South Brisbane have given rise to anxiety in the beekeeping industry. The moving of apiaries from district to district has been practised extensively by beekeepers and has resulted in large crops of honey being harvested. Concurrent with the increase in migratory beekeeping, however, there has been a spread of American foul brood. A certain amount of migration will always be necessary, but it is desirable for beekeepers to adopt a thoughtful attitude in regard to the movement of apiaries in order to avoid consideration being given to restrictive disease control measures. Any such measures would undoubtedly limit the free moving of apiaries.

Routine Inspections.

It is sound beekeeping practice to *inspect regularly* the brood in every colony to ascertain whether American foul brood is present. *Furthermore, these inspections must be carried out thoroughly, and the work should be undertaken as a separate operation, and not in conjunction with other tasks.*

* *Bacillus larvae* White.

Features of the Disease.

(1) Larvae of all three castes are susceptible, and infection takes place only during the larval feeding period. Death occurs invariably after the capping of cells, when the insects are still in the late larval or early pupal stages.

(2) Larvae are susceptible to infection in all seasons, and an outbreak of the disease may appear irrespective of the quantity of food available.

(3) All races of honey bees are susceptible to American foul brood.

(4) Infected honey is not injurious to humans.

Symptoms.

(1) The colony is noticeably weak.

(2) The brood comb has an irregular appearance. In healthy brood the cappings are slightly convex, but where death has occurred they become concave or sunken and may be perforated. In addition, capped cells are somewhat scattered, giving what is often termed a pepper-box appearance (Plates 1 and 2).

(3) Diseased larvae or prepupae are at first slightly yellowish in colour, but as decomposition advances they gradually change to brown. The dead larvae are usually extended lengthwise in the cells.

(4) The decaying contents of a cell may, before drying, be drawn out with a wooden match or a splinter of wood into fine, glue-like, ropy threads. In drying, a tough dark-brown or coffee-coloured scale is formed which the bees cannot remove. This may be seen extended along the lower side walls when the comb is held so that sunlight falls on the side and lower walls of the cell.

(5) Where death has occurred after pupation a partly developed "tongue" may protrude as a fine thread upwards and backwards from the scale, sometimes adhering to the upper wall of the cell.

(6) The odour in an infected hive may become heavy and foetid, and has been likened to that of stale glue.

Preventive Measures.

The following measures for preventing the appearance and spread of American foul brood are recognised as sound:—

(1) The interchange of brood combs between hives and apiaries should be reduced to a minimum.

(2) Any manipulations or activities which induce robbing should be avoided.

(3) Second-hand bee equipment should be bought only after inspection has established freedom from disease.

(4) Honey from an unknown source should never be fed to bees.

(5) If second-hand honey tins are used great care should be exercised to ensure that the bees do not have access to them.

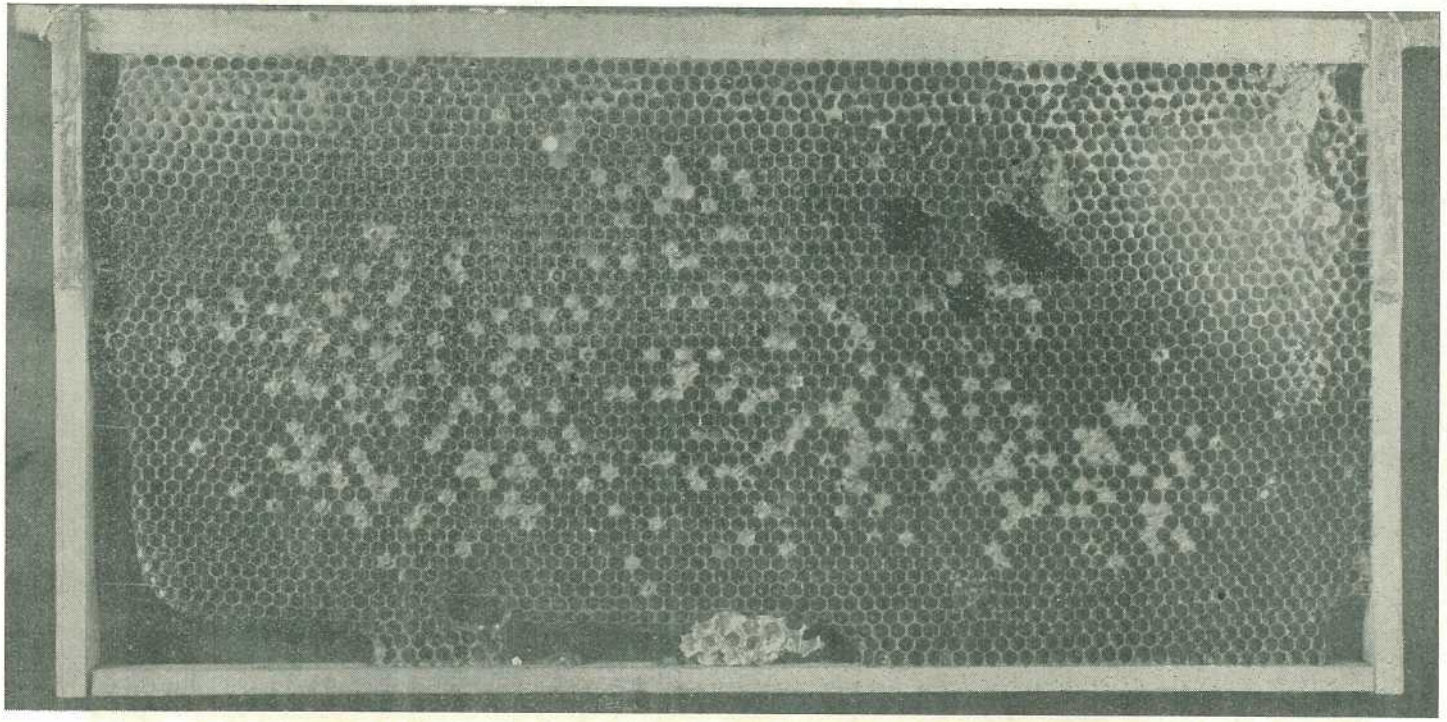


Plate 1.

Brood Comb Infected with American Foul Brood, Showing the Irregular Distribution of Capped Cells.

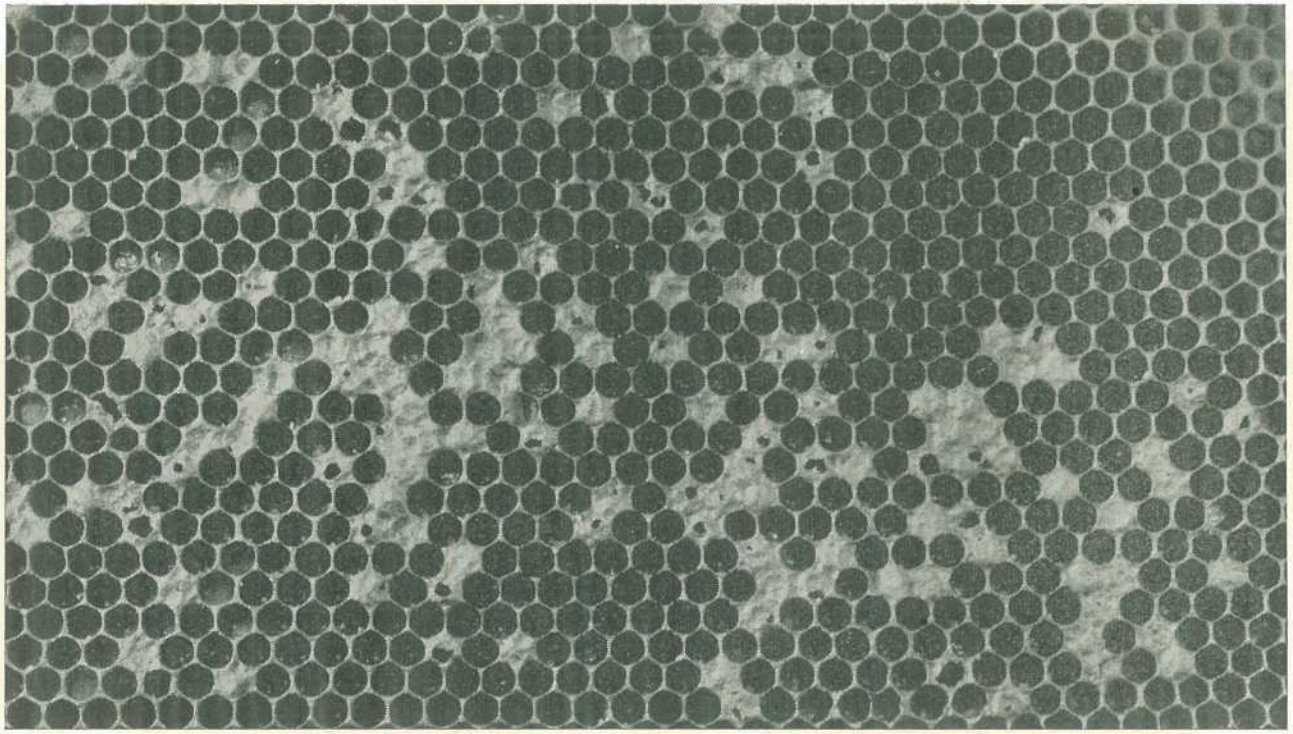


Plate 2.

Portion of Infected Brood Comb, Showing Sunken and Perforated Cappings.

Treatment of Infected Colonies.

All contents of diseased hives should be burnt and the hives themselves decontaminated according to the following method, which is the safest and most economical:—

(*a*) The destruction of diseased colonies should take place in the evening when all bees are in the hives.

(*b*) Dig a pit of a size suitable for the number of colonies to be destroyed.

(*c*) Kill all bees in the diseased hives with calcium cyanide; about two teaspoons 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.

(*d*) 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.

(*e*) Remove all metal rabbets and then scrape the inside surfaces of the unburnt parts of the hives and burn the debris.

(*f*) After all diseased material has been burnt, spade the ground down, refill the pit, and pack well.

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

Legislative Requirement.

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 promptly with the Department in order that assistance may be rendered in treating the infection.

BEEKEEPING LEAFLETS.

The following publications are available free of charge to Queensland Beekeepers—

Beekeeping Legislation.
Hints on Making Hives.
European Foul Brood of Bees.
Nosema Disease of the Honeybee.
Pests of the Hive and Honeybee.

The Honey Flora of South-Eastern Queensland.

S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 239 of the October issue.*)

River Mangrove.

Botanical Name.—*Aegiceras corniculatum* (L.) Blanco; also known as *Aegiceras majus* Gaertn.

Other Common Name.—Small black mangrove.

Distinguishing Features.—A shrubby mangrove with green leaves not in pairs, and bunches of pure white flowers.

Description.—This is usually a bushy dark green shrub (Plates 52-53) up to 8 ft. high with leathery leaves singly arranged, tapering

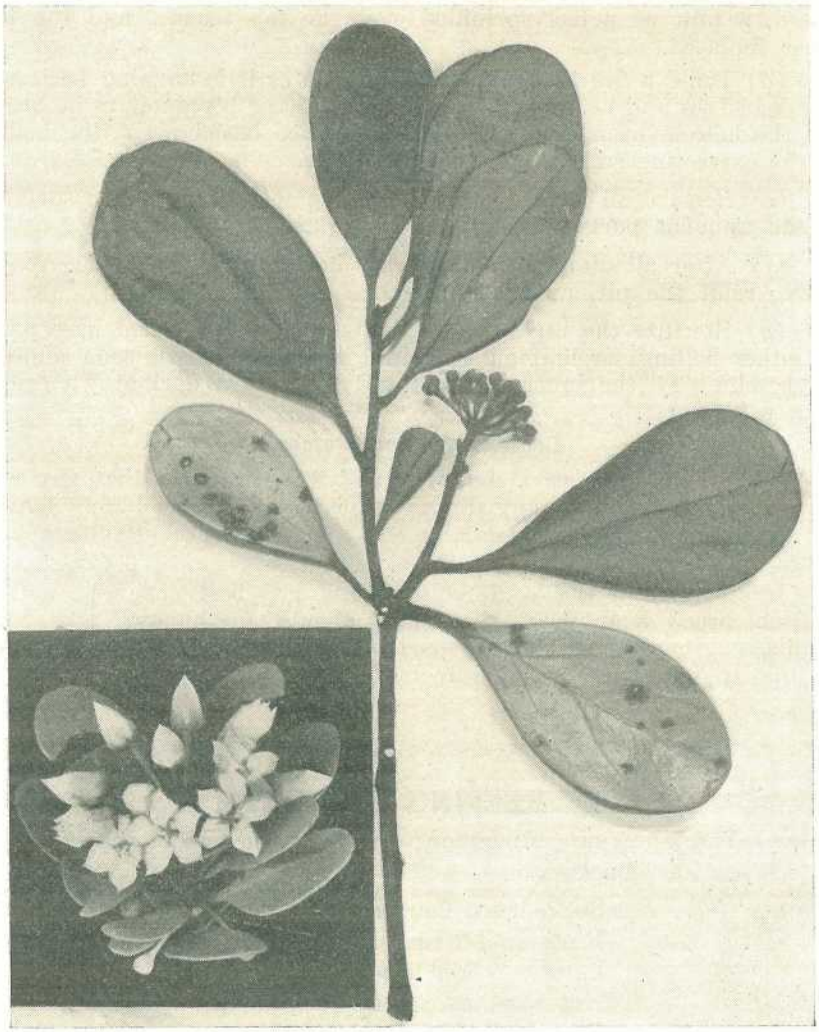


Plate 52.

River Mangrove (Aegiceras corniculatum). Leaves, buds and flowers.

gradually to their stalks, rounded at the top, 2-3 in. long, about twice as long as wide, and often covered with a film of salt. The flowers are in bunches at and near the ends of the twigs. They are pure white, nearly ½ in. wide, and the five petals are united into a tube. The five stamens are inconspicuous. The fruit is curved, narrow and pointed.

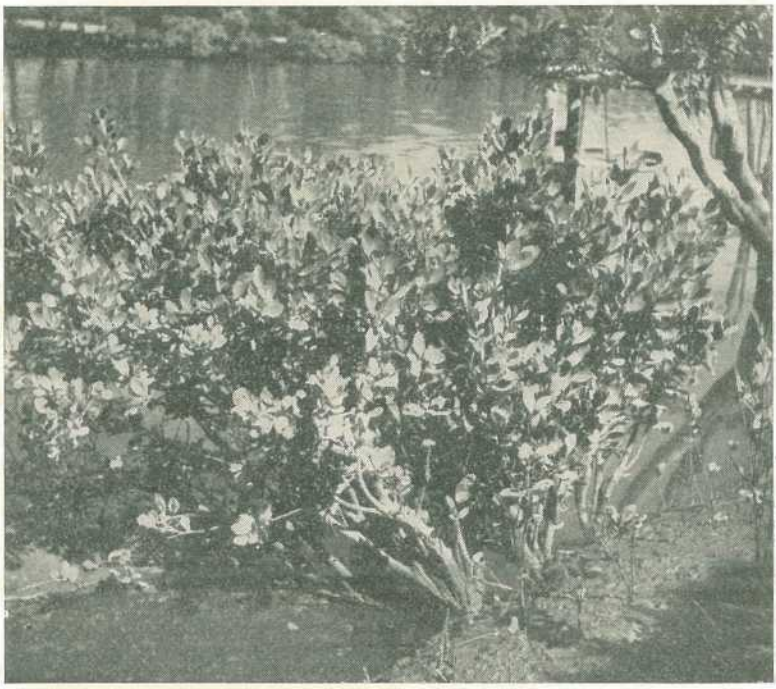


Plate 53.

River Mangrove (Aegiceras corniculatum). Bulimba Creek, Hemmant.

Distribution.—River mangrove is common on the landward side of the mangroves and extends up the rivers nearly to the tidal limit. It usually grows with the grey mangrove on river banks. It is common along the coast of Queensland, in Northern Australia and in countries north of Australia.

Usual Flowering Time.—October-November.

Colour of Honey.—Bright water-white.

Importance as Source of Honey.—Major.

Importance as Source of Pollen.—Major.

General Remarks.—This species is the most valuable of the mangrove group. Some flowering occurs yearly, but usually a heavy honey crop is harvested in alternate years. Along the Mary and Susan Rivers, in the Maryborough district, this tree is used extensively by commercial beekeepers and it is not unusual for them to obtain up to 120 lb. of river mangrove honey from each colony. Elsewhere the amount harvested is considerably less.

Flowering of river mangrove may last for some eight weeks. Colonies thrive on this tree, working it freely for nectar and large quantities of greyish coloured pollen.

The honey has excellent colour, inferior density and a distinctive but not unpleasant flavour. During cool weather it granulates quickly.

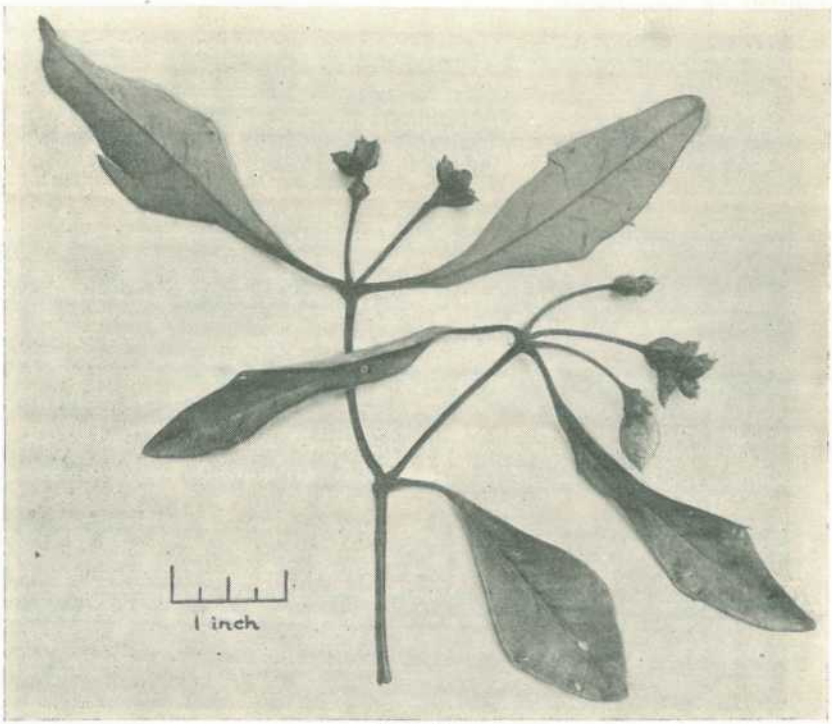


Plate 54.

Grey Mangrove (Avicennia marina var. resinifera). Leaves and fruits, one with a germinating seed.

Grey Mangrove.

Botanical Name.—*Avicennia marina* (Forsk.) Vierh. var. *resinifera* (Forst.) Bakh.; also known as *Avicennia officinalis* L.

Other Common Name.—White mangrove.

Distinguishing Features.—A mangrove (Plates 54-55) with erect, peg-like branches of the roots projecting above the surface of the mud, and leaves in pairs, whitish underneath.

Description.—This is a tree up to about 40 ft. high but often much smaller, with light-grey, nearly smooth bark; peg-like projections from the roots grow for a few inches above the surface of the mud in which the tree grows. The leaves are arranged in pairs; they are grey-green above and whitish underneath, narrowed to each end, about 2-3 in. long and about 3-4 times as long as wide. The deep yellow or orange flowers are produced in small dense bunches at the ends of the twigs; they are scarcely more than $\frac{1}{3}$ in. long and wide, with 4 petals united into a tube in the lower part, but this tube is hidden by the five sepals. Four small stamens are attached to the tube. The fruit is four-lobed. The seeds usually germinate before falling, as in most other mangroves.

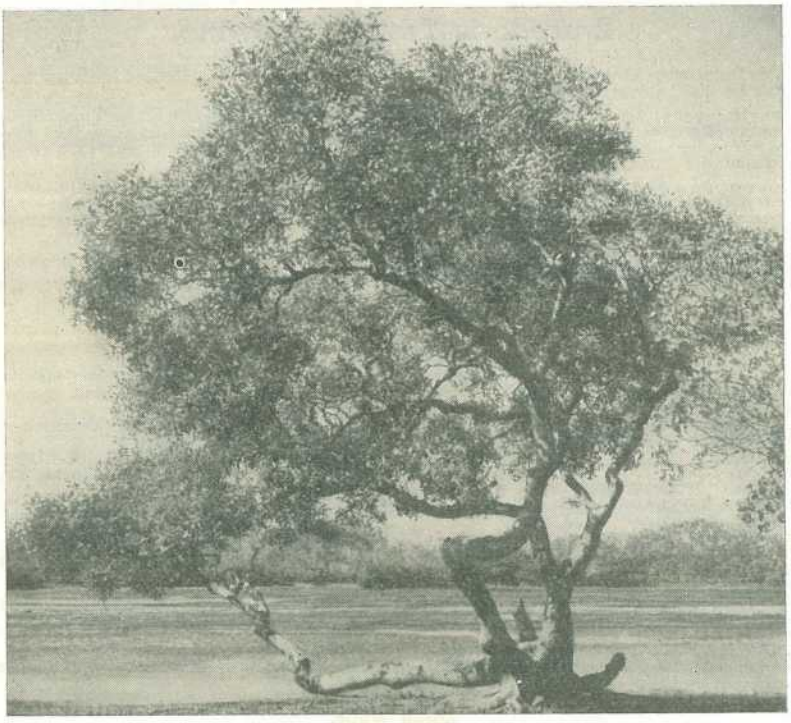


Plate 55.

Grey Mangrove (Avicennia marina var. resinifera). Bell Creek, Caloundra.

Distribution.—Along the coast in muddy estuaries and quiet backwaters, sometimes forming extensive stands, and along the banks of tidal streams. It or a closely similar species is found along the coast of eastern and northern Australia and in many other parts of the world.

Usual Flowering Time.—February.

Colour of Honey.—Medium amber.

Importance as Source of Honey.—Minor, occasionally medium.

Importance as Source of Pollen.—Medium, occasionally major.

General Remarks.—This tree produces both nectar and pollen. It is not, however, a prolific source of honey, as even during a good season a colony obtains no more than 40 lb. of predominantly grey mangrove honey.

The honey has a strong flavour, possesses weak density, and does not granulate readily. It adversely affects the grade of any other honeys in which it is blended naturally.

Notwithstanding its poor commercial qualities, the honey is excellent bee food, and this, with the moderate amount of pollen produced, makes grey mangrove a useful supporting species.

[TO BE CONTINUED.]

Brucellosis Testing of Swine.

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

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

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

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

TESTED HERDS (As at 15th October, 1953).

Berkshire.

J. J. Bailey, " Lucydale " Stud, East Greenmount
S. Cochrane, " Stanroy " Stud, Felton
G. Handley, " Handleigh " Stud, Murphy's Creek
J. L. Handley, " Meadow Vale " Stud, Lockyer
R. G. Koplick, " Melan Terez" Stud, Rochedale
O'Brien and Hickey, " Kildurham " Stud, Jandowae East
E. Pukallus, " Plainby " Stud, Crow's Nest
G. C. Traves, " Wynwood " Stud, Oakey
E. Tumbridge, " Bidwell " Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, " Palen " Stud, Palen Creek
A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
H. H. Sellars, " Tabooba " Stud, Beaudesert
F. Thomas, " Rosevale " Stud, M.S. 373, Beaudesert
D. T. Law. " Rossvill " Stud, Trouts road, Aspley
R. H. Crawley, " Rockthorpe " Stud, *via* Pittsworth
F. R. J. Cook, " Alstonvilla," Wolvi, *via* Gympie
Mrs. I. M. James, " Kenmore " Stud, Cambooya
H. L. Stark, " Florida," Kalbar
J. H. N. Stoodley, " Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, " Bardell," Goovigen
R. E. Paulsen, " Crest " Stud, Binjour Plateau, M.S. 670, Gayndah
M. G. and R. H. Atkins, " Diamond Valley " Stud, Mooloolah
L. Puschmann, " Tayfeld " Stud, Taylor
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
W. F. Ruhle, " Felbar " Stud, Kalbar
C. E. Edwards, " Spring Valley " Stud, Kingaroy
G. J. McLennan, " Murcott " Stud, Willowvale
H. M. Wyatte, " Deepwater " Stud, Rocky Creek, Yarraman
C. F. W. and B. A. Shellback, " Redvilla " Stud, Kingaroy

Large White.

H. J. Franks and Sons, " Delvue " Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, " Highfields," Murgon
K. B. Jones, " Cefn " Stud, Pilton
R. G. Koplick " Melan Terez " Stud, Rochedale
R. Postle, " Yarralla " Stud, Pittsworth
E. J. Bell, " Dorne " Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, " Thistleton " Stud, Maleny
H.M. State Farm, Numinbah
K. A. Hancock, " Laurestonvale " Stud, Murgon
V. P. McGoldrick, " Fairymeadow " Stud, Cooroy
R. S. Powell, " Kybong " Stud, Kybong, *via* Gympie
E. B. Horne, " Kalringal," Wooroolin
S. T. Fowler, " Kenstan " Stud, Pittsworth
H. L. Larsen, " Oakway," Kingaroy
C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek
E. G. Evans, " Lauraven " Stud, Box 22, Maleny
Mrs. I. G. Utting, " White Lodge," Mountain road, Cooroy
N. E. Meyers, Halpine Plantation, Kallangur
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. L. Skyring, " Bellwood " Stud, *via* Pomona
O. H. Horton, " Manneum Brae " Stud, Manneum, Kingaroy
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
Miss G. R. Charity, Coondoo, Kin Kin.

Tamworth.

S. Kanowski, " Miecho " Stud, Pinelands
N. R. Potter, " Actonvale " Stud, Wellcamp
D. F. L. Skerman, " Waverley " Stud, Kaimkillenbun
A. C. Fletcher, " Myola " Stud, Jimbour
Salvation Army Home for Boys, " Canaan " Stud, Riverview
F. Thomas, " Rosevale " Stud, M.S. 373, Beaudesert
A. J. Surman, " Namrus " Stud, Noble road, Goodna
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, " Sunny View," M.S. 90, Kingaroy
T. A. Stephen, " Withcott," Helidon
W. F. Kajewski, " Glenroy " Stud, Glencoe
A. A. Herbst, " Hillbanside " Stud, Bahr Scrub, *via* Beenleigh
R. G. Koplick, " Melan Terez " Stud, Rochedale
H.M. State Farm, Numinbah
D. B. Alexander, " Debreczen " Stud, Kinleymore, *via* Murgon
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley

Wessex Saddleback.

W. S. Douglas, " Greylight " Stud, Goombungee
D. Kay and P. Hunting, " Kazan " Stud, Goodna
J. Gleeson, " Iona Vale " Stud, Kuraby
C. R. Smith, " Belton Park " Stud, Nara
H. H. Sellars, " Tabooba " Stud, Beaudesert
H. Thomas, " Eurara " Stud, Beaudesert
D. T. Law, " Rossvill " Stud, Trout road, Aspley
J. B. Dunlop, " Kurrawyn " Stud, Acacia road, Kuraby
A. Curd, " Kilrock " Stud, Box 35, Jandowae
C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek
R. A. Collings, " Rutholme " Stud, Waterford
M. Nielsen, " Cressbrook " Stud, Goomburra
G. J. Cooper, " Cedar Glen " Stud, Yarraman
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
A. H. Groves, " Kinvara " Stud, Ingleside, West Burleigh

The Banana.

J. McGREGOR WILLS (Senior Adviser in Horticulture) and F. W. BERRILL (Assistant Horticulturist), Horticulture Branch.

(*Continued from page 210 of the October issue.*)

PLANTING MATERIAL.

THE type of planting material used has a considerable bearing on the success or failure of the plantation. It is essential that all planting material be obtained from reasonably mature, vigorous plants in an area which is free from the more important diseases and pests. Wherever possible, growers use their own planting material because better selection is possible under these conditions.

Three types of planting material (Plate 10) may be used—namely, butts, suckers and bits—but in actual practice the butts are of minor importance.

Butts.

A butt is obtained by removing the corm together with a portion of the pseudostem from a plant that has recently had a matured bunch cut from it, or, if the plantation is scheduled for eradication, is carrying a bunch or is just about to produce one. The pseudostem is severed so as to leave about 4 in. above the corm and the corm itself is trimmed. All eyes or buds except one are gouged out and the butt is then planted so that the junction of the corm and pseudostem is about 6 in. below ground level. A butt has a fairly large reserve of food material and butt plantings are therefore fairly resistant to adverse weather conditions which may occur at or immediately following the establishment of a plantation. A butt may be 10 lb. or more in weight; on hilly country where bananas are usually grown in southern Queensland, this presents an appreciable transport problem and planting of butts is now seldom practised.

Suckers.

Suckers are offshoots from the parent plant. They make excellent planting material provided they are sturdy, of the current season's growth and retain the narrow "sword" leaves until they are at least 18 in. high. The persistence of the sword leaves is an indication of plant vigour. Suckers about 2 ft. high with a corm not less than 3 in. in diameter are preferred in practice. Small suckers with a spindly stem and broad flattened leaves lack vigour and should be discarded as unsuitable for planting.

Suckers are the most widely used planting material, chiefly because they are easily obtained. A draining spade or sharp crowbar is a suitable implement for the removal of suckers from the parent plant, but irrespective of what method is used, care should be taken to ensure that the small corm is not damaged in the process. Suckers are planted with the junction of the corm and pseudostem approximately 6 in. below ground level. They should be placed so that the part originally furthest from the parent plant faces in the direction desired for the following sucker.

Plate 10.

Banana Planting Material. Left to right—bit, sucker, corm. Note position of bud (eye) on bit. Whole corms are seldom used.

Although a good plantation can be established from suckers, this type of planting material possesses an important defect. If conditions are fairly dry after planting, the sucker develops a new secondary corm on top of its original one. The new plant is then comparatively shallow-rooted and the old corm interferes with root development from the new corm above it. As the banana stool tends to work towards the surface of the soil with each successive generation of suckers, it is essential that planting material of this kind be set as deeply as is practicable.

Bits.

A "bit" is a portion of a corm carrying a mature bud or eye. Well-grown healthy plants at least six months old and preferably older, which have not yet bunched, provide good bits. The whole butt is dug out, the roots trimmed off and the outer tissue of the corm pared to a depth of about one-eighth of an inch as a precaution against weevel borer infestation. The pseudostem is usually removed about 4 in. above

the top of the corm. The corm may be cut into several sections in such a way that each bit measures not less than 3 in. in any direction and has one underground eye centrally placed.

However, there is a second series of buds near the upper surface of the corm and protected by the sheathing layers of the pseudostem. These upper buds are much younger than those below ground and tend to develop faster and produce more vigorous plants. For this reason, a bit cut so as to utilize one of these buds is generally preferred to a bit with an underground bud.

Only two bits, each with an outermost bud, should be cut from the one corm. The buds are located by carefully removing the outer ring of leaves to expose the pink edges of the next pair of leaves. One will be found at this point and the other is approximately opposite to it. The corm and attached pseudostem is then split in half so that each half possesses one of these two buds approximately centrally situated. The original growing point and any lower buds are gouged out, and the two bits are trimmed with square sides and base to facilitate handling and planting. Prepared bits may weigh 2-4 lb., but the larger that they can be cut the better. The upper buds are very susceptible to bruising and it is usual to leave a small flap of covering tissue as a protection during transport and planting.

Bits are considered the best type of planting material available owing to their normally rapid growth, the deep rooting system and the particularly even stand which develops from them. If soil moisture is very low at the time of planting, however, and irrigation is not possible, bits are usually affected more adversely than suckers planted under the same conditions. The bit should be planted in an almost vertical position with the eye facing usually in a south-easterly direction, and at a depth of about 6 in. below soil level. In heavy soils somewhat shallower planting may be preferable.

Planting material, whether suckers or bits, should be graded into at least two, and preferably three, groups for size and then allowed to stand for at least 24 hours before planting. During that period, the cut surfaces dry out sufficiently to prevent any subsequent breakdown. Each grade of bits or suckers can be planted as a block in the new plantation, in order to give reasonable uniformity to the stand and simplify cultural and harvesting operations.

PLANTING.

In a warm, moist, equable climate the banana may bunch in about 12 months, but the period varies from one district to another and even within any given district depending on the particular aspect of the plantation and the prevailing climatic conditions. For instance, in southern Queensland the rate of growth is relatively slow from April to September, and in a dry spring for an even longer period. Under these conditions bananas usually bunch 15-18 months after planting. Bunches thrown between January and March are usually cut when prices are high and for this reason growers endeavour to adjust their planting time so that the majority of the bunches in the plant crop will be thrown in this period. However, adverse climatic conditions may completely nullify even the most careful planning.

In southern Queensland, planting takes place from September to February, and usually late December or early January planting

produces the best results. The aim is to get the plants well established before the winter but not so far advanced that the development of the bunch has actually commenced. Thus, given ideal growing conditions and adequate nutrients in the soil, a December planted crop will have completed 3-4 months growth before the onset of winter. The initiation of the bunch commences immediately after winter when climatic conditions are favourable for the production of a large number of hands of good-sized fruit. As a general rule the taller varieties such as Lady Finger are planted somewhat earlier than Cavendish and Mons Mari, for they require a slightly longer period to reach an equivalent stage of maturity.

Under North Queensland conditions, growth is more or less continuous if soil moisture is adequate. Plant development is correspondingly more rapid and planting times must be amended accordingly.

Planting Methods.

Before marking out the plant positions, provision must be made for access roads and the removal of the fruit from the plantation. If the area is steep and broken, a wiring system may be the most economical method of conveying the bunches rapidly to the packing shed with a minimum of handling and bruising. If this is the case, the positions selected for the loading platforms should be so situated that the distance which bunches have to be carried is reduced to a minimum and that, as far as possible, they can be carried downhill.

The planting positions in the area should be marked out with a long stick cut to the length of the required distance between plants. Planting distances vary somewhat with the variety, but those in general use in Queensland are:—

Spacing (Feet).	Plants per Acre.	Spacing (Feet).	Plants per Acre.
9 x 9	535	13 x 13	260
10 x 10	435	14 x 14	220
11 x 11	330	15 x 15	190
12 x 12	300	16 x 16	170

The above figures are applicable to the square system of planting. As a general rule, the number of plants required for a block planted on the contour will be slightly less.

In contour planting the procedure is to work systematically along the lines which have been run, using the measuring stick to determine the position of each hole relative to the next.

When square planting is to be practised, a reasonably straight line is run across one side of the area, and another on the opposite side as far as possible parallel to the first. Using the measuring stick, "sighter" stakes about 7 ft. long are put in at the required intervals along both these base lines. A hole is dug at the first stake position on the base line. The measuring stick is laid with its end in the centre of this hole and in a direct line with the first "sighter" stake at the other side of the block; the second hole is then dug at its other end. This procedure is repeated when the planter turns and comes back along the row defined by the second pair of stakes, and so on. If the area to be planted is too large for easy sighting from one base line to the other, intermediate stakes can be placed along each planting row at intervals of about five chains.

The planting holes should be dug with a sharp mattock carrying a strong, preferably reinforced, blade. The hole should be at least 18 in. square by 15 in. deep, although it need not necessarily be symmetrical. The larger the hole the better, as a greater quantity of well-broken-up soil can be filled in around the young plant. If a large stone or stump happens to occupy the planting position and it cannot be readily removed, the hole should be dug above the obstacle so that there will be no restriction on the growth of the uphill sucker which is desired for the ratoon crop.

On hillsides, suckers are planted with the cut surface facing downhill and bits with the eye facing uphill. By this means, the followers can be set on the uphill side of the parent where they penetrate deeply into the soil and give added firmness to the stool.

In digging holes for bananas, the earth should be drawn into a small mound on to the lower side. In planting, a small amount of surface soil is first broken into the hole from the upper side. The sucker or bit is then placed in position, and sufficient soil is dug from the top and side banks to cover the plant to a depth of about 4 in. This soil is tramped down firmly. A further layer of loose soil is then added so that a sucker finally has about 6 in. of soil above the junction of pseudostem and corm, and a bit has the eye buried at a similar depth. When the work is completed, the plant will be in a shallow basin of loose soil with a mound on the lower side.

The period which elapses between planting and the appearance of the first shoot above ground level depends largely on the temperature of the soil and its moisture content—the higher the temperature the more rapidly the bud or growing point develops.

FERTILIZING.

When large areas of virgin rain forest were available for bananas, fertilizers were seldom, if ever, used. Now the use of fertilizer is essential on most plantations to maintain a level of soil fertility at which profitable crops can be produced for a reasonably long period. The banana is a gross feeder and makes heavy demands on the available plant foods in the soil. Many different fertilizers have been used, but as a general rule, a mixture with an N–P–K formulation 8–10–8 or thereabouts is suitable for most of the soils in southern Queensland on which bananas are grown. The rate of application depends on the planting distance and the quality of the land, but is usually from 1 to 1½ tons per acre per year.

The first application is made immediately after planting, 1–1½ lb. of fertilizer being distributed over each stool site and lightly worked into the surface soil. A second application at the rate of 1½–2 lb. per plant is required two months later, and this should be repeated at the end of a further two months. In this way the young plant receives the whole of its fertilizer in three applications before it is four months old.

As a plant grows, the roots gradually move out further from the corm, until, in a fully grown plant, there are comparatively few feeding roots within two feet of the base. The second fertilizer application should therefore be broadcast in a uniform band 1½–2 ft. wide round the plant at a distance of about 1 ft. from its base. The third dressing is applied similarly in a slightly wider band and correspondingly further out from the base. The fertilizer is lightly chipped into the soil.

A similar fertilizing programme should be followed in the ratoon crop, the follower sucker being treated as though it were a new plant and the times of application determined accordingly, the first being made when the sucker is 12–18 in. high. In first and second ratoon crops, however, the fertilizer should be applied in a semi-circular band on the side of the stool where the sucker is situated. After the third and subsequent ratoons, the easiest method of fertilizing is probably to broadcast the mixture in a wide band between the rows.

In plantations on open forest or replant land, where the fertility level is frequently low and the plants sometimes lack vigour, or in cases where individual plants are backward and require forcing, an additional dressing of 2 oz. of sulphate of ammonia per stool may be used with beneficial results. These supplementary dressings to backward plants can, if necessary, be applied each month for up to three or four months; they do much to even out the period of bunching and bunch development in the plantation. Such treatments should not be made during very dry weather, as an accumulation of sulphate of ammonia at the base of a stool can result in serious damage to the plants under such conditions.

On the red volcanic soils which are extensively used for banana production, dressings of ground limestone or dolomite are often applied with good results at intervals of about three years. Such applications tend to improve the texture of the soil and assist in making available to the plants certain essential nutrients. Both ground limestone and dolomite may be broadcast at the rate of 1½–2 tons per acre in early spring. This period is particularly suitable if a cover crop is to be sown in October.

CULTIVATION AND WEED CONTROL.

Weeds are apt to be troublesome in plantations established on replant land and on virgin land where the burn has not been satisfactory. The weeds may develop rapidly and compete with the young bananas for soil moisture, sunlight and plant nutrients. Efficient control is therefore necessary from the outset. On most plantations, particularly those on steep slopes, weed control is done entirely by hand hoe; on lesser slopes or relatively flat land, horse-drawn or power implements can be used effectively, at least in the early life of the plantation. Cultivation must be shallow and care must be taken to avoid damage to the stool.

In any system of cultivation the need for conserving surface soil is a major consideration, even in hand operations such as chipping. Chippers should therefore work towards the plant and drag the soil up the slope rather than down the slope.

If the rainfall during summer is heavy, chipping is sometimes impracticable and ineffective. Weedicides may then be used to keep weed growth in check. Arsenic pentoxide and sodium arsenite are used extensively in Queensland for this purpose at appropriate strengths, which are specified by the manufacturers. Two applications at an interval of about one month should be sufficient to control weed growth in summer. The sprays are applied on a calm day with the nozzles close to the weeds at a rate of 20–40 gal. per acre. Care must be taken not to wet the stools, particularly while the suckers are comparatively small.

Hormone weedkillers such as 2,4-D should not be used for the control of weeds in banana plantations; they are highly injurious to banana plants and wind drift from any type of spray apparatus may cause considerable damage.

During the first year in the life of a plantation, weeds should not be allowed to get out of hand or to seed. If they are effectively controlled during this period, chipping costs will be considerably reduced later on. During the wet season, when competition for moisture is not a limiting factor to plant growth, the weeds may be brushed before they seed if chipping is impracticable and weedicides cannot be used effectively; the brushed weeds left on the surface of the soil act as a mulch and reduce erosion during heavy rains. Under normal conditions, one man should be able to keep five acres of bananas free from excessive weed growth from planting onwards.

COVER CROPPING.

Cover cropping has been practised in some banana plantations located in southern districts with a relatively heavy rainfall. Poona pea is the usual crop, but some of the newer cowpea strains such as Reeves Selection may be more satisfactory if previous plantings have suffered from wilt. In tropical areas, cowpeas are less satisfactory, as the plants tend to get out of control and climb over the stools. The green manure cover crop reduces the loss of surface soil from erosion. It also suppresses weed growth during the summer months, and little chipping or hoeing is necessary before April, by which time the cover crop has matured and died. In districts with a rainfall under 50 in. per annum, cover crops may compete with the bananas for available soil moisture during dry periods and the practice has, therefore, a local rather than a general application.

In a bearing plantation, the best results are obtained by growing the cover crop in a narrow band less than four feet wide across the slope between every alternate row of bananas. By adopting this method, it is a relatively simple matter to mow or chip these strips quickly in a dry period and so remove any competition for soil moisture which might otherwise seriously affect the bananas. If the seed is sown in moist soil at the rate of about 20 lb. per acre and either chipped in or buried by a rotary hoe operated with a shallow cut during late October, the legume can be established very quickly. In young plantations from which bunches will not be cut during the growing period of the cover crop, a strip may be sown between every row of stools.

During the period of most vigorous growth, usually late January and February, routine brushing may be necessary to keep the legume away from the stools. The amount of brushing required depends mainly on the variety of cowpea used, being relatively slight with Reeves Selection, Brabham, Victor or other strains with a semi-erect habit.

MULCHING.

Instead of cover cropping, the banana plantation may be mulched with various types of organic material. The use of a surface mulch has many advantages over clean cultivation. By shading the ground, it reduces the loss of water by evaporation and keeps the soil cool in summer. The mulch also assists in preventing soil erosion. Even in a heavy downpour, the raindrops cannot reach the soil directly and pulverising of the surface layer of soil by splashing and washing is

eliminated. Provided the mulch is spread evenly and sufficiently thickly, weed growth is almost completely suppressed and chipping no longer required.

Many different materials have been used for mulching in Queensland. Blady grass is probably the best, since it does not rot down quickly and is usually readily available in quantity close to most plantations (Plate 11).

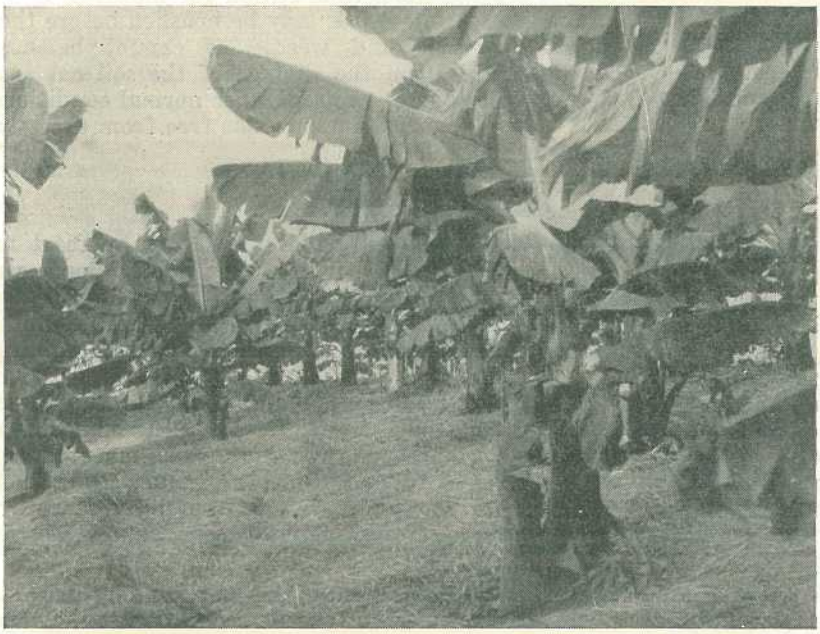


Plate 11.

Bananas Planted on the Contour and Mulched, North Coast. This is the same plantation shown in Plate 8 six months later. Note the inter-row drain showing as a depression in the blady grass mulch cover.

In applying the blady grass the material should be spread as uniformly as possible over the whole of the plantation to a depth of approximately 6 in. but not closer than 3 ft. to the base of the stools. This bare area around each plant facilitates fertilizing the young plants and ensures that sucker development will be normal. Weeds in this unmulched area can be hand-pulled if necessary. As the lower layer of grass gradually rots down, additional light dressings of mulch can be applied to maintain the initial thickness. Blady grass from about three acres of land is required to mulch an acre of bananas.

All weed growth should be eliminated, either by chipping or spraying, before the mulch is put down, and if any perennial grasses such as common couch are present these should be carefully and completely eradicated.

CROP CONTROL.

The success or failure of a plantation as an economic venture depends very largely on the ability of the grower to control plant growth so that the bunches will be harvested when market prices are

most remunerative. The careful selection of site and aspect, the provision of windbreaks, contouring, and where practicable, irrigation, do much to eliminate climatic hazards in a banana plantation. Control of cropping is, however, equally important, for it determines both the period of harvesting and to a great extent the life of the plantation. Such control depends on the setting of the right type of sucker at the correct time of the year.

Selection of the Follower.

When the crop is grown without irrigation, it is usual to select only one follower from each parent plant for the ratoon crop. Under this method of management, commonly referred to as the "one-bunch-one-sucker" system, the number of bunches per acre is controlled in order to ensure that those which are produced will be large and the fruit of good quality. On very fertile soils, two suckers may be allowed to develop for the first ratoon crop, and under irrigation even a third may be permissible; but in either case only one sucker should be set on each plant in succeeding generations.

Plate 12.

First Ratoon Suckers. Suckers on these two Mons Mari plants were set at the correct time. Note the stages of development of parents and followers.

The sucker selected should be deep seated, and this is often indicated by the fact that it breaks through the soil well out from the base of the parent plant. However, deep suckers do sometimes break through the ground close to the parent plant, and shallow suckers may, if they strike

an obstacle, come up some distance away from it. It should be spear-shaped, with a well-developed corm and narrow sword-shaped leaves. Shallow-seated suckers lack vigour and rarely produce good plants. The extreme type, commonly called a "sitter", arises from a bud at or just below ground level and produces a corm more or less on the surface of the soil. Suckers of this type are of no value as followers, although they provide good planting material. A deep-seated sucker, on the other hand, will develop a substantial root system at the soil depth most suited to the plant.

On hillside country, the sucker for the first ratoon crop should be selected on the uphill side of the parent, preferably at an angle up and across the slope rather than directly behind the original plant. The rotting down of the butt of the parent plant after the fruit is harvested will not then weaken the following sucker, which still has soil to support it on the lower side. The sucker should always be selected towards the side of the parent where it will receive the greatest amount of sunlight; in most cases this will be the south-east.

The first follower should be set before the parent plant throws its bunch. Since location, soil type, aspect and altitude all influence the time taken for a plant to bunch, the time of setting of the follower will vary with the plantation. Generally speaking, however, the best month for planting should be the best month for sucker setting, but in some areas allowance has to be made for the fact that ratoon plants usually take a longer period to bunch than maiden plants. If the followers are all set at or about the same time, more uniform bunching for the next crop should be achieved.

The time of setting of the first follower to a large extent determines the success or otherwise of the plantation, for the behaviour of the crop in the third and subsequent years is governed by the management of the first ratoon (Plate 12). If two suckers are set for the first ratoon crop, each should be directed at an angle to the parent plant up and across the slope so that a large "V" is formed with the parent at the lower point.

The selection of suckers for the second and subsequent ratoons is based on what is commonly referred to as the "straight follow through" system. The "straight follow through" sucker arises more or less directly in line with the previous season's sucker and the original parent, and originates from a bud situated almost at the base of the corm. This fact ensures that it is firmly established in the soil and has a considerable rooting system (Plate 13).

Sometimes more than one sucker may break through the ground in a straight line with the pseudostems of the two previous generations. The first of these is usually fairly shallow and appears early in the life of the plant, whereas the required "straight follow through" sucker does not appear until the parent plant is about two-thirds to three-quarters grown. This generally coincides with the time when it is most desirable to set suckers for the next crop. Under normal conditions, therefore, the selection of suckers for the second and subsequent ratoon crops is to a very large extent automatic if the first follower has been set at the correct time.

Desuckering.

All sucker growth arising from the plant prior to or after the selection of the desired follower should be removed as soon as possible after its appearance. If allowed to remain on the parent plant, these

unwanted suckers reduce its vigour, delay cropping and adversely affect yield. During spring and summer, when sucker growth is rapid, it is necessary to desucker the plantation at least once a month; during autumn and winter, when growth is less vigorous, desuckering at intervals of two or three months is normally sufficient.

Plate 13.

Second Ratoon Suckers. Complete stool dug out to illustrate position of "straight-follow-through" sucker. A, maiden plant; B, first follower; C. "straight-follow-through" sucker. Note the point of origin of this sucker at D relative to the ground level at E.

Desuckering may be done with a special desuckering tool or gouge, made from a 3 ft. piece of spring steel 1½ in. by ¼ in. About 15 in. of one end is hammered out, and the edges turned up and sharpened. This

"blade" is tapered to a point of about ½ in. across. The top of the gouge is generally fitted with a handle of ½ in. round iron for better leverage.

Where the plants to be removed are more than 6 in. above the soil surface, they should be cut off with a knife at ground level and the centres bored out by inserting the gouge in a vertical position and giving one complete turn. In this way, the growing point of the sucker is removed and further growth suppressed without interfering with the rooting system of the stool. A few handfuls of soil placed in and over the inverted cone-shaped cavity of each sucker treated, immediately after the operation, will stop an excessive discharge of sap through the new wound.

Small suckers just showing through, commonly known as "peepers," may be gouged out in a similar manner, but in this case there is no necessity to cut the tops off first.

Within recent years the use of a gouge has been largely superseded by the kerosene method of desuckering. The latter is rapid, relatively simple and speeds up the rotting and decomposition of the butt of the sucker without interfering with the root system of the parent plant. The procedure is to cut the sucker off just above ground level with a sharp knife and then, using the point, gouge out a small central portion of the butt. About one-half of a teaspoonful of kerosene is poured into the cavity, the quantity being increased slightly if very large suckers are encountered. The kerosene can be handled most conveniently if it is carried in a bottle fitted with a cork through which a piece of glass or metal tubing projects. This ensures that the liquid is not splashed on the parent pseudostem or spilled.

TRASHING.

Trashing is the removal of dead leaves from the pseudostems of the plants. As the plant ages, the older leaves die and hang as a cloak of dead tissue which keeps the pseudostems cooler than would otherwise be the case and slows down the rate at which the plant and its associated suckers grow.

Trashing is usually carried out at the same time as desuckering by simply cutting the dead leaves off with a knife where they bend over and hang down from the pseudostem. Tearing off the leaves opens up the leaf bases and results in damage to the pseudostem by loss of water and chilling; the practice has nothing to commend it.

PROPPING.

During the wet season, when strong winds frequently accompany heavy rain, the root system of the banana is often incapable of supporting a plant carrying a heavy bunch, and unless the plant is propped, it may be blown over and the bunch lost. Dwarf Cavendish bananas require less propping than Mons Mari and Williams Hybrid, whilst Lady Fingers rarely need propping at all.

Props are best placed in position as soon as the last hand on the bunch has become visible. The safest type of support is a double prop, made from two pieces of timber of equal length fastened together by a bolt or piece of wire about a foot from the end (Plate 14). When the legs are spread the top forms a "V" in which the bunch stalk is held; this supports the bunch firmly, and, no matter how rough the weather, the prop cannot fall away and leave the bunch unsupported.

Another satisfactory type of prop may be made by boring a hole about 6 in. from the end of the timber and passing about 2 ft. of No. 8 or No. 10 gauge wire through it. The ends of the wire are bent upwards parallel to the prop so as to project beyond it, and the lower part of the wire is held in position with staples. When placed under the neck of the bunch, the wire forms a "U" and holds the bunch firmly.

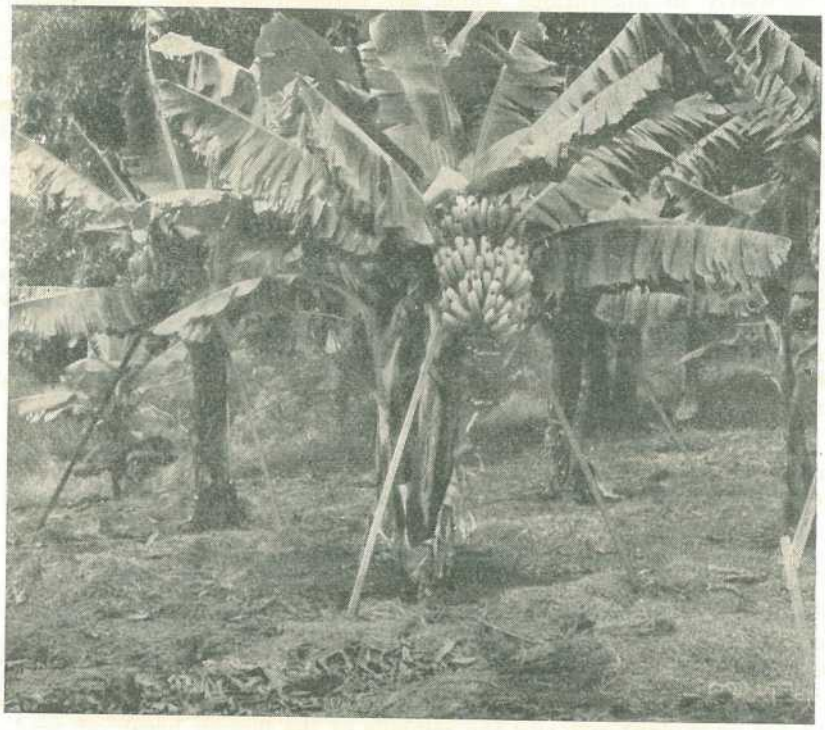


Plate 14.

Propping the Bunch. Note the spread of the two legs to give stability with the bunch hanging clear and safeguarded against abrasion. The fork of the prop holds the bunch stalk, not the pseudostem.

Forked saplings may be used as single props, but they are difficult to obtain and rarely last more than one year. Pointed props stuck into the side of the pseudostem or the bunch stalk should not be used; they give little support, and during rough weather the movement of the plant either dislodges the prop or forces it deeply into the tissues. The bunch stalk may then eventually break and the bunch "snaps" off.

When placing the prop in position, care should be taken to ensure that the fruit on the side of the bunch next to the pseudostem is not scratched or bruised, and also that the legs are so placed that when fully developed the bunch will hang well clear of the prop even in windy weather.

The length of the prop will vary according to the variety of banana and the steepness of the country, but it should be such that the legs have a good spread and the prop stands at an angle under the bunch. If the props are too short and stand almost vertically, they have a tendency to lift the plants out of the ground, particularly during wet weather.

The bunch flower, commonly termed the "bell," should be cut off when the bunch is about half matured, as its retention only increases the weight which has to be supported and to some extent delays the maturity of the bunch.

BUNCH COVERS.

In southern Queensland, bunch covers can be used to advantage, particularly in plantations which are exposed or liable to premature defoliation following an outbreak of leaf spot. During the winter months, fruit blemishes are common and considerably reduce the value of even well-filled fruit. Bunches protected by suitable covers are invariably free from these blemishes and the fruit develops and matures more evenly than it would do otherwise. In practice, covers should be fitted not only to the bunches on partially defoliated plants but to all bunches which are likely to be harvested between May and September.

Chaff bags or corn sacks make suitable covers if the bottom of the sack is cut open, slipped up over the bunch and tied firmly around the stalk above the top hand. The other end of the bag is left open so that that fruit can be easily examined as the bunch approaches maturity. Heavy paper bags are specially manufactured for covering banana bunches and these may be used if desired. Unlike the hessian bags, they can usually be used for only one season and may prove unserviceable during very wet, cyclonic weather accompanied by high winds.

The use of bunch covers increases production costs in the plantation, but the additional capital outlay is amply repaid by the high quality of the fruit and the increased marketing returns.

HARVESTING.

Only fully-matured bunches of well-filled fruit should be harvested (Plate 15). However, bunches should not be left on the plant until the fruit begins to colour or the fingers are so full that they split when being packed.

A bunch is ready to cut when the fruit is evenly rounded without showing prominent ribs and the remains of the flowers break off readily from the tips when rubbed. Thin, angular, immature fruit should not be harvested under any circumstances. Experience is required to judge the stage of maturity at which fruit should be harvested in order to obtain top market prices.

For cutting bananas, a cane knife, reaping hook or large butcher's knife may be used. With the Cavendish variety the leaves are first cut away to give freedom of action, and the bunch stalk is then severed above the top hand by a downward stroke of the knife, leaving sufficient length for easy handling.

Mons Mari and the tall varieties require a different technique, the exact method depending on whether or not the plant has been propped. If it is propped, a "V" cut which is deep enough to sever the bunch stalk in the middle of the pseudostem should first be made on the side nearest the prop about 6 ft. from the ground. This allows the pseudostem to sag and the prop may be used to lower the bunch until it can be cut comfortably. If the plant has not been propped, a slanting cut is made half-way through the pseudostem at a suitable height. This allows the plant to sag sideways and the "tail" or flower end of the bunch may be caught and used to guide the bunch down until it can be cut easily. In either operation, two men should work together.

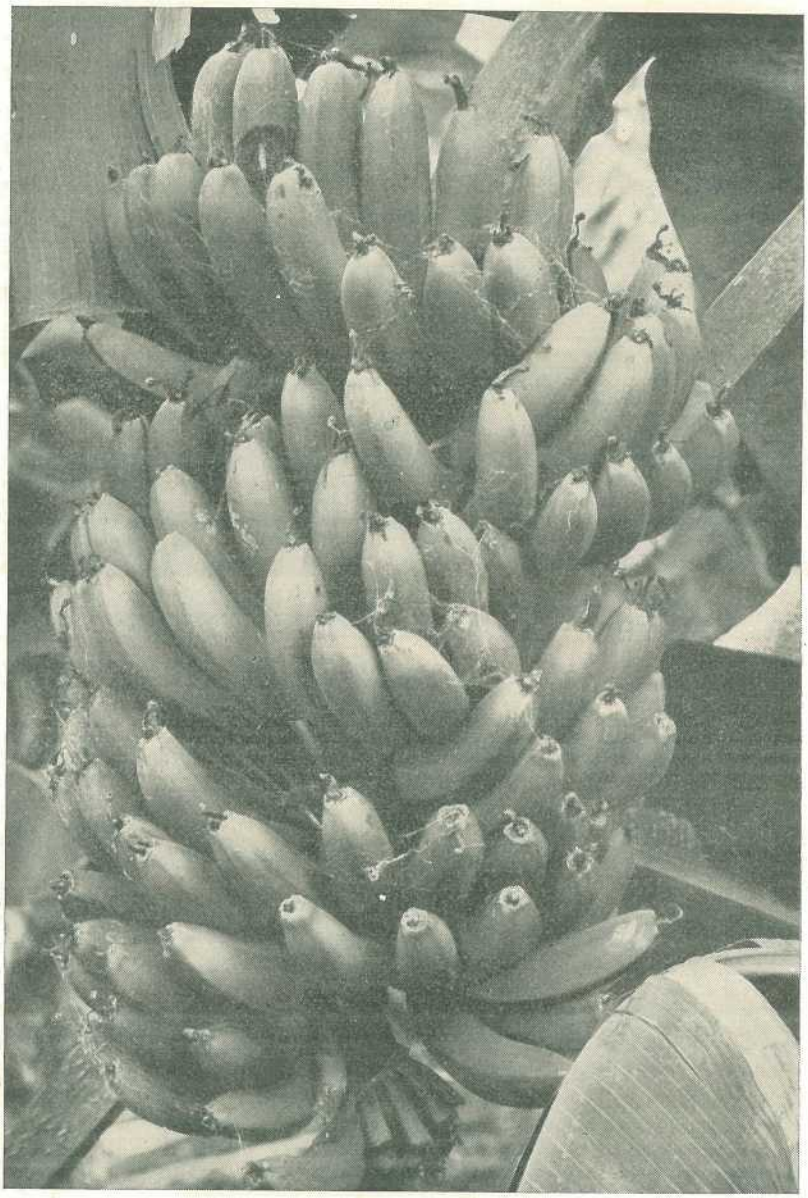


Plate 15.

Bunch Ready for Harvesting. The fruit has lost its former angular shape and the remains of the flowers are dead.

After cutting, the bunches are usually taken to every fourth row and placed on heaped leaves to reduce injury to the fruit. They are then carried to points from which they can be "wired" or otherwise carried to the packing shed. Wherever workable, wiring systems are to be preferred, as they permit rapid transport of the fruit from the field and cause less damage than other methods.

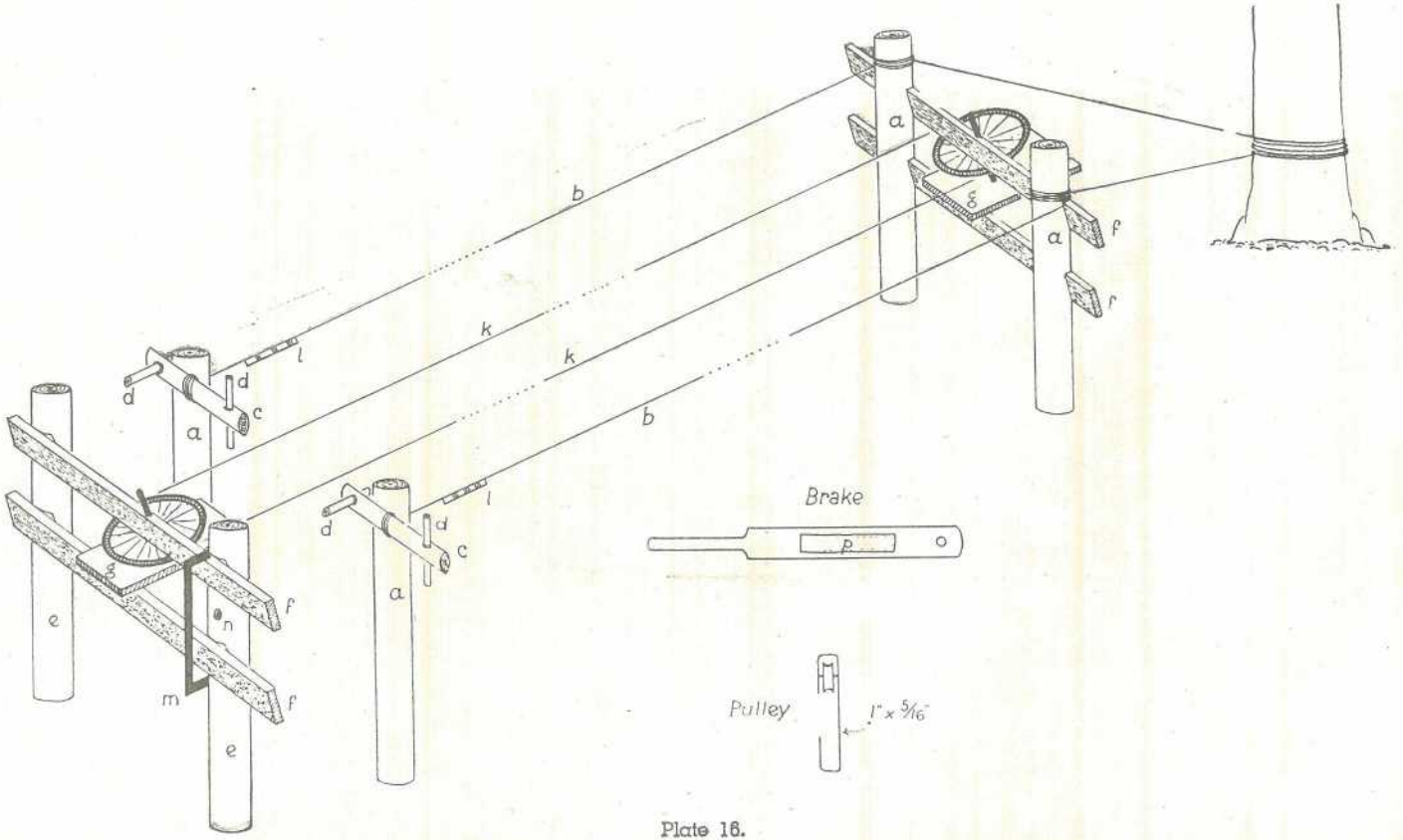


Plate 16.

Sketch Plan of an Endless Wiring System for Bananas. (a) main posts for carrier wires sunk 4 ft. in ground and stayed; (b) carrier wires along which the pulley runs with bunches to the packing shed and then back empty to loading ramp; (c) rollers for tightening carrier wires; (d) levers for operating rollers; (e) terminal posts; (f) cross bearers; (g) platform supporting guide wheels for endless wire; (k) endless wire with guide wheels at ends; (l) stop for pulley carrying bunch; (m) brake frame; (n) brake arm pivot. (Insets) brake arm, which operates on lower guide wheel for endless wire; pulley on which the bunch is hung (a detachable rope ties the pulley on the carrier wire to the endless wire).

WIRE TRANSPORT.

Various aerial wire systems are in use, ranging from a single wire stretched from a stump within the plantation to another stump near the packing shed, along which run loose pulleys bearing short rope slings by which the bunch is suspended, to elaborate installations. Probably the best from the point of view of economy and mechanical efficiency is the "endless wire" system, in which the fruit is despatched from one or more centrally situated points in the plantation on carrier pulleys which run on wires to the packing shed (Plate 16). Each pulley with a bunch attached runs on a fixed wire but is roped to an endless wire running round grooved wheels at each end of the system. When the bunch is off-loaded at the packing shed the pulley is transferred to a second fixed wire, hitched to the endless wire and returned to the plantation for reloading.

The system is not difficult to install, but it must be strongly built. Having selected the centrally placed point or points for despatching the fruit, a suitable site is chosen near the packing shed for a receiving station. This should be on a small rise if possible, so as to give the wires greater height. It is usually an advantage to build a staging at each despatching point to facilitate handling and loading of the fruit on steep slopes. If these loading points are kept to a fairly straight line the upper end of the wiring system can be fixed at a point higher up the hill and the wires run straight to the packing shed so that they pass directly over each of the stagings. The accompanying diagram (Plate 16) gives constructional details for the system.

PACKING.

Whilst the packing shed need not be an elaborate and expensive structure, it should be built in such a way that the fruit can be handled and packed in comfort under hygienic conditions. The framework may consist of bush timber and the sides of slabs, but a good roof and a sound floor are essential.

As the bunches arrive at the packing shed, they may be stacked or immediately de-handed and allowed to "sweat." The sweating period is at least eight hours and it is therefore usual to pack the fruit the day after it has been cut. After each consignment has been despatched, all damaged and waste fruit, together with any refuse, should be cleared away and dumped some distance from the shed.

In Queensland, most of the fruit sold locally is marketed in the bunch. Consignments to more distant markets are usually packed in standard 1⅛ bus. cases as "singles" or, less commonly, as "hands." The skill and care shown by growers in harvesting and packing the fruit are reflected in its appearance on the market floor.

ARTIFICIAL RIPENING.

Fruit showing colour in the plantation usually deteriorates rapidly between the time of harvesting and the time it reaches the consumer. The bunch is therefore cut when the fruit is still green, and artifically ripened in special chambers with coal gas or other accelerators. Ripening practices vary, but tolerably good results are obtained with the Cavendish and Mons Mari varieties at coal gas concentrations of 0·1–0·3%, a relative humidity of 85% and temperatures of 65–70°F. The normal treatment period is about 5–7 days. The Lady Finger variety may be ripened under similar conditions but will tolerate higher temperatures than the Cavendish types.

LEGISLATION.

From time to time outbreaks of bunchy top, leaf spot, weevil borer and rust thrips have influenced production in particular areas. To cope with this situation, appropriate legislation has been included in *The Diseases in Plants Acts,* 1929 *to* 1948 and *The Banana Industry Protection Acts,* 1929 *to* 1937. The more important provisions which concern the grower may be summarised as follows:—

(1) Bananas may be planted only when permission has first been granted by the Banana Industry Protection Board through one of its several agents stationed in the more important producing districts. Such permits are granted if the proposed planting is in conformity with the planting policy issued by the Secretary for Agriculture and Stock in August each year. The planting policy defines permissible sources of planting material.

(2) Diseased plants must be controlled in the plantation. In the case of bunchy top the grower must treat infected plants with kerosene as prescribed, and then dig up and destroy the affected stool. He must also report outbreaks to the Department of Agriculture and Stock.

(3) The occupier or, failing the occupier, the owner of the land is required to dig out or otherwise completely destroy a banana plantation at the end of its cropping period.

ERADICATION OF BANANAS.

Until recently, most non-commercial plantations were dug out by hand, although cattle were sometimes used for eradicating bananas in the more accessible areas. Since the introduction of synthetic plant growth substances such as 2,4–D and MCPA for the control of broad-leaved weeds, these materials have been used for eradicating old banana plantations.

An injection of a 1% solution into the heart of the plant followed by spraying of any regrowth suckers with an 0·2% solution is quite effective. The commercial preparation is diluted with water to the required 1% strength of the active hormone and the solution is then injected at the rate of 15 c.c. (about ½ fluid ounce) for a fully grown plant, 10 c.c. (about one-third fluid ounce) for medium-sized plants, and 5 c.c. (about one-sixth fluid ounce) for small suckers.

Probably the most efficient and economical injector is built up from a small regulated jet sprayer in which the spray nozzle is replaced by a metal needle 8 in. long and sharply pointed, with a small hole just behind the point to allow the liquid to escape. A metal or rubber knapsack container is carried on the back and connected to the intake of the pump by rubber tubing. The sprayer is fitted with a graduated plunger rod and the dosage injected can therefore be regulated accurately. If the regulator is set to 5 c.c., the dosage for large, medium and small plants can be delivered according as the pump is given three, two or one strokes. The needle is plunged into the base of the pseudo-stem about 12 in. above ground level and at an angle of about 45 degrees to the vertical (Plate 17). It is then withdrawn about an inch and the requisite amount of solution pumped in. The whole operation is very simple and quite rapid.

The quantity of solution required for eradication will depend on the condition of the plantation, but as a general rule, unless the area is in an exceedingly overgrown condition, 5 gal. of a 1% solution should be sufficient to inject an acre planted on a 9 ft. x 9 ft. spacing. The quantity of the commercial preparation required may be calculated from this once the concentration of actual hormone in it is known.

Best results can be expected when the plants are growing vigorously and for this reason the injection should be carried out preferably from summer to autumn rather than in the cooler months (Plate 18). The effects of the treatment vary according to the size of the plant injected. If the plant has thrown a bunch or is about to do so, it usually dies in position without any very spectacular symptoms, but

Plate 17.

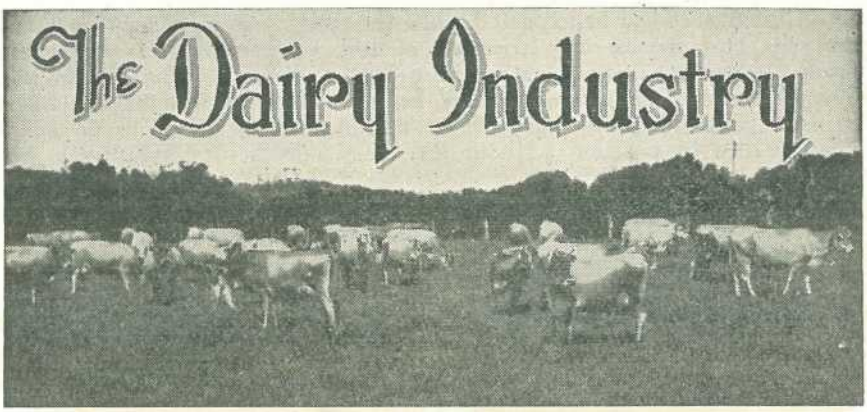
Eradication of Bananas with Hormone. Note method of holding injector and point of injection. The rubber tube connects with the knapsack carrier on the back.

Plate 18.

Eradication of Bananas with Hormone. Cavendish stools injected with 1% 2,4-D seven days previously. Note stool in background leaning badly and small distorted suckers in centre still standing.

the bunch may be thrown prematurely, the bunch stem may snap off in the throat or the fruit may become abnormally elongated and rot without ripening. The flower usually dies fairly rapidly.

In the case of an immature plant, one side of the pseudostem grows much more rapidly than the other, so the plant cants over at a wide angle. As the plant leans over, the strain on the base becomes greater until finally the pseudostem snaps off just above the level of the corm; decomposition of the corm follows rapidly. If a 1% solution has been injected, the sucker buds begin to grow soon afterwards, but not all of the suckers will survive. Those which do so should be allowed to grow until they have developed broad adult leaves and then sprayed with a 0·2% solution of the original material—that is, one-fifth of the concentration used for the primary injection. A second spray treatment is often required a little later to complete the eradication, but this is on the basis of isolated spot applications only.



The Manufacture of Cheddar Cheese in Queensland.

E. B. RICE and T. A. MORRIS, Division of Dairying.

(*Continued from page* 184 *of the September issue.*)

THE PRODUCTION OF MILK FOR CHEESEMAKING.

The Quality of Cheese Milk.

A CLEANLY produced milk free from foreign matter and foreign flavours is necessary for successful cheesemaking. It must be capable of forming a firm clot when rennet is added and of allowing normal acid production by the starter organisms.

A cleanly produced milk will have a low bacterial content and this is desirable from the cheesemaker's point of view. He can much more readily obtain uniformity in manufacture when he consistently receives milk of low bacterial content, as this ensures a reasonably uniform starting point. It is recognised that lactic acid organisms are necessary in cheese manufacture, but it is much more satisfactory to add a known amount of a specific type of starter organism to milk of low bacterial content than to depend to some extent on a variable bacterial content of unknown organisms.

Both good and bad organisms (from the cheesemaking point of view) come from much the same sources on a dairy farm; thus it is necessary to insist on a milk of low bacterial content.

Milk Grading.

In order to ensure a supply of milk of the required quality for cheesemaking it is necessary to institute a satisfactory system of milk grading. This enables the suppliers of poor-quality milk to be detected and an endeavour can then be made to have the quality of their supplies improved.

The success of a grading system in improving milk quality depends on the pride the farmer takes in his work and the extent to which he is rewarded, or penalised, for good or poor milk as the case may be. The payment of premiums for good-quality milk or the imposition of penalties for poor-quality milk is justified.

The supplier of poor-quality milk makes it more difficult for the cheesemaker to produce satisfactory cheese even if he does not actually lower the grade of the cheese. Is it therefore right that he should receive the same price for his milk as the supplier who takes the extra trouble necessary to produce good milk, thereby facilitating the manufacture of high-grade cheese? In a co-operative dairy company, penalties paid by suppliers of low-quality milk serve as a compensation to the suppliers of high-quality milk for the lowering in cheese quality caused by the former.

A satisfactory system of grading milk for cheesemaking is one which will grade milk according to the extent to which it fulfils the requirements of good cheese-milk. Other points to be considered are the ease with which the test can be applied, the costs involved, and the reliability and consistency of the test.

In Queensland the grading of milk for cheesemaking is not compulsory, and while some factories pay for cheese milk on a quality basis, no set grading system is universally adopted. Where grading is carried out, the methylene blue test is mostly used. Occasionally the sediment test and the Wisconsin curd and fermentation tests are applied.

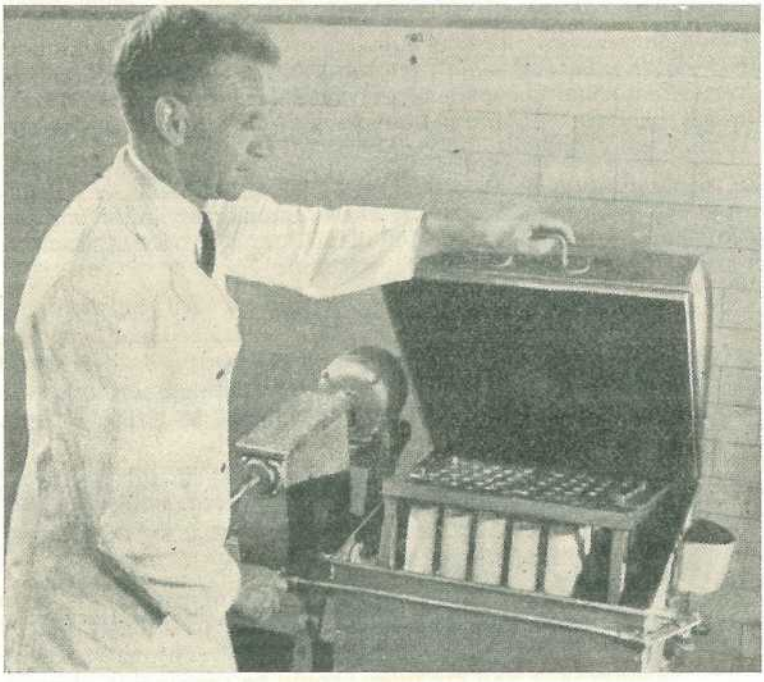


Plate 3.

Grading Milk by the Combined Curd and Reductase Test.

[Photo by National Publicity Studios, New Zealand.

A test which probably comes closer to satisfying all the requirements than does any other cheese-milk grading test is one devised in New Zealand and used there for some years past. This is the combined curd and reductase test (Plate 3), which, as well as giving a methylene blue reduction time, enables the judging of the curd formed with rennet

and incubated at 100°F. for 6 hours, on the basis of flavour, body and texture. The setting of the milk with rennet has the additional advantage that the milk samples do not have to be inverted every half-hour in the course of the methylene blue test.

Factors Affecting the Quality of Cheese Milk.

Troublesome defects in milk may arise from any one of the following sources:—

(1) Insanitary methods of production (bacterial defects).
(2) Lack of efficient farm cooling.
(3) Flavour-tainting weeds and fodder.
(4) Unhealthy cows producing abnormal milk.
(5) Improper use of penicillin.
(6) Absorbed flavours.
(7) Adulteration.

Insanitary Methods of Production.

It is generally accepted that of the inferior milk produced, approximately 90% of the low gradings is attributable to bacterial contamination. Freshly drawn milk from the healthy udder has a low bacterial count. At the same time, milk is an ideal food for bacteria, and every effort should be made to prevent their entry. If contamination is allowed, bacterial life may flourish and thus make the control of milk quality more difficult.

In controlling such bacterial defects as unclean or off-flavour, over-ripe, stale, fermented, yeasty, cheesy, and gassy milk, a thorough check-up should be made on the following sources of contamination and where necessary control measures instituted:—

(*a*) *Contamination from dairy equipment.*—All equipment should be free from structural defects. Perished rubbers, cracked and pitted metal surfaces and faulty soldering afford breeding grounds for bacteria by making thorough cleaning more difficult. Rusted utensils should be either retinned or replaced.

All necessary cleaning facilities should be provided. These comprise an adequate supply of boiling water, an approved detergent, a suitable metal washing-up trough, and machine line and can brushes.

Dairy equipment—benches, washing-up trough, draining racks, sterilizer or boiler—should be conveniently placed for efficient working and kept clean. All equipment, including vacuum tank and air lines, should be thoroughly cleaned and sterilized.

Efficient sterilization will help to reduce initial utensil contamination to a minimum, thereby increasing the keeping quality of the milk. Where hand milking is adopted, a 12-gallon copper will provide sufficient boiling water for cleaning and sterilizing purposes. Where milking machines are installed, a steam sterilizer or electric hot water unit is necessary.

(*b*) *Contamination during milking operations.*—The milker's hands and cow's udders should be kept clean and for this purpose each unit should be provided with clean cloths and a supply of clean chlorinated water. Dual udder-wash containers can be used to good advantage. Chlorine is a germicide and its use as recommended by the manufacturers will assist in preventing the spread of mastitis. Wet-hand milking should be discouraged. Bail-door sticks, milking stools and leg ropes should be maintained in a clean condition to obviate any chance of the milker carrying contamination to the milk during stripping. It is a wise practice to reject the foremilk, as it may be highly contaminated with undesirable organisms. The use of a strip cup to enable the foremilk to be examined before it is rejected is a very good practice as it aids in the early detection of mastitis.

(*c*) *Air-borne contamination.*—Pulverised manure dust is a menace not fully appreciated by most dairymen. It carries gas-forming organisms, which have the power of producing an offensive smell and flavour in the milk. These organisms gain access to the milk in three ways—direct entrance during the milking operation, lodgment on dairy equipment between milkings, and through the water supply tank by way of the roof.

To reduce contamination from the air, yards and bails should be cleansed daily and the dairy utensils and milk stored in a dust-free area. Prior to the commencement of milking, all utensils should be rinsed with chlorine solution. Cottonwool filter wads should be used for straining the milk in order to remove visible dirt.

(*d*) *Impure water supply.*—There should always be available at the milking shed an adequate supply of water for washing and rinsing dairy equipment. Water tanks at the milking shed should be regularly cleaned, and, if suspected of being impure, sterilized with a chlorine preparation.

Ropy and slimy milk is chiefly caused by impure water. Drinking water for cows should be wholesome and supplied in suitably constructed troughs which can be regularly cleaned. Cattle should not be allowed to wade in swamps, dams or waterholes, and the ground around the water troughs should not be allowed to become boggy.

(*e*) *Personal cleanliness.*—The persons engaged in milk production should be clean in their personal habits and in good bodily health, and when engaged in milking should wear clean overalls kept specially for this purpose.

Lack of Efficient Farm Cooling.

The cooling of milk considerably improves its keeping quality by retarding bacterial multiplication; hence efficient cooling of milk is a prime factor in connection with the production of milk for cheese manufacture. If efficient farm cooling were universally adopted there would be an appreciable reduction in the proportion of inferior milk being delivered to cheese factories. At the same time, cooling must not be accepted as an alternative, but used rather as an addition, to proper cleaning and sterilization of dairy utensils.

The temperature at which it is advisable to store milk on the farm is 50°–55°F. or lower, but this temperature is difficult to reach without the aid of mechanical refrigeration. Much can be done with various systems of water cooling, provided the water temperature is low enough, but no other system of aeration can be considered suitable for the purpose. A rippled surface cooler, coupled to a water-cooling tower (Plate 4) gives good results in some areas.

Plate 4.

A Water-Cooling Tower. When in operation, water is pumped from the pit through a milk cooler and back to the top of the tower, from where it falls in a spray, being cooled by evaporation as it descends.

After being drawn from the cow, milk has a temperature ranging from 94°F. to 100°F. depending on whether it is produced in winter or summer months and whether by machine- or hand-milking. At this temperature the development of undesirable types of bacteria is rapid. If cooling is not practised, the rate of fall in temperature is slow and considerable time elapses before the milk reaches within 2–4°F. of atmospheric temperature.

Thus the milk should be cooled as soon, and to as low a degree, as possible, and then held at this low temperature until transported to the factory.

Flavour-tainting Weeds and Fodder.

Strong tainting weeds like cressweed, carrot, mustard weed, Hexham scent and stinking roger cause undesirable flavours in milk. These undesirable weed taints may be lessened by change of ration, allowing cows to graze on such feed immediately after milking and taking them off some considerable time before the next milking. Cooling and thorough aeration of the milk will also assist in reducing weed taints.

The feeding of strong fodders (green lucerne, clover, etc.) and silage and mouldy foods also causes undesirable flavours. Control measures may be adopted as stated above for weed taints.

Unhealthy Cows Producing Abnormal Milk.

The quality of milk is adversely affected by the following circumstances:—

(*a*) *Cows just calved.*—Milk from freshly calved cows (colostrum milk) should not be included with the normal milk until at least 10 days after calving or until the milk is normal. This type of milk is of low fat percentage, is high in albumen content and imparts a slimy condition to the curd.

(*b*) *Cows far advanced in lactation.*—Milk should not be used from cows less than 15 days prior to calving. It is a sound practice to dry off all milking cows at least six weeks prior to calving. Late-lactation milk usually has high chloride and lipase contents and is frequently bitter in flavour.

(*c*) *Cows suffering from mastitis.*—Mastitis milk is sometimes responsible for slow-working vats in cheesemaking and should be excluded from the bulk supply. Careful dairy hygiene will assist in controlling this disease.

(*d*) *Cows affected with three-day sickness or any other disease which adversely affects the normal health.*—Milk from such cows should not be used for the manufacture of cheese.

Improper Use of Penicillin.

Penicillin is used extensively in the treatment of mastitis. It has an inhibitory effect on cheese starters and when in a sufficiently high concentration will prevent the proper development of acidity during cheese manufacture. Farmers are advised to discard the first milking subsequent to treatment of a cow with penicillin. Provided this is done there is not likely to be any trouble.

Absorbed Flavours.

Milk stored in an impure atmosphere or adjacent to any strong-smelling substance will readily develop an "off" flavour by absorption of the particular smell. Contact with new or perished rubber inflations, rag strainers and untinned utensils will taint milk, and it will readily take up disinfectant flavours if odorous disinfectants are used for washing cows' udders. Cleaners of a pungent-smelling nature should be avoided for the same reason. Exhaust fumes from engines and anything of an oily or kerosene nature will readily be absorbed by milk and cream, giving undesirable flavours.

Adulteration.

(*a*) *Watered milk.*—This may be detected by the use of the lactometer or by a determination of the freezing point. The adulteration is mainly caused by deliberate watering or by allowing flushing water from machines to flow into the milk. The watering of milk is an offence under the Dairy Produce Acts. The addition of impure water is detrimental to quality, and any water added lowers the yield of cheese and may increase cost of manufacture.

(*b*) *Skimmed milk.*—This is due to skimming cream off the night's milk or separating portion of the milk and pouring the skimmed milk into the bulk supply. Skimming may be detected by the use of the lactometer. Skimming causes dry, hard, corky body and flat flavour and decreases the yield of cheese per 100 lb. of milk received.

(*c*) *Preservatised milk.*—Chemical preservatives (formalin, boric acid, saltpetre, etc.) are detrimental to cheesemaking. Most chemical preservatives affect the action of rennet and inhibit the growth of the starter organisms.

Preservatives may be detected by various chemical tests. Milk adulterated with chemical preservatives should be rejected at the cheese factory.

[TO BE CONTINUED.]

Improving Dairying on the Marginal Coastal Lands of Kin Kin—Mooloolah.

G. I. ALEXANDER (Cattle Husbandry Branch), A. HEGARTY (Agriculture Branch), and G. C. KENNY (Veterinary Services Branch).

ON coastal dairy farms in the Kin Kin-Mooloolah area of south-eastern Queensland, where the soils are sandy and of low fertility, there are many problems confronting the dairy farmer. The annual production per cow is amongst the lowest in Queensland. This is considered to be a reflection of the poor nutritional quality of the feed available to stock and the consequent poor condition and health of the animals. Seasonal conditions influence the production of pasturage and crops for stock, but in recent years even under good seasonal conditions cattle have been found to suffer from emaciation and loss of production, and some deaths have occurred.

During 1950, an excellent year in coastal Queensland, many instances of emaciation and losses of dairy cows and calves were recorded. These losses seemed to be associated with very low soil phosphate and low phosphorus and copper levels in the blood of the grazing animals. With these losses as a background, demonstrations were undertaken under the Commonwealth Dairy Industry Efficiency Grant in an endeavour to overcome the difficulties.

Four types of project were undertaken in view of the complex nature of the problems confronting farmers. These were:—

(1) Correction of the low phosphorus balance of the cattle by the use of

  (*a*) Phosphorus supplements in the diet of the cows.

  (*b*) Phosphorus as a component of crop and pasture fertilizer mixtures.

(2) Correction of the copper deficiency which occurs in stock, especially after periods of high rainfall, by the use of

  (*a*) Copper supplements in the diet of the cows.

  (*b*) Copper as a component of crop and pasture fertilizer mixtures.

(3) Growing of fodder crops in regular winter and summer cropping programmes to provide adequate bulk for a longer period of the year.

(4) Topdressing and re-establishment of the more desirable pasture grasses to enable stock to obtain sufficient roughage of good quality.

On the farm selected, a number of cows had died from undetermined causes during the period of satisfactory seasonal conditions experienced in 1950. On investigation death was considered to be due to poor nutrition and poor mineral balance of the dairy cattle. Rearing of calves presented a problem, and scouring calves did not respond to drenching with phenothiazine, the normal treatment for worms; this suggested that copper deficiency might be an important factor.

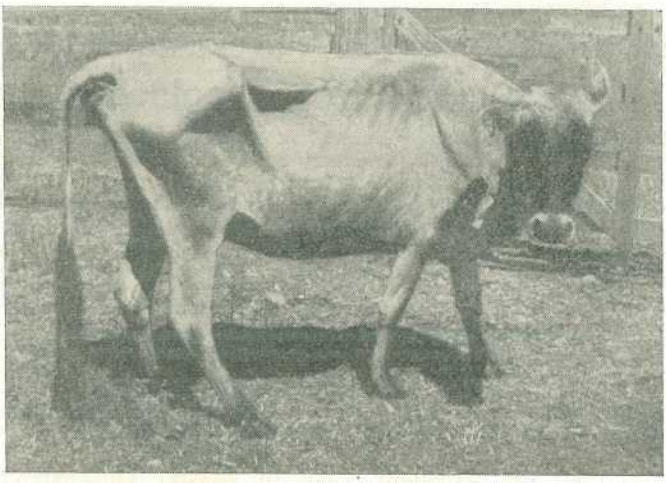


Plate 1.

An Emaciated Cow Before Farm Improvement was Undertaken.

Emaciated cattle on the property (Plates 1 and 2) had a rough, bleached coat and excreted a profuse, foul-smelling scour. Such cattle also suffered from faulty dentition, and young milking stock were stunted in growth. In addition to these symptoms, dairy production was decreased; cattle were averaging only 3 lb. of milk per day and did not respond to the normal methods of supplementary feeding practised in the district.

Biochemical Investigations.

In August, 1950, cattle were bled and examinations were carried out to determine the phosphate and calcium levels of the blood. Both phosphate and calcium levels were low, indicating the existence of a borderline phosphorus status. Haemoglobin estimations were carried out and these were also found to be low, this condition indicating the possibility of copper deficiency. A further indication of copper deficiency was given by the liver analysis of a cow too weak to walk. On analysis, this liver was found to contain only 8.5 p.p.m. copper, indicating that the animal had been copper-deficient.

Following these tests for phosphorus, calcium and copper, the farmer was recommended to feed sterilized bonemeal at the rate of 3 oz. per head daily, with copper sulphate added at the rate of 1 part to 100 parts bonemeal to correct the suspected copper deficiency.

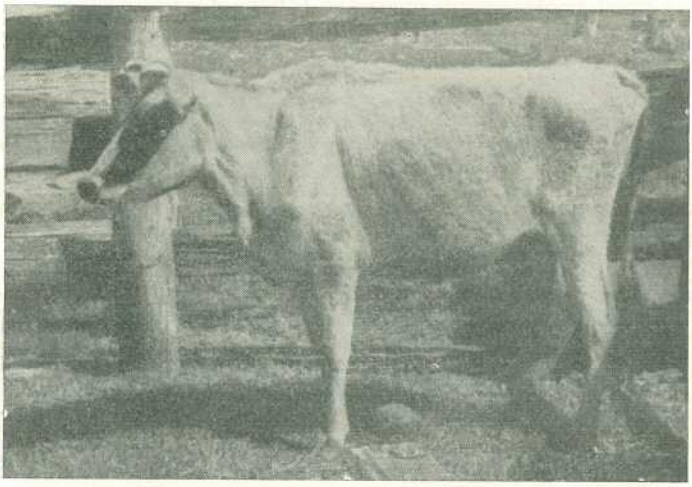


Plate 2.

A Heifer Showing the Rough Coat Characteristic of Cattle on Unimproved Areas.

Agricultural Investigations.

A survey of the area showed the soils to be sandy and analysis revealed them to be of low fertility. Available soil phosphorus was low and associated with high acidity. Production of grass and crops without fertilizer was barely sufficient to maintain cattle alive. Soil fertility had so declined that the pasturage consisted of closely grazed mat grass (*Axonopus affinis*), blue couch (*Digitaria didactyla*) and bluetop (*Ageratum conyzoides*), and it was doubtful if cattle were obtaining sufficient roughage for normal health. Attempts had been made by the farmer to grow crops, but due to the use of inadequate amounts of fertilizer, yields were disappointing and uneconomic.

To provide sufficient good roughage to supplement the poor pasturage available, it was obvious that some form of cropping programme was necessary, and this important phase received attention in addition to the direct treatment of cattle.

The demonstrations were commenced in May, 1951, when the district was entering a severe drought. Rainfall during the period covered (May, 1951, to April, 1952) totalled 25.03 in., as compared with the average rainfall for the area of 45 in.

Therapeutic Treatment of Cattle.

During the 12 months' period of the demonstration dairy cattle were fed daily, in the bails, 8 oz. of mixed crushed grain to which was added 3 oz. of a mineral mixture comprising ground bonemeal 50 parts, coarse salt 50 parts, and copper sulphate 1 part.

All cattle regularly receiving this mixture remained in good condition, with glossy coats (Plate 3). While mineral supplements were being fed, no cattle died, though on neighbouring farms stock were being lost due to drought and poor nutrition. Scouring of cattle and calves ceased and the farmer was able to rear a number of healthy calves for herd replacement purposes (Plate 4.)

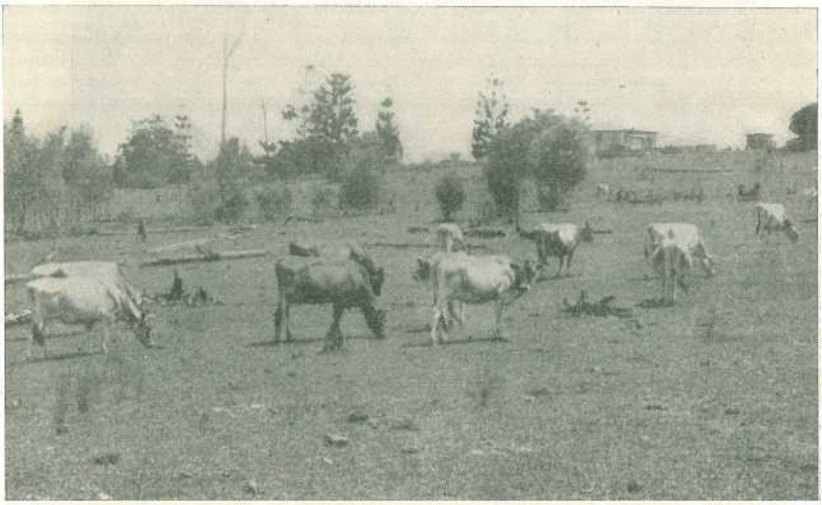


Plate 3.
Cattle in Good Condition Following Treatment.

Plate 4.
Calves Reared on the Property After Improvement.

In April, 1952, after 12 months of mineral feeding, the blood levels of phosphorus, calcium and copper were found to be satisfactory, with no trace of the earlier deficiencies.

Cropping Programme for Production of Grazing Crops.

To improve the low nutritional value of the feed available, areas of land were prepared for winter and spring fodder crops, and these areas were also used to provide late summer grazing.

Initial plantings of 10 acres of oats were made in early May, 1951, sufficient rain being received to ensure a good strike, and in late May an area of 4 acres was sown to field peas to help provide late winter grazing.

Following extensive grazing of these winter plantings, the entire area was sown to Poona peas to help improve the nitrogen status of the soil as well as to provide late summer grazing for the dairy herd.

Sufficient fertilizer was applied in the May application to provide enough plant food for two grazing crops in the 12 months, and the suitability of this treatment was borne out by the excellent crop of Poona peas grown on residual phosphate.

Cost of Sowing and Fertilizing Supplementary Grazing Areas (Per Acre).

	£	s.	d.
A. Oats followed by Poona pea—			
1½ bus. Victand oats	1	2	6
2 cwt. superphosphate + 1 cwt. sulphate of ammonia ..	3	10	0
15 lb. copper sulphate	0	15	0
30 lb. Poona pea (sown in early summer)	1	10	0
Annual cost of area A per acre	£6	17	6
B. Field peas followed by Poona pea—			
1½ bus. Dun field pea	2	13	0
2 cwt. superphosphate + 1 cwt. sulphate of ammonia ..	3	10	0
15 lb. copper sulphate	0	15	0
30 lb. Poona pea (sown in early summer)	1	10	0
Annual cost of area B per acre	£8	8	0

The total cost of seed and fertilizer for the equivalent of 28 acres of grazing crops over the 12-month period May, 1951, to April, 1952, was £102 2s., or a unit crop cost of £3 13s. per acre.

Utilization of Grazing Crops.

Oats and field peas established in May provided excellent grazing despite low rainfall; with the aid of an electric fence the milking herd was grazed on strips for three hours daily from July to November. The succeeding crop of Poona peas established in late November provided useful grazing from February to April and showed the versatility of leguminous grazing crops for this area.

Follow-up work was scheduled for the winter of 1952, using the same programme as in 1951, but with a reduction of fertilizing materials in view of the improvement in soil fertility effected.

Pasture Investigations.

Pasture topdressing was undertaken on a 3-acre field in which kikuyu grass had been established by the farmer and where growth had been negligible. A fertilizer dressing at 3 cwt. per acre (2 cwt. superphosphate plus 1 cwt. sulphate of ammonia) was applied in December,

but lack of suitable rain until late January prevented early growth. Following this late January rain, the pasture grew rapidly, with excellent colour and bulk, and was submitted to heavy grazing during March and April. This small preliminary demonstration showed the value of using fertilizers containing nitrogen and phosphorus for promoting early grass growth after seasonal rain in this area where pasture legumes are absent and a permanent deficiency of available soil nitrogen exists. Where cattle are in need of bulky feed, such fertilizers appear to offer a temporary solution to the problem of poor growth in pastures which do not contain a legume.

Production Figures.

The data in Table 1 show a considerable lift in production during the period of grazing on oats and Poona pea. In Plate 5 the production of the herd concerned on marginal land is compared with that of the Pomona Herd Recording Group which comprises 20 herds. Many of these herds are depastured on paspalum and kikuyu pastures on scrub farms in more favourable areas, and supplementary feeding of the milking herds is commonly carried out.

TABLE 1.

PRODUCTION TREND RELATIVE TO AVAILABILITY OF SUPPLEMENTARY GRAZING.

	1951.					
	May.	June.	July.	August.	September.	October.
Number of Cows in milk ..	18	15	9	11	12	17
Average daily milk per cow (lb.)	3·1	2·3	6·1	7·9	7·4	8·2
Total milk per day (lb.) ..	55·8	34·5	54·9	87·4	88·5	139·4
Rainfall (points)	142	64	11	73	44	297
Type of feed	Mat grass	Mat grass	Oats	Oats	Oats	Oats + Field peas

	1951.		1952.			
	November.	December.	January.	February.	March.	April.
Number of Cows in milk ..	24	26	26	26	25	25
Average daily milk per cow (lb.)	7·0	5·7	4·6	5·3	6·8	7·3
Total milk per day (lb.) ..	167·9	147·5	121·5	138·0	170·0	183·0
Rainfall (points)	41	84	212	175	590	338
Type of feed	Oats + Field peas	Mat grass	Mat grass	Poona peas	Poona peas + Fert. Kikuyu	Poona peas + Fert. Kikuyu

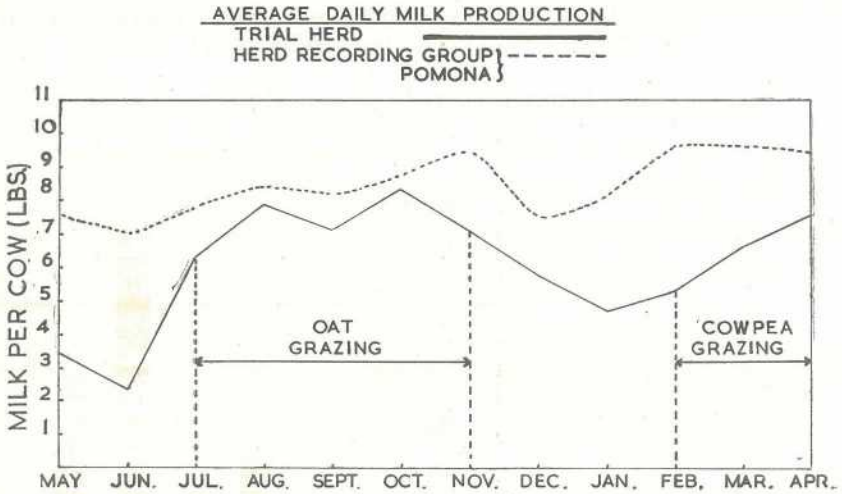


Plate 5.

Comparison of Milk Production by Cows in a Good Dairying District (Pomona) and those on the Poor Farm on Improved Feed.

The graph illustrates the results that can be obtained on these and similar lands by the grazing of suitable fodder crops, combined with mineral supplements, where animals suffer from lack of feed and from mineral deficiencies during certain periods of the year.

During the period July to November, when milking cattle had access to grazing oats, a production increase of 48.6% over the corresponding period in the base year was recorded. Such a trend for five consecutive months clearly shows the value of the demonstrational work undertaken, and emphasises the benefits of using suitable grazing crops, grown with adequate applications of fertilizers.

TABLE 2.

COMPARISON OF MONTHLY PRODUCTION ON TEST FARM, 1950–51 AND 1951–52.

Month.	Butter (lb.).	Kin Kin Rainfall (points).	Month.	Butter (lb.).	Kin Kin Rainfall (points).
1950.			1951.		
May	129	378	May	108	90
June	111	456	June	58	79
July	85	1,179	July	81	Nil
August	69	95	August	114	52
September ..	81	52	September ..	119	115
October	100	427	October	199	295
November ..	131	660	November ..	171	24
December ..	184	493	December ..	150	166
1951.			1952.		
January	271	1,838	January ..	159	404
February ..	248	443	February ..	180	251
March	237	504	March	236	589
April	171	34	April	201	438
Total ..	1,825 lb.	6,459	Total ..	1,786 lb.	2,503

As shown in Table 2, the herd's butter production for the drought period May 1951 to April 1952 was practically equal to that of the previous 12 months, when the area received excellent seasonal conditions and an extra 29 inches of rain over the year during which the demonstration was carried out.

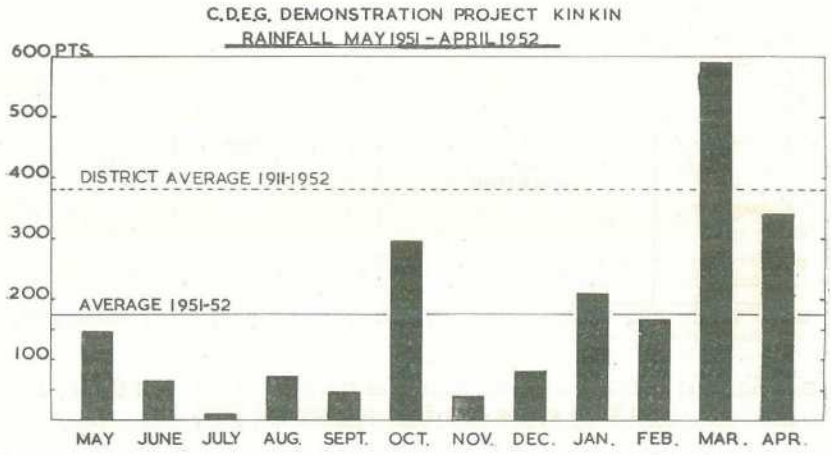


Plate 6.

Rainfall at Kin Kin during the Demonstration Period.

Despite the severe drought production was held at reasonable levels and no stock were lost through poor nutrition.

A combination of adequate, good-quality grazing and correct mineral balance for cattle points the way to the successful utilisation of these marginal coastal lands. On soils which are leached and of low fertility, the correct application of soil amendments, fertilizers and trace elements will enable dairying to be carried out at a reasonably satisfactory standard.

Safety Catches for Forcing Yard Gates.

P. ROUND, Senior Adviser, Cattle Husbandry Branch.

WHEN forcing cattle towards a crush it frequently happens that the cattle surge backwards before the gate is secured, resulting in inconvenience, delay and possibly injury to both man and beast.

The accompanying drawings illustrate simple and effective safety catches for the gate of the forcing yard which can be constructed by any handy man.

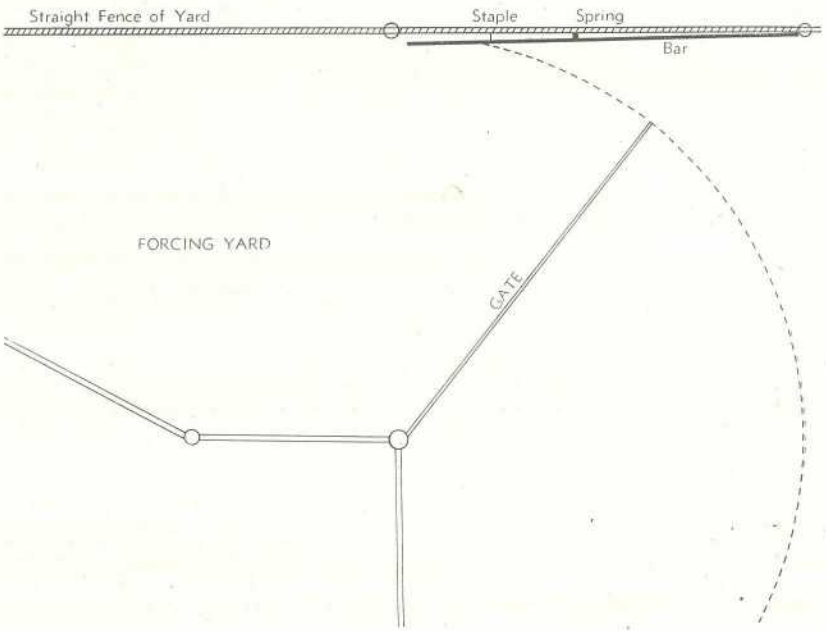


Plate 1.

Ground Plan of Safety Catch for Forcing Yard Gate.

Spring Catch.

Plate 1 shows the ground plan of a spring safety catch, and Plate 2 gives the elevation, showing the spring and the bar.

Materials Required.—

One 4 x 2 hardwood bar sufficiently long to reach from the first post behind the gate to the back of the closed gatehead, leaving about 1 in. play between the end of the bar and the gatehead.

Two plates of 1½ in. x ¼ in. flat iron 18 in. long bent at right angles.

One 5 in. x ½ in. bolt.

Four ½ in. spikes or bolts to secure the elbow plates to the yard post.

One main leaf of car or similar spring.

One "U" bolt to carry bar. This is bolted through the rail and its length will depend on the thickness of the rail. The bolt should be set just behind the point of contact of the gate with the bar.

Bolts or wire to attach the end of the spring to the rail.

It will be noted that the secured end of the bar butts against the post and is hinged onto it by the bent plates and bolt.

The operator can swing the gate from a safe distance behind the cattle. In the act of closing, the gatehead slides along the loose end of the bar and depresses the spring. As the gate clears the end of the bar, the recoil of the spring forces the end of the bar behind the gatehead, thus effectively securing it.

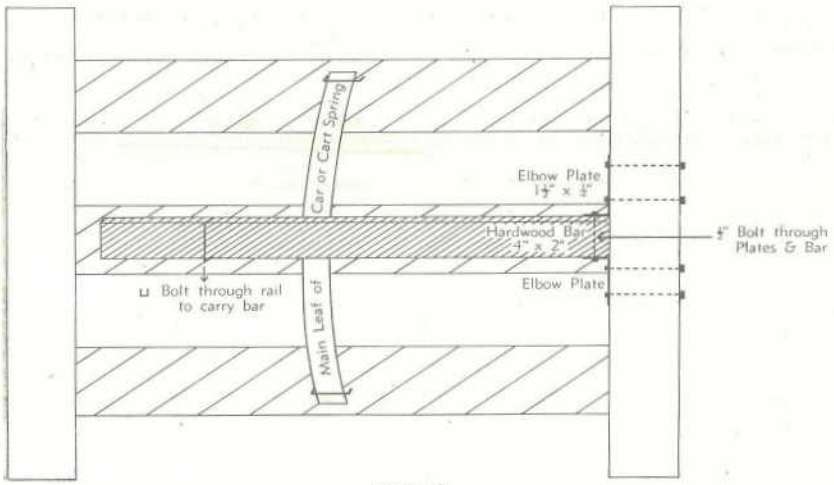


Plate 2.

Elevation of Safety Catch, Showing Spring and Bar.

Hinged Prop Catch.

The hinged prop type of catch is shown in Plate 3. This is quite effective but somewhat more cumbersome than the spring and ratchet types. Angle iron or hardwood can be used for the prop.

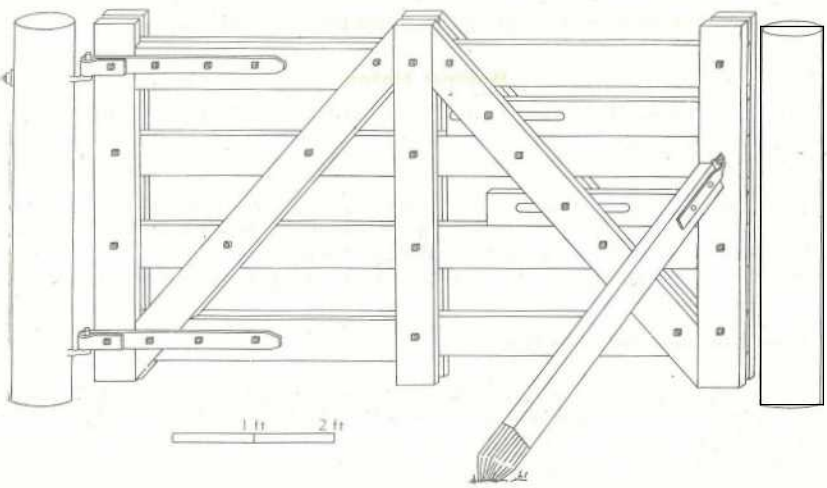


Plate 3.

Diagram of Hinged Prop Catch.

Ratchet Catch.

Plate 4 shows a ratchet type of catch. This is an ordinary drop-latch type, that slides along the ratchet, bolted to the rail and dropping into position. Tough hardwood should be selected for the latch and ratchet.

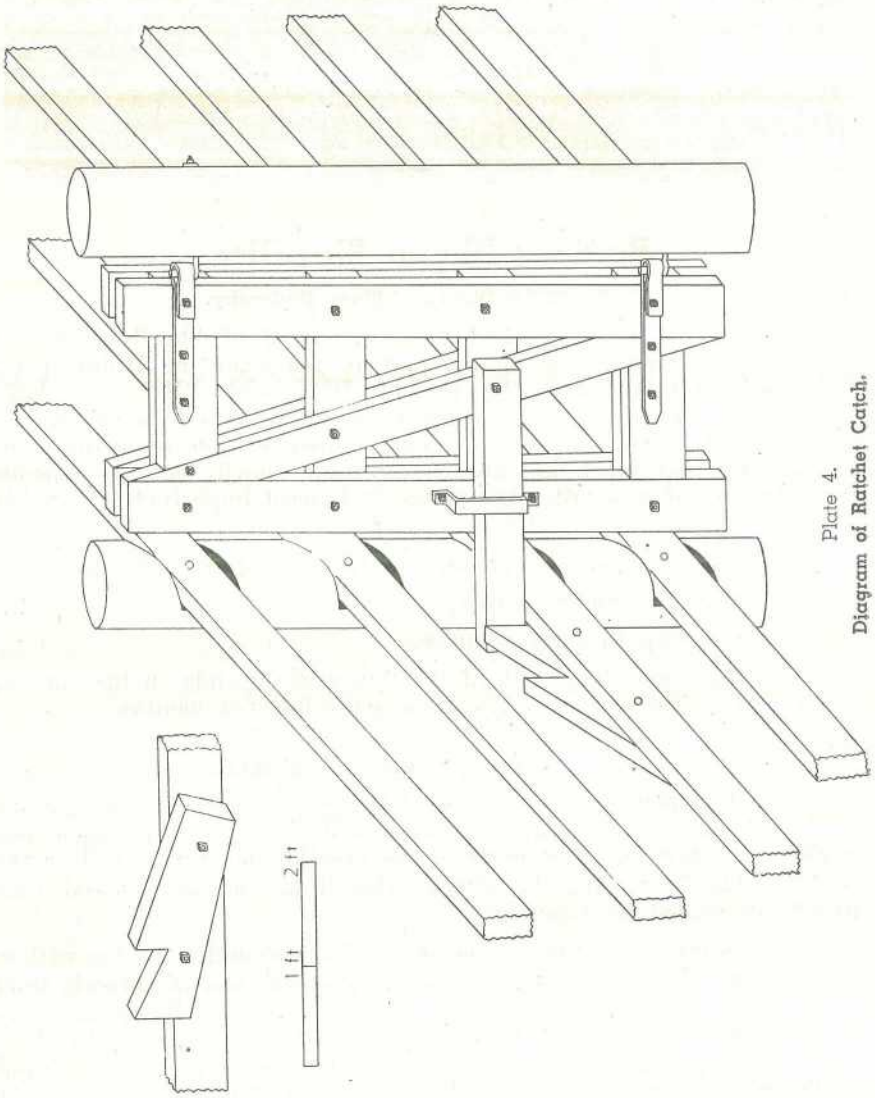


Plate 4.
Diagram of Ratchet Catch.

Beating Sheep Blowflies.

G. R. MOULE, Director of Sheep Husbandry.

THERE is no single method for the control of blowfly strike in sheep. Publicity during the past 10 years for the Mules operation, tail stripping and the use of DDT and BHC may have drawn emphasis away from the use of a balanced plan in preventing blowfly strike. The Sheep and Wool Branch of the Department of Agriculture and Stock has always felt that blowfly control depends upon the use of a co-ordinated plan. It is most important to forecast waves and to act before the flies start.

The two main periods of blowfly activity in Queensland are:—

(1) Late summer to early autumn.

(2) Spring to early summer.

In most years the length of the fly-waves depends on the amount of rain which falls or has fallen during the last few months.

DIFFERENT TYPES OF STRIKE.

Crutch strike in ewes causes most trouble in most years in Queensland. Crutch strike starts on the inner side of either back leg. Strike may start on other parts of the breech, such as the tail or the udder. The latter may be struck after it has become stained with afterbirth voided by lambing ewes.

Body strike may start on the point of the shoulder, on the wither, back or rump, or on any part of the body other than the breech, head or pizzle. In most areas and in most years, body strike occurs only during or just after good seasons. The Stanthorpe district is a notable exception. Body strike may occur there during the winter, as the heavy dews on long grass keep the point of the shoulder wet. A severe wave of body strike can be hard to handle, and losses in terms of sheep and wool can be heavy. Fortunately, bad waves occur only every seven or eight years.

Pizzle strike occurs only on wethers and rams. The latter may also be struck on the head.

WORK TO A CO-ORDINATED PLAN.

A co-ordinated plan for blowfly control always pays. The one recommended by the Sheep and Wool Branch includes several steps. They are applied at different stages of the sheep's life and are easy to follow.

A. At Lamb Marking.

(1) Cut the lamb's tail level with the tip of the vulva.

(2) Cut the tail so the bare skin from the under-surface of the tail is long and heals back over the severed stump.

B. At Weaning Time or at any Time up to When the Sheep Become 2-Tooths.

(1) Do the Mules operation. Wethers as well as ewes may be treated if crutch strike is a problem in wethers in most seasons. The tail strip can be removed while doing the Mules operation if this was not done at marking. The Mules operation will protect sheep against strike starting in the crutch. It will not protect against strike starting on the udder after lambing, or on the tail or any other part of the sheep's body.

C. Subsequent Treatment.

(1) *Crutching.* In all cases a mid-season crutching is recommended.

(2) *Jetting and Spretting.* Jetting or spretting with arsenic is effective and cheap. It can be used during severe fly-waves if the sheep are carrying more than six weeks' wool. Sheep carrying small strikes may be jetted with arsenic. Because it is so poisonous it may cause injury to sheep carrying large strikes. If the jetting fluid is re-used, the cost of arsenic is about £3 10s. per 1,000 sheep treated. Rams should not be treated with arsenic prior to joining, because it may cause temporary infertility. However, it can be applied to the pizzle of wethers.

(3) *Spraying with DDT.* DDT remains poisonous for a fairly long time after it is applied to the wool. It is used in a 1.0 per cent. solution to protect against body strike. It can be put on the sheep from the top sprays of a shower dip or by a curved spray boom which is bent to fit over the back and sides of the sheep. "Fishtail" or "Cyclone" nozzles are fitted to the curved boom and the fluid is pumped through by a jetting plant running at about 150 lb. per square inch. This gives a finely atomised spray. About one-third to half a gallon should be used for each sheep. The cost for materials is in the vicinity of £40 per 1,000 sheep.

DDT will not kill blowfly maggots. It protects the sheep by stopping the flies from laying their eggs.

D. Emergency Treatment.

All of these methods aim at preventing strike. It has now been shown that the fly which starts most of the strike breeds in struck sheep. Therefore, any methods which protect sheep from being struck help prevent serious blowfly waves. However, sudden changes in the seasons, floods and the like can prevent the handling of stock for shearing, crutching, jetting, spretting and/or spraying. When this coincides with a severe fly wave, a large number of sheep may be struck. In such circumstances, emergency methods may have to be applied urgently. Hand-dressing is too laborious, and it is often impossible to get crutchers.

BHC is the most useful material to use in such a case. It is poisonous to blowfly maggots, but will not injure the sheep, even if it is jetted or spretted onto large strikes. It can be applied copiously to struck sheep, at as much as 2 gallons of a 0.05 per cent. solution per head. It can be applied by a jetting plant, spretter or, if body strike occurs, from the top sprays of a shower dip.

BHC used at this strength will protect sheep from restrike for from 3 to 30 days, depending on the weather and the severity of the fly-wave. It may be necessary, therefore, to treat the struck sheep again soon after the initial application of BHC. Its main value, then, is in handling an emergency. Applied at the rate of 2 gallons per head as a 0.05 per cent. solution, BHC would cost about £125 per 1,000 sheep treated.

Forecasts are Important.

The use of a co-ordinated plan and anticipation of fly waves are the keys to success in the control of blowfly strike in sheep. The adoption of a plan similar to the one set out is an easy matter, although it has to be co-ordinated with lambing dates and the like.

The anticipation of fly waves is a little more difficult. For that reason a forecast is read during the A.B.C.'s Country Hour each Tuesday. It gives woolgrowers up-to-date information about weather conditions in their districts. It gives warnings about the development of fly-waves and suggests the use of protective measures at appropriate times.

Detailed information about the use of any of the methods recommended can be obtained from your nearest Sheep and Wool Advisory Officer.

FORECASTING BLOWFLY STRIKE IN SHEEP.

"It is bad management to get caught by blowflies," is an old saying in the sheep industry. But it is not always easy to forecast a fly-wave. Woolgrowers in Queensland know only too well that once blowfly strike gets out of hand, losses can be serious. The old maxim that prevention is better than cure applies to blowfly control—except that you often need prevention by the ton instead of by the ounce! The Sheep and Wool Branch of the Department of Agriculture feels timing is important in using preventive measures against fly strike. You have to be able to forecast fly waves if you want to protect your sheep. To forecast correctly you have to know the effects of the weather on the life cycle of the blowflies that cause strike.

The Flies Which Strike Sheep.

Most strikes are started by the green blowfly. The female is a prolific egg layer. Sheep have a natural attraction for her but she lays most commonly on patches of wet wool. The eggs hatch into creamy coloured smooth maggots, which move quickly into nearby parts of the fleece. Other blowfly maggots prey on those of the green fly. If they did not, we could resign ourselves, willy-nilly, to handing the world over to them. They reproduce so quickly that they could soon challenge our comfort and welfare.

Because she starts the strike, the green fly is called the primary fly. The smell produced by the activity of her maggots attracts other flies. These are known as secondaries. They most commonly lay their eggs on existing strike. These hatch into hairy maggots, which

have strong mouths and sharp claw-like teeth. They are the greatest natural enemy of the green fly's smooth maggots. For this reason, very few smooth maggots which hatch out in carcases complete their life cycle. On the other hand, many thousands of primary green flies may be bred from a single large strike on a live sheep.

As the struck sheep is the main breeding ground of the green fly, the prevention of strike is most important.

How the Weather Influences Fly Populations.

There are never many blowflies during very hot weather or when there is a cold snap. However, the weather affects blowflies in other ways. The eggs hatch more rapidly and the maggots grow more quickly when the weather is warm and humid. These conditions also shorten the resting stage between maggot and mature fly. As a result, a mature female fly can develop from an egg in as few as 17 days. As each female fly can lay anything up to 3,000 eggs in her lifetime it does not take long to work up large fly populations. In theory, it is possible for a pair of flies to have enough descendants to outweigh the world in two years!

If rain falls when the weather is warm and humid, the wool may stay wet. This renders it attractive to green blowflies and they soon deposit their eggs. The moist wool provides the maggots with ideal conditions for growth and development and the stage is set for the first few strikes which may herald a wave.

In Queensland, air temperatures during the autumn and spring or early summer favour the development of blowflies. They hasten the stage between the maggot and the young fly. When the new crop of flies emerge from the ground they form the basis for a new fly wave if conditions suit. The resting stage in the ground can extend over several months until conditions are suitable for the young flies to emerge.

The time of the year and the weather since the last severe fly-wave affect the number of flies which emerge. If some part of the wool is not fairly long and does not remain wet for at least a few days, very few strikes will occur. However, if some areas of wool stay wet from either rain, heavy dews, or urine they attract the green fly and she soon lays her eggs.

CONSIDERATIONS IN FORECASTING.

In making a forecast about blowfly strike in your flock, you have to consider the following.

(1) How Attractive are Your Sheep to Blowflies?

Crutch strike and body strike should each be considered singly. If you answer "yes" to at least one in each of the following pairs of questions there is a fair chance crutch strike won't occur in your sheep now or in the near future.

(*a*) Have my sheep been treated with the Mules and tail strip operations and did each ewe have its tail cut level with the tip of the vulva?

or

Were my ewes crutched less than six weeks ago?

(*b*) Are my ewes free from damp urine stain around the breech?

or

Were my ewes jetted or spretted with arsenic less than six weeks ago?

If you can answer "yes" to at least one in each of the following pairs of questions there is a fair chance your sheep will not be struck on the body just now.

(*a*) Have the fleeces on my sheep been free from continuous wet such as rain, heavy dews or flood waters?

or

Are my sheep carrying less than three months' wool?

(*b*) Are my sheep free from any discolouration of the wool on the back, sides and shoulders?

or

Have my sheep been sprayed over the back, sides and shoulders during the last two weeks with a 1 per cent. solution of DDT?

(2) Is the Blowfly Population Likely to Incease in the Near Future?

If you answer "yes" to at least one of the questions in each of the following pairs there are fair chances it will.

(*a*) Is it the late summer and autumn season?

or

Is it the spring and early summer season?

(*b*) Were there useful rains during the 4-6 weeks preceding to-day's date?

or

Is the weather at present warm and humid?

(*c*) Were blowflies active at some time during the previous six months?

or

Has the weather been warm and moist since the last fly-wave?

(*d*) Are a few sheep in the district being struck now?

or

Is the feed green and lush?

Further Information.

A more detailed discussion of the sheep blowfly problem in Queensland is given in Advisory Leaflets Nos. 27, 29 and 31, which are available to woolgrowers free of charge on application.

MARKETING

Movements in the Wholesale Price of Tomatoes—Brisbane, 1948-1953.

PREPARED BY OFFICERS OF THE DIVISION OF MARKETING.

THIS analysis of tomato prices on the Brisbane market since January 1948 represents an endeavour to isolate and interpret the seasonal pattern and to elucidate the general trend over the last five years.

GENERAL REMARKS ON PRODUCTION AND MARKETING.

It is considered essential to make some preliminary reference to the actual price data used as well as to certain aspects of the production and marketing of tomatoes as they impinge on prices in Queensland.

Prices Information Collected.

The price data which have been subjected to examination consist of average weekly and monthly prices calculated from the records of daily price ranges obtained by the Market Price Reporting Section of the Division of Marketing.

For the most part these averages are representative of the general quality available. However, there are short periods when the tail-end of a crop from one district overlaps supplies of choice new season's tomatoes from another district, resulting in two distinct levels of prices. Under these conditions, it is obvious that no single average could adequately represent the full range of prices and quality then available. Nevertheless, as these periods are merely transitional in character it seems reasonable to use a calculated average which falls between the two levels as indicative of the movement of prices generally.

Production.

Queensland production of tomatoes averaged 1,308,260 half-bushel cases per year over the five years 1947-48 to 1951-52, and during the last four of those years the annual acreage remained remarkably constant at between 5,500 and 6,000 acres. This is reflected in the quantity of tomatoes produced, which varied between 1,230,000 and 1,286,000 half-bushel cases from 1948-49 to 1951-52 compared with 1,471,000 cases from 6,759 acres in 1947-48.

Reference to Tables 1 and 2 shows that the main producing districts are located within the statistical divisions of Moreton, Townsville and Downs, which together account for about 88% of the total production.

Marketing.

Queensland is a substantial net exporter of tomatoes. Approximately 44%, or nearly half of the State's total annual production, finds its way to interstate markets. The principal outlet for the remainder of commercial production is the Brisbane Wholesale Market.

TABLE 1.

TOMATOES.

AREA AND PRODUCTION IN MAIN STATISTICAL DIVISIONS.

(Average 1947–48 to 1951–52.)

(Source—Queensland Government Statistician.)

Statistical Division.	Area.		Production.	
	Acres.	Per Cent.	Half-bushel Cases.	Per cent.
Townsville	1,735	29·3	388,283	29·7
Rockhampton	499	8·4	84,523	6·5
Moreton	1,671	28·3	480,545	36·7
Downs	1,651	27·9	287,095	22·0
Rest of State	356	6·1	67,814	5·1
Total State ..	5,912	100·0	1,308,260	100·0

TABLE 2.

TOMATOES—QUEENSLAND.

AREA AND PRODUCTION IN MAIN STATISTICAL DIVISIONS.

(Source—Queensland Government Statistician.)

Statistical Division.	—	1947–48.	1948–49.	1949–50.	1950–51.	1951–52.
Townsville ..	Acres	2,017	1,564	1,602	1,807	1,684
	½ Bush.	507,514	356,090	389,036	277,648	411,126
Rockhampton	Acres	679	448	453	570	344
	½ Bush.	107,833	73,208	69,784	113,584	58,204
Moreton ..	Acres.	1,792	1,476	1,567	1,783	1,737
	½ Bush.	488,420	405,512	466,286	504,230	538,276
Downs ..	Acres	1,776	1,866	1,649	1,573	1,390
	½ Bush.	288,022	387,836	301,708	260,042	197,868
Rest of State	Acres	495	278	318	336	356
	½ Bush.	79,640	48,822	59,678	74,324	76,608
Total State ..	Acres	6,759	5,632	5,589	6,069	5,511
	½ Bush.	1,471,429	1,271,468	1,286,492	1,229,828	1,282,082

Import and export of tomatoes takes place throughout the year, but the volume of interstate exports from Queensland is considerably in excess of imports. Exports during 1952 reached a total of 809,004 cases, compared with imports of only 61,284 cases.

The greater percentage of exports is "on consignment" from Queensland growers to agents in New South Wales, and the main reason for this is that from May to September Bowen producers provide the Sydney market with a fairly high percentage of its total supplies. For Bowen growers, the Brisbane market is of only secondary importance. In addition to these northern consignments, the southern markets also draw supplies direct from many growers in the Central and Moreton districts of Queensland, usually during September, October and November. However, in the main, the principal market for Central and South Queensland crops is Brisbane.

Over the last four years, the volume of interstate imports has increased greatly, and during 1952 a total of 61,284 cases was imported, compared with 21,589 cases in the previous year and only 5,447 cases in

1949. This has resulted mainly from an increasing tendency towards heavy supplies on the Sydney market in recent years, particularly during the months from October to April, with a consequent change in relative price levels in favour of Brisbane.

The frequent disparities in price levels between Brisbane and Sydney have encouraged an increase in the number of interstate operators and an intensification of their activities. It is significant that with the exception of direct consignments from northern New South Wales growers, the greater part of the inward movement of tomatoes from southern States can be classed as speculatory. As the Brisbane market is conveniently situated in relation to producing districts in northern New South Wales, it naturally attracts spring and early summer consignments direct from growers in districts located between the Tweed River and Coff's Harbour.

A statistical summary of interstate imports and exports of tomatoes since 1949 is presented in Table 3.

TABLE 3.

INTERSTATE IMPORTS AND EXPORTS OF TOMATOES.

(Source—Department of Agriculture and Stock, Queensland.)

Period.	—	1949.	1950.	1951.	1952.
January–March	Imports	637	9,646	4,812	31,985
	Exports	90,184	44,116	31,794	7,809
April–June	Imports	2,477	244	1,098	4,287
	Exports	122,468	139,241	185,985	175,795
July–September	Imports	384	1,539	888	7,288
	Exports	224,828	124,770	297,093	500,347
October–December ..	Imports	1,949	4,591	14,791	17,724
	Exports	104,243	267,752	120,112	125,053
January–December ..	Imports	5,447	16,020	21,589	61,284
	Exports	541,723	575,879	634,984	809,004

SEASONAL PATTERN OF PRICES.

Tomato prices exhibit a seasonal pattern which is neither precise nor regular. The course of prices is nevertheless confined between broad but fairly definite limits.

This pattern is illustrated in Plate 1, on which comment is made at a later stage.

Both the supply of and the demand for tomatoes so far as Queensland alone is concerned are fairly stable from year to year and each exhibits a fairly regular seasonal pattern of its own. However, frequent periodic disturbances emanating from southern markets cause considerable distortion. The effect of these disturbances on prices is such as to make any precise representation of the seasonal pattern impossible unless their influence is measured and eliminated. However, such treatment is undesirable in this analysis since the resultant pattern would be unrealistic.

Supply Factors.

The main feature of the supply of tomatoes to the Brisbane market is that peak supplies from the various districts arrive at different times of the year.

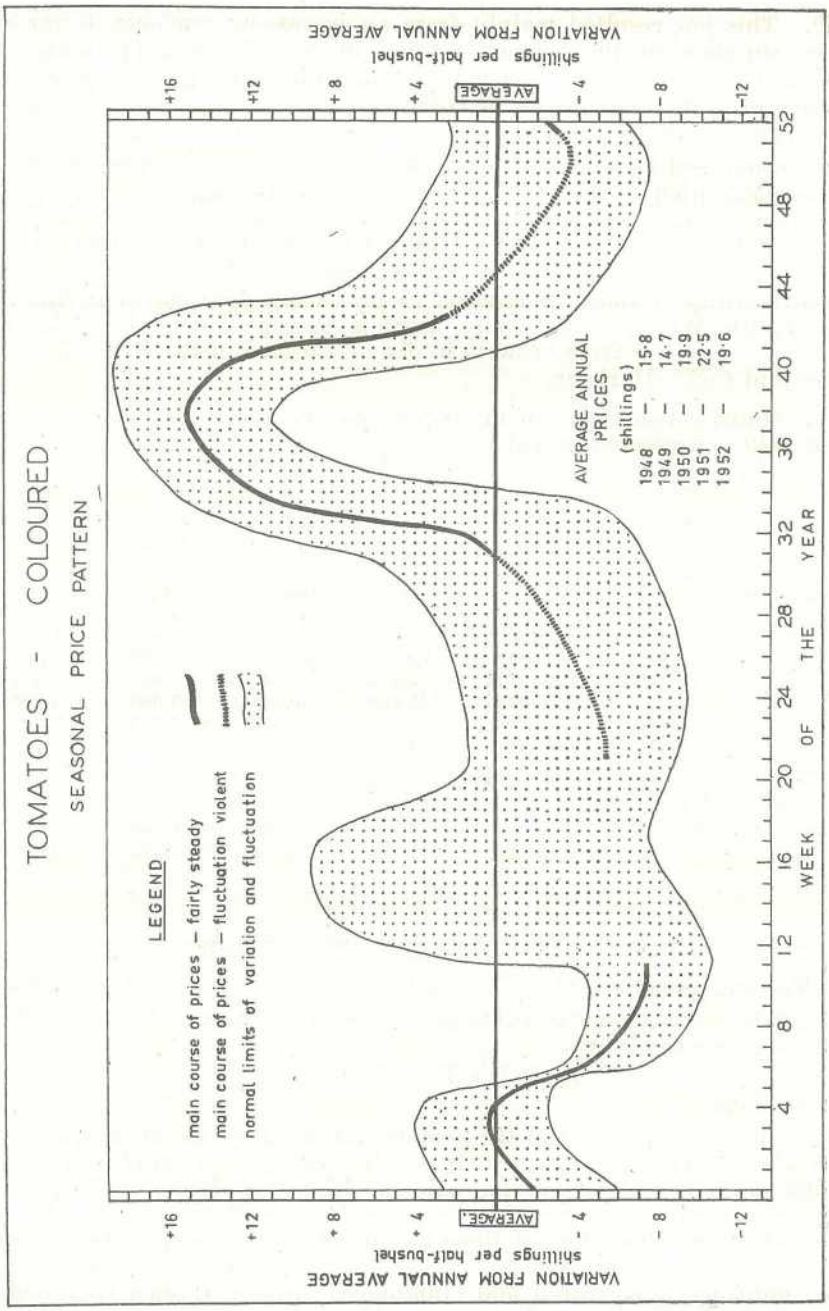


Plate 1. Seasonal Price Pattern of Coloured Tomatoes.

From mid-January to mid-March the market is usually well supplied from the Stanthorpe district. These supplies dwindle rapidly with the onset of frost, but during the autumn adequate stocks are generally available from areas near Brisbane. By May, small quantities begin to arrive from North Queensland districts, and it is quite common during May and June to find most Queensland coastal areas represented.

Local growers in areas close to Brisbane can usually produce satisfactory crops from March to December, but their midwinter production is generally curtailed because competition from northern crops, which reach a peak in July, sometimes causes prices to fall to a fairly low level. Northern consignments tend to decline somewhat in quality during August, and quantities fall off sharply in September. However, moderate quantities from the spring crop in Central and South Queensland coastal districts are harvested from August to early October and these are the main supplies available during that period. A heavy local crop is then the dominating influence until about Christmas.

Demand Factors.

Tomatoes enjoy a good measure of popularity throughout the year, but their use is more widespread during the summer months, so the Queensland demand is essentially seasonal in character. Some modification of this basic pattern is caused by the fact that producing districts throughout the State are widely separated, and climatic differences between producing areas cause demand on the Brisbane market by country centres to vary with the availability of local supplies in those areas. Furthermore, the volume of demand for tomatoes on the Brisbane market is at times greatly increased by requests from interstate sources, with the result that the inherent seasonality of Queensland demand is effectively disrupted.

Nevertheless, the forces which obscure the basic seasonal pattern are themselves regular in occurrence, if not in intensity, and display a measure of seasonality.

Generally there is a good demand for tomatoes on the Brisbane market during January, February and March, particularly from northern towns. This is because the normal seasonal enquiry is accentuated by the fact that the main source of supply is the relatively small Stanthorpe district located in the southernmost part of the State, and only very light local supplies are available in other districts.

Towards the end of March a slight reduction in demand is experienced as near-Metropolitan districts come into production, and dependence of these heavily populated areas on the Brisbane market is reduced. These conditions usually obtain throughout April. Similarly, a further reduction can be expected in May with the start of the new season's crop in the north, but this is invariably offset by speculative enquiry from interstate sources.

Southern demand is usually greatest during June, but weather conditions in New South Wales during July often have an adverse effect upon tomato sales in the Sydney Markets and this is followed by a similar reaction in Brisbane. However, interstate enquiries remain a dominant influence until late-October, when fresh supplies from New South Wales districts cause a rapid decline in prices.

The warm weather during November and December might be expected to favour tomato sales, but generally speaking demand on the Brisbane market at that time is only moderate, probably because there is some production in most districts which is available for local consumption.

Description of Seasonal Price Pattern.

The seasonal pattern of tomato prices resulting from the interaction of the factors outlined above is necessarily broad and at times indefinite.

A central tendency or normal course of prices is apparent during most of the year, but it will be seen that prices vary about this course between fairly well established limits. Consequently the general direction in which prices move and the normal range of variations must be taken together when considering the overall seasonal pattern. It has been found that weekly fluctuations and seasonal changes in the level of prices tend to show a more or less fixed monetary margin above or below the annual average at different periods of the year rather than a percentage relationship to that average.

Both the general course of prices and the normal limits of fluctuation are illustrated in Plate 1. However, when referring to this chart it should be remembered that there are occasions when exceptionally violent disturbances cause prices to move beyond the limits shown.

TABLE 4.

TOMATOES—COLOURED.

MONTHLY AVERAGE PRICES—BRISBANE WHOLESALE MARKETS.

(Source—Division of Marketing.)

Month.	Shillings per Half-bushel Case.					
	1948.	1949.	1950.	1951.	1952.	1953.
January ..	16·5	15·4	16·1	11·5	28·6	21·0
February ..	11·5	4·4	13·9	11·1	34·7	10·9
March ..	9·1	7·3	10·4	25·4	22·8	11·2
April ..	8·3	19·4	17·9	19·8	10·0	14·8
May	12·6	15·3	13·9	13·3	9·1	28·5
June	16·0	9·8	13·3	11·5	11·6	..
July	20·0	10·4	17·2	18·6	12·6	..
August ..	28·5	17·8	36·5	19·2	15·6	..
September ..	27·4	26·4	39·2	36·4	16·2	..
October ..	17·2	18·9	29·0	34·3	24·5	..
November ..	12·5	15·8	17·8	32·2	23·3	..
December ..	10·0	15·5	13·4	34·6	23·5	..

TABLE 5.

TOMATOES—GREEN.

MONTHLY AVERAGE PRICES—BRISBANE WHOLESALE MARKETS.

(Source—Division of Marketing.)

Month.	Shillings per Half-bushel Case.					
	1948.	1949.	1950.	1951.	1952.	1953.
January ..	10·9	8·8	12·4	8·1	23·0	14·3
February ..	7·5	4·4	8·4	6·8	32·5	8·5
March ..	6·3	5·8	7·6	20·1	12·5	8·1
April ..	6·2	12·7	12·3	11·7	8·2	10·4
May	8·8	10·9	11·7	9·5	6·6	18·8
June	11·4	7·4	10·6	8·7	8·5	..
July	13·2	7·8	11·5	13·0	9·0	..
August ..	23·3	12·4	31·2	13·7	14·4	..
September ..	22·5	..	32·2	..	14·0	..
October ..	17·2	16·5	23·1	32·7	20·7	..
November ..	10·7	12·9	17·2	28·8	21·8	..
December ..	9·5	11·8	11·4	27·0	19·2	..

The seasonal pattern consists of one period (March-May) when prices show no tendency whatsoever to follow a definite course; two periods of relatively smooth movement (January-March and August-October) and two periods (June-July and November-December) which are marked by a fair degree of fluctuation about the central course.

Taken in chronological sequence, the first period extending from January to mid-March is one in which prices follow a fairly smooth course within the limits shown in Plate 1. Prices for coloured tomatoes tend to firm in the early part of this period as consignments from near-Metropolitan districts decline, whilst most of the receivals from Stanthorpe are in green condition. However, increased quantities early in February cause prices to drop. A further fall is usually experienced over the latter part of the period and this is attributable mainly to a decline in quality following seasonal rains.

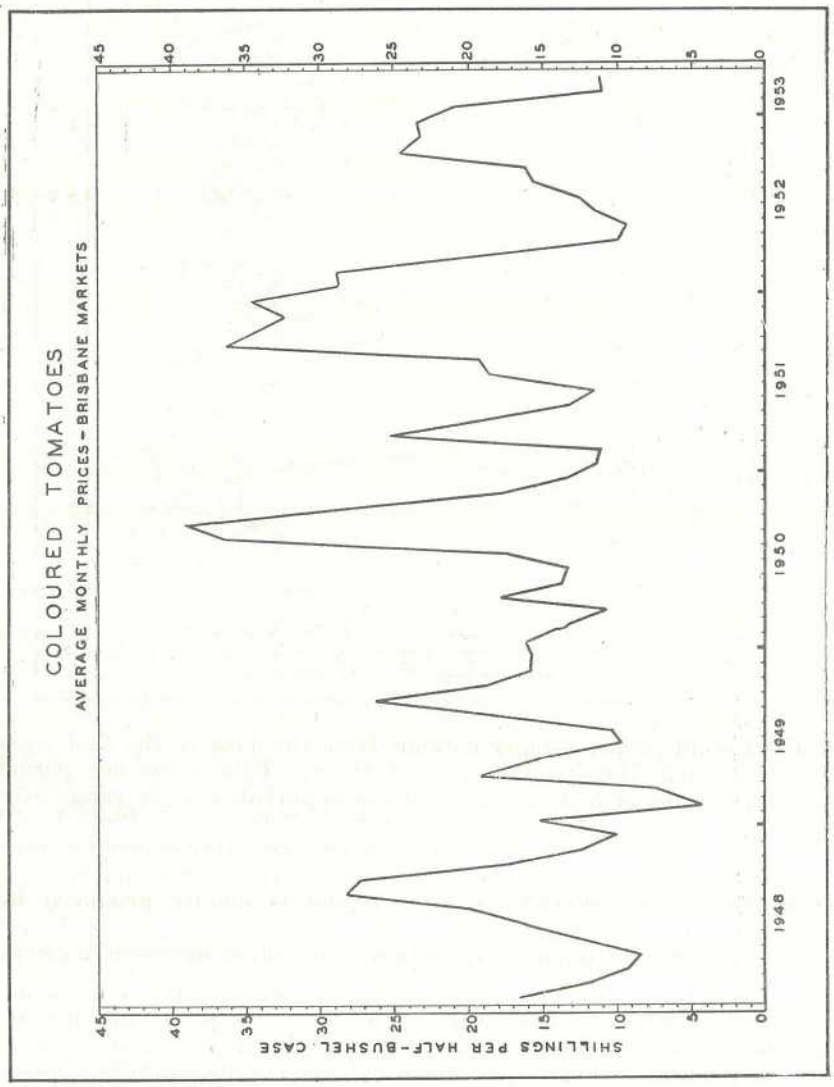


Plate 2. Average Monthly Prices for Coloured Tomatoes.

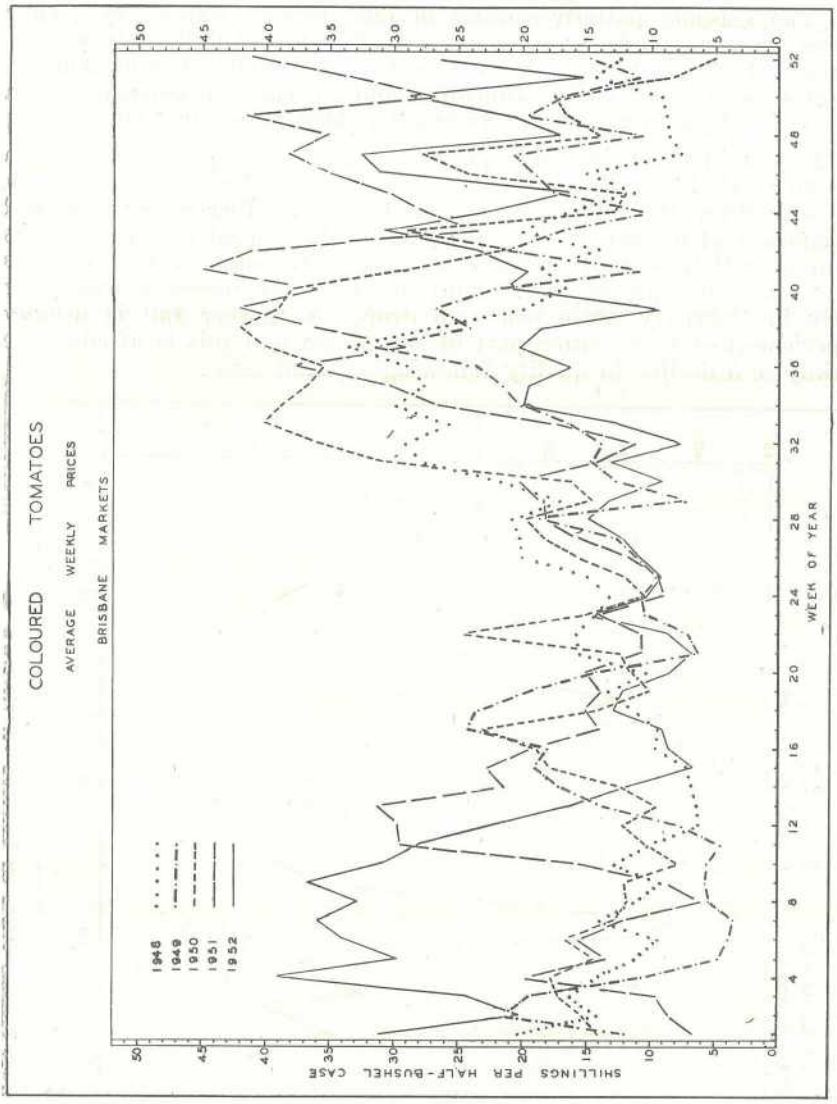


Plate 3. **Average Weekly Prices for Coloured Tomatoes.**

The second period usually extends from the 11th to the 21st week of the year (mid-March to the end of May). This is the one period for which no central tendency of prices is apparent and the range over which prices can fluctuate is most extensive. Reference to Plate 1 will show that the normal limits of this range are approximately nine shillings above and eight shillings below the average price for the year. The instability characteristic of this period is mainly produced by unseasonal extensions of the harvesting period in the Stanthorpe district or the early arrival of tomatoes from Bowen and other northern districts.

The third period takes in the months of June and July, during which prices tend to fluctuate sharply whilst at the same time moving in a general upward direction. At this time of the year, conditions in the Sydney market exert a dominating influence on tomato prices in the

Brisbane wholesale markets. If prices tend to fall in Sydney, Brisbane usually suffers a decline in interstate purchases together with increased receivals from Bowen, and these factors, in conjunction with the normal seasonal limitations of *per capita* consumption, cause a sharp drop in values. Conversely, a tendency for prices to rise in Sydney also reacts quickly on Brisbane prices, forcing a fairly sharp rise.

By contrast, the next period (August-September-October) is relatively free from sudden fluctuations. The main feature of prices is a steep upward movement which reaches a peak somewhere around the 38th week of the year. The initial reason for this upswing is a falling-off in supplies and it is maintained and even accentuated by an improvement in demand with the advent of warmer weather. However, during October, increasing supplies from the new spring crops of the coastal areas south of Rockhampton usually precipitate a fall in values. Nevertheless, average realisations for tomatoes over the whole of this period are, in normal times, at least twice as high as those obtaining at other periods of the year.

Fairly wide fluctuations about a falling price level are the main attributes of the tomato market during the remaining period of November-December. Supplies are moderately heavy at first and diminishing southern outlets constitute the main depressing influence. During December the local crop tails off, and as the early deliveries from Stanthorpe are in very green condition some improvement in prices for the coloured tomatoes available from south-eastern districts is usually registered over the last week or so of the year.

It seems reasonably certain that, although the pattern presented in Plate 1 shows fairly wide limits, tomatoes marketed consistently in one period of the year for a number of years should return an average which would tend to vary from the annual average to the extent shown by the heavy line in Plate 1.

Variations from the Seasonal Pattern.

From the foregoing it is evident that the nature of tomato marketing and production is such that the normal price pattern is one of variation within limits. However, at times episodic disturbances occur which take prices outside the normal variations. These disturbances invariably follow either a complete crop failure in a particular district when it has a virtual monopoly of supply or a combination of unusually heavy crops with unseasonal overlapping of harvesting periods in different districts.

A typical example of such extreme variation was provided by the behaviour of prices in February, 1952. Early plantings in the Stanthorpe district were curtailed as a result of abnormally dry weather conditions, with the result that consignments to the Brisbane market during February were extremely light, and this, coupled with an unusually heavy seasonal demand, caused prices to rise well beyond the normal limits. Prices as high as 45 shillings per half-bushel case were recorded, whilst the calculated average monthly price covering all sales was 34·75 shillings, compared with a normal mean for February of about 10 shillings.

An example of extremely low prices was provided in May, 1952. Good rains toward the end of January enabled additional plantings plus a measure of replanting in the Stanthorpe district and a heavy late season crop was harvested. At the same time, mild weather in the late

summer and autumn also ensured crops in most of the other producing areas of both Queensland and New South Wales. This resulted in very heavy supplies arriving on the Brisbane market during the early part of May at a time when demand was abnormally weak, and, as a consequence, prices during that period were extremely low. The average price for the month was only 9·1 shillings per half-bushel case, compared with a normal mean of 13·75 shillings.

TREND.

An analysis of tomato prices covering the period from July 1947 to December 1952 reveals an upward trend in prices up to the end of 1951. This resulted in an increase in basic values of about 2·2 shillings per half-bushel case per annum.

Subsequent to the end of 1951, any possible trend has been so masked by pronounced episodic disturbances which have largely coincided with somewhat changed economic conditions that it is impossible to determine whether the previous trend is continuing or a new short-term trend has taken its place.