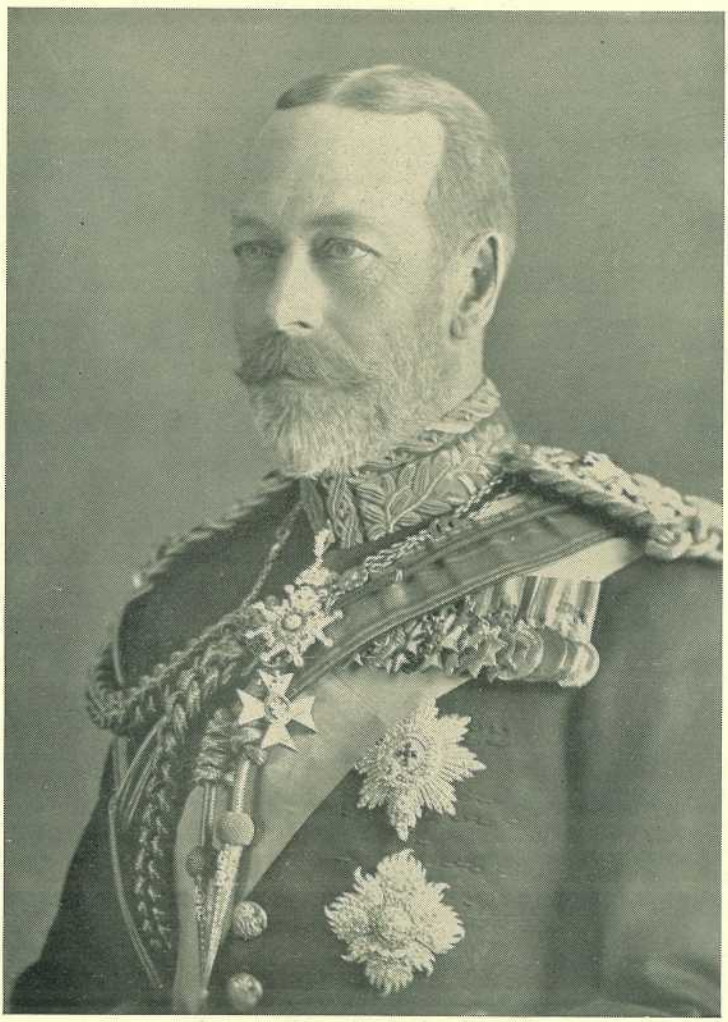


PLATE 33.

His Late Majesty King George V.

His Majesty King Edward VIII.

PLATE 34.

This photograph of KING EDWARD was taken at the Royal Agricultural Show, Brisbane, July, 1920, when His Majesty, as Prince of Wales, was visiting Queensland.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten shillings,** including postage.

VOL. XLV. 1 FEBRUARY, 1936. PART 2

Event and Comment.

Death of the King.

THROUGHOUT Australia, no less than in the Motherland, the death of King George V. aroused a feeling of profound sorrow, to which was added a sense of deep personal loss. Of the late King's own consciousness of the greatness of the trust he held as head of the most liberal democracy in the world, his Empire has had the amplest evidence. It has been said of the Empire that it has become a fellowship of self-governing peoples; yet their freedom has not lessened, but strengthened their loyalty to the one Commonwealth. "It is in the one Throne that they find the symbol and bond of their unity."

The Archbishop of Canterbury expressed the sentiments of the whole of the British Dominions when he said that it might be that by mere force of circumstances or sentiment the Throne itself would have been accepted by the people of the United Kingdom, and the nations of the Empire, as the centre of their unity. What was certain was that the personality of the King had given to the Throne the power of personal attachment. He brought the Throne into the hearts of his subjects. They had discovered in the Sovereign a man whom they could understand, respect, and trust. They had seen him in quiet dignity worthy of his high office, and with it an unaffected friendliness. They had seen his constant care for their welfare, and his unselfish devotion in their service.

The sentiments of Queenslanders have been expressed eloquently, yet simply, by Archbishop Wand and Archbishop Duhig of Brisbane.

In the course of his address at the Citizens' Memorial Service in Brisbane, Archbishop Wand said that King George had not only endeared himself to the people of this country by visiting Australia and identifying himself with its interests, but he presided over the development of the Dominions into adult nationhood. To-day the Crown is recognised as the symbol of that allegiance which binds us, a free and independent people, into the great Commonwealth of the British Empire.

"Therefore we rejoice in the memory of his kingly acts. With pride we remember how once and again, when the machinery of government seemed on the point of breaking down, he was able by his own personal interposition to set the wheels again in motion and save the greater part of the civilised world from disaster. With humble gratitude we recall how in the day of the nation's greatest peril his sense of Royal duty led him to share the sacrifices and dangers of his people even to the point when, like any of his sick or wounded soldiers, he was carried by ambulance from the scene of war. Above all, we exult that by his steadfast example he led us through a quarter of a century of unexampled difficulty until he brought us to a condition of recovery and stability which is the envy of all nations.

"But . . . our reverence for the King is merged in our admiration for the man. The unique and central position of the British Throne demands that for the security of the Empire the Crown shall be worn by one whose personality draws forth the best in his subjects. Of King George V. it may be said that he displayed a character which 'became the enthroned monarch better than his crown.'

"His dignity sprang from an unfeigned simplicity that endeared him to the heart of his people. Like many sailors he combined a love of the sea with a longing for the homely interests of the countryside. His farm, his horses, and his cattle were the delight of his private life. It was in the pastoral surroundings of his country home at Sandringham that he wished to die. The desire was fulfilled. Among the quiet scenes and the friendly folk with whom he was most familiar he entered into his rest.

'Here he lies where he longed to be,
Home is the sailor, home from sea,
And the hunter home from the hill.'

"He was extraordinarily modest about his own abilities. Yet it was to the advantage of the whole Empire that the sea and the country had impressed characteristic qualities upon the personality of the great monarch. Clear vision and kindly courtesy, sense of duty, and willingness to serve were the gifts most needed in his day and station. These he displayed with a devotion that has rarely been equalled and never surpassed by a reigning king. He raised our common nature to the pitch of genius, and revealed in the capacities of the plain man an inexhaustible treasure for the service of humanity."

In the course of his panegyric preached in St. Stephen's Cathedral, on the day of the funeral of King George V., Archbishop Duhig said:—

"For a quarter of a century King George ruled through recurring periods of exceptional difficulty. He saw thrones rock and fall, while out of each ordeal came his own set more firmly in the hearts of the people whom he trusted absolutely and whose liberties he never sought to curtail. It was said by the poet Claudian that 'never could liberty shine more fair than under a righteous king.' Of the truth of this assertion we have ample proof in the reign of the beloved monarch who is to-day being laid to rest to the accompaniment of the tears and prayers of his people.

"Seldom if ever has the news of the demise of a monarch evoked anything like the widespread sorrow that . . . marked the announcement of the King's death. Not only the people of a vast Empire, but men and women of every race and nation beyond its confines, joined in mourning the loss of a beloved friend of humanity. The world seemed to pause in its daily routine as if numbed by the sudden removal from its councils of a mighty influence for stability, peace and goodwill. Men and women in every condition of society from the factory worker to the millionaire, uncovered and bowed their heads in silence at the passing hence of one who was not only a great King but a truly good man, the warm rays of whose kindly thoughts and deeds penetrated everywhere and the common passport to whose sympathy was suffering and want.

"Unprecedently great as were the Throne and Empire to which he succeeded, George V. never allowed himself to be carried forward automatically by their motion or live on their influence. He never sank the beauty and power of a fine personality in the role or title of a King. He was before all else a man and one so good that the qualities of the man often overshadowed the dignity of the King, and leaving undiminished the ancient respect of the people for the Crown, translated their obedience into a passionate personal attachment for him who wore it. To him might with truth be applied the poetic words written of one of his predecessors of over 200 years ago!

> 'While the late King had many other gifts befitting a ruler, he will always be best remembered for his Christian attitude to every phase of national and social life, his devotion to duty, and his solicitude for the welfare of his people in every portion of his Dominions. He sought the good of his people and his power and his glory pleased them well all his days.'

"The King was almost as well known overseas as he was at home. As a Prince he had made two visits to this country. As King he had met many Australian visitors in London, and tens of thousands of the people of the Commonwealth had heard his voice in his touching Christmas messages over the radio.

"Above all he had taken a keen personal interest in this country, which he had himself launched on its career as a free Commonwealth and whose growth and progress he had ever since watched with pride. It is because of all these considerations that Australians can heartily enter into the sentiments expressed by the English poet who wrote:—

"We, too, are friends to loyalty.
We love
The king who loves the law,
respects his bounds,
And reigns content within them.
Him we serve
Freely and with delight, who leaves us free.

"The King's life has added lustre to his throne and has elevated monarchial rule in the eyes of the whole world. His memory will be enshrined in the hearts of the people and his name will live in history as one of the most beloved of British rulers.

"With this sincere tribute to the late King I feel we must combine words of admiration for the bereaved Queen who so loyally and faithfully shared his joys and sorrows, and his work and solicitude for the people. Queen Mary is undoubtedly one of the great women of our time, and history we hope will record how far-reaching has been her influence for good on the life of the nation. . . .

"As to the new King, we may say of him in the words of Holy Writ: 'His father is dead, and he is as if he were not dead; for he hath left one behind him that is like unto himself.' (Eccli., 30th chapter, fourth verse). That is the highest tribute we can pay to the new Sovereign, and we can pay it in all truth and sincerity. The loss sustained by the death of the late King is felt intensely everywhere, but happy without doubt is the nation that can suffer so great a loss and can see it so readily repaired by the accession to the Throne of a son whose extensive travels abroad in the Dominions and in foreign lands as the best Ambassador of his Empire has prepared him to rule it wisely and whose first declaration to his people was that he would walk in the footsteps of his beloved father. May his reign be lengthy and peaceful, blessed by God and beneficial to all the people. . . .

"May God reward the love of justice, charity, and kindly compassion which marked the life of the noble dead, and may Divine Providence guide and protect him upon whose shoulders has fallen the mantle and responsibilities of his kingly father.

"In the name of all I say in the ancient Latin tongue: Vale Optime Rex: sit tua perennis Memoria: Adieu O Excellent King: may thy memory never fade."

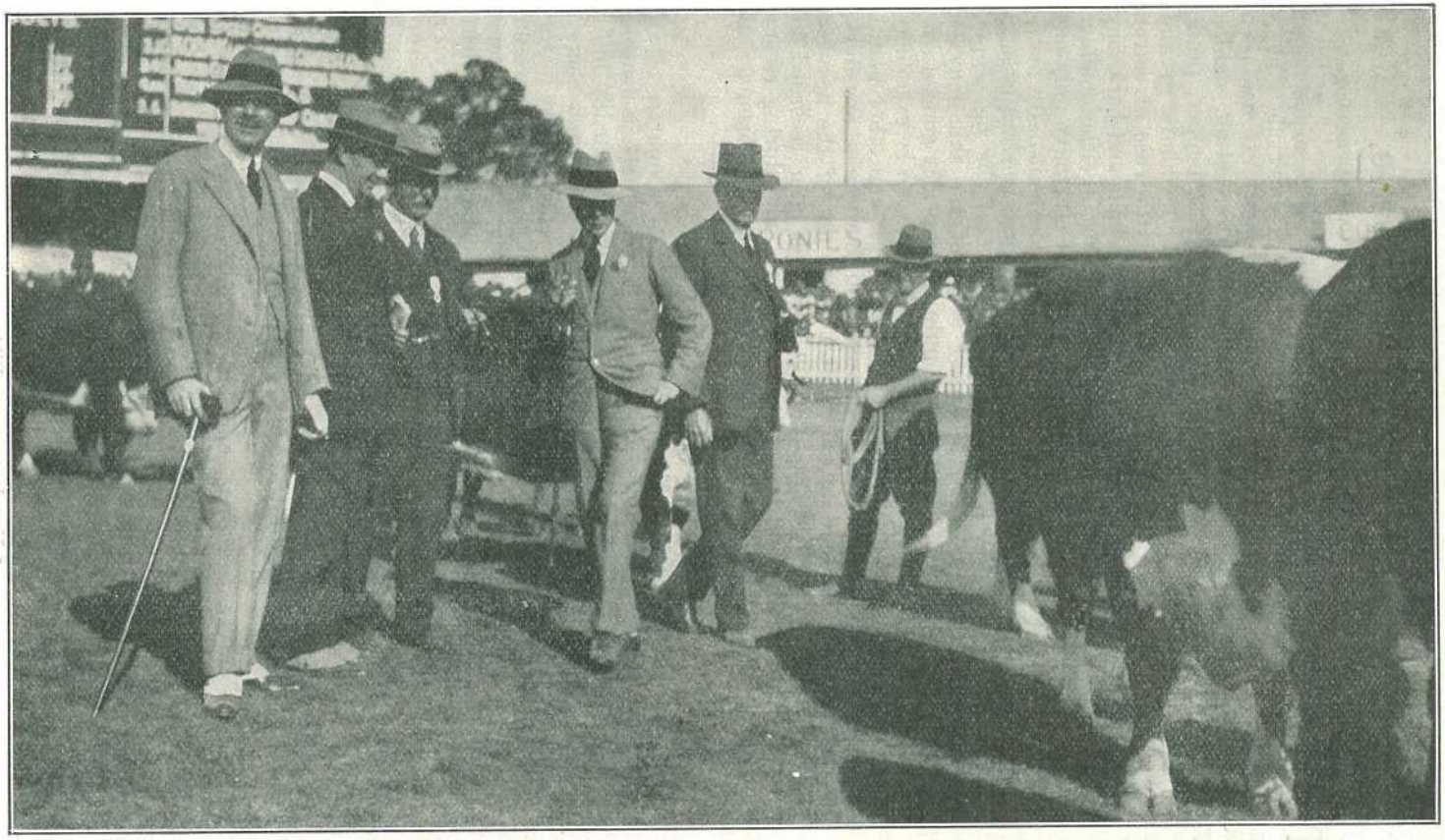


Plate 35.

His Majesty King Edward VIII. interested in the Herefords at the Royal Show, Brisbane, 1920.

Red Shouldered Leaf Beetle.*

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE red shouldered leaf beetle attacks a wide range of economic plants, but occurs thereon only at infrequent intervals and is accordingly regarded as being normally a minor pest. It has been recorded as attacking apple, avocado, banana, citrus, cotton, dahlia, fig, grape vine, loquat, maize, mango, mulberry, peach, pepper, plum, quince, rose and wattle. Practically any part of the above ground portion of the host plant may be attacked, e.g., in the case of cotton (Plate 36; figs. 1 and 2) the foliage, flowers, squares, bolls and bark may all suffer from the infestation. Feeding may take place on either surface of the foliage which may be perforated by the beetles or have only one or both surfaces eroded without perforation. The leaves usually manifest both types of damage and thus present a ragged perforated and withered appearance. When fruits such as those of the fig, apple, quince, and loquat are attacked, extensive areas of the skin may be eaten (Plate 36; fig. 3) and the underlying pulp is frequently gouged out. Although this beetle is normally of little importance it can be extremely destructive when it occurs in plague proportions, trees and other plants sometimes being denuded of foliage, flowers, and fruit in a few days. It was abnormally abundant in 1923, cotton being one of the heaviest sufferers during that outbreak. Since then it has been recorded at intervals as being destructive to various host plants, and during recent weeks it has been observed attacking cotton, fruit trees, and ornamental plants.

Life History and Habits.

This pretty little beetle measures slightly less than a quarter of an inch in length, its breadth being somewhat greater than half its length, the general impression conveyed being that of a squarish sturdily built insect. The body colour is light yellow, but there is a distinct cherry coloured band stretching across the back of the body at the base of the wing covers, and a pair of similarly coloured circular spots occurs on the back towards the end of the body. Little is known of the life history of this pest, which appears suddenly in enormous numbers, a single leaf of an infested plant not infrequently affording harbourage for fifty or sixty of the active little beetles. The duration of infestation of a crop is generally relatively brief, but, as already indicated, losses in that brief period may be serious.

Control.

A procedure frequently adopted for the control of this pest is based on the fact that it is attracted to light when disturbed at night, and flares are accordingly used for its destruction. A suitable flare is produced by securely wrapping some old sacking or similar material round a seven or eight foot pole, dipping it in kerosene and then lighting it. This flare is carried between the trees or among the plants known to be infested and if these trees or plants are jarred it will be found that large numbers of beetles will fly into the flare and will thus be destroyed. The sacking and kerosene must be renewed as required and the flare should be kept as bright as is consistent with the safety of the person carrying it. The jarring of the food plants must be adequately attended

* *Monolepta rosea* Blkb.

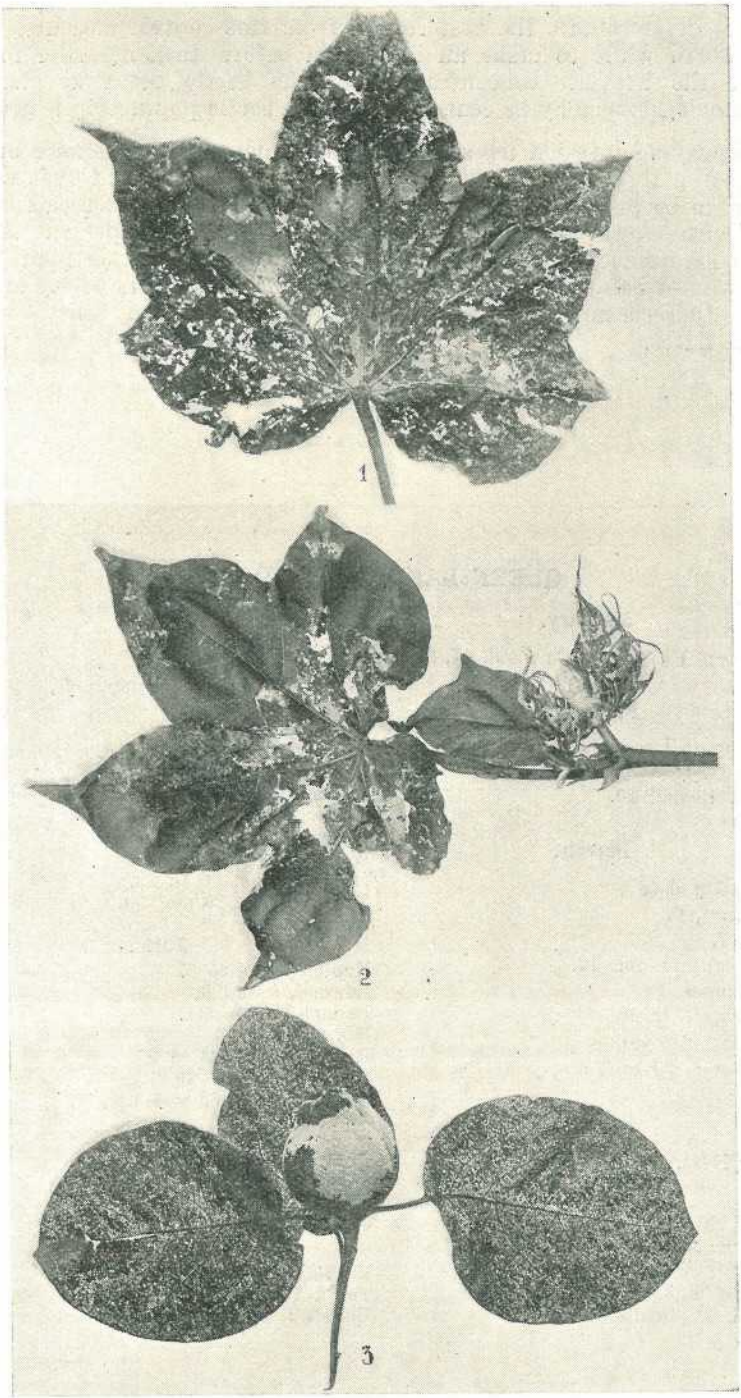


Plate 36.—Red Shouldered Leaf Beetle.

Fig. 1.—Attacked cotton leaf; Fig. 2.—Attacked fruiting branch of cotton plant; Fig. 3.—Attacked quince fruit and foliage.

to in order to obtain the best results from this control measure. It is also worth while to make an inspection before dusk in order to note where the heaviest concentrations of the beetle occur so that the operator's efforts may be centred where the beetle population is greatest.

Spraying infested trees or other host plants with arsenate of lead or dusting them with a reliable brand of arsenate of lead dust will be found to be productive of some good in cases where arsenicals can be used with safety. The beetles, however, are frequently present in such enormous numbers that a great amount of foliage and other plant tissue is consumed before they have obtained a lethal dose of the spray or dust. Hence there is much to be said in favour of attempting control by the use of flares.

QUEENSLAND SHOW DATES.

January.

Pittsworth Bushmen's Carnival, 27.

February.

Stanthorpe, 5 to 7.
Killarney, 13 and 14.
Clifton, 19 and 20.

March.

Allora, 3 and 4.
Milmerran, 6.
Oakey, 7.
Pittsworth, 11 and 12.
Goombungee, 13.
Warwick, 18 to 20.
Tara, 18; Campdraft, 19.
Toowoomba, 23 to 26.

April.

Crow's Nest, 1 and 2.
Dalby, 1 and 2.
Chinchilla, 7 and 8.
Miles, 22.
Kingaroy, 22 to 24.
Wallumbilla, 28 and 29.
Wondai, 30 April and 1 May.

May.

Goondiwindi, 1 and 2.
Taroom, 4 to 6.
Beaudesert, 6 and 7; Campdraft, 8 and 9.
Charleville, 5 to 7.
Murgon, 7 to 9.
Goomeri, 13 and 14.
Mitchell, 13 and 14.
Ipswich, 19 to 22.
Roma, 19 to 21.
Biggenden, 21 and 22.
Warrill View, 23.
Maryborough, 26 to 28.
Toogoolawah, 29 and 30.
Kalbar, 30.

June.

Bundaberg, 4 to 6.
Lowood, 5 and 6.
Boonah, 10 and 11.
Esk, 12 and 13.
Rockhampton, 23 to 27.
Laidley, 24 and 25.
Mackay, 30 June and 1 July.

July.

Cleveland, 10 and 11.
Rosewood, 10 and 11.
Nambour, 16 to 18.
Caboolture, 31 July and 1 August.

August.

Royal National, 17 to 22.
Tully, 11 and 12.
Innisfail, 18 and 19.

Leaf Miner and Stem Borer of Tobacco in North Queensland.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

(*Continued from January*, 1936.)

THE STEM BORER.

AS far as can be ascertained from "The Review of Applied Entomology," the stem borer, *Phthorimaea heliopa* Low., has not been recorded as a pest of any cultivated crop other than tobacco, though known as a serious pest of the latter crop for more than twenty years. There are early records of severe losses traced to the stem borer in both Indo-Malayan and African tobacco growing districts (Jack, 1913). Since then the pest has been reported from a number of the important tobacco growing countries of the world, but not from America. The present distribution includes the following countries:—Rhodesia, Nyasaland, Tanganyika, Greece, Turkey, Palestine, India, Ceylon, Malaya, the Phillipines, East Indies, Australia, Fiji, and Samoa.

The insect was not recorded as a pest of tobacco in Australia until recently (Smith, 1932), though it was originally described from New South Wales in 1900. It certainly has been present in the Australian tobacco crops for many years, as unpublished illustrations in the Queensland Department of Agriculture and Stock show that the pest occurred in tobacco at Bowen in the year 1909. There is apparently no specific record of any wild host for this pest in other countries. In North Queensland during this investigation the species has been taken in two wild tobaccos, *Nicotiana suaveolens* and *N. glauca*. The former is indigenous in Queensland and the latter is a naturalised introduction from South America.

It is significant that whilst no records of this species are from the American continent, the original home of the cultivated tobacco, it has been recorded from tobacco in many of the countries bordering the Indian Ocean. Thus it seems that the insect is indigenous in these countries about the Indian Ocean and that *Nicotiana tabacum* is not the primary host. The species has been regarded as a major pest of tobacco in several countries for more than two decades and yet, in spite of protracted investigations (Keuchenius, 1915), there is in the literature no specific record of any native host. In short, the natural occurrence of the insect now known as the tobacco stem borer presents a very interesting problem which may well repay further study.

Description.

Adults of this species (Plate 37; fig. 8) exhibit considerable variation in size, but the average length is little more than 6.5 mm. and the width across the outspread wings may be slightly greater than 13 mm. The moths are coppery-red or reddish-brown in colour and the forewings are mottled with small darker patches. When at rest the forewings are held folded roofwise over the back, the tips overlapping a

little. The apical margins of the forewings are fringed with light brown hairs, very short at the apex and increasing slightly in length to the anal angle. The hind wings are greyish in colour and the margins from the apex round the anal angle to the thorax are fringed with relatively long grey hairs. In the female the abdomen is stouter than in the male and the tip of the female abdomen has the appearance of a tiny crater, whereas in the male the tapering of the abdomen is less pronounced and it ends in a bluntly rounded tip.

The species was originally described as follows:—

Gelechia heliopa n. sp.

8–11 mm. Head, thorax, palpi and antennae ochreous, fuscous tinged, second joint of palpi grooved. Antennae faintly annulated with fuscous. Abdomen greyish-ochreous, middle segments orange-yellow, segmental margins silvery white. Legs whitish, tibiae and tarsi fuscous, tarsi with whitish rings. Fore-wings elongate, moderate, costa gently arched, apex round-pointed; ochreous slightly fuscous tinged, with darker irregular spots throughout, obscure and sometimes hardly traceable, not forming definite markings; cilia ochreous. Hindwings with apex pointed, hind-margin sinuate beneath apex; light fuscous; cilia light fuscous, with an ochreous basal line.

Broken Hill, New South Wales; four specimens in October (Lower, 1900).

Life History.

The various stages in the life history of this pest are described in these notes along the same lines as those adopted in the discussion of the leaf miner.

Egg.

The eggs (Plate 37; fig. 1) of the stem borer are creamy white in colour when newly laid and are somewhat elongate oval in outline, being shaped rather like a short cylinder terminated at each end by a hemisphere. The mean length of one series of egg measurements was $479 \pm 23\mu$ and the mean width $315 \pm 13\mu$. The chorion is fairly smooth, but somewhat pronounced slightly irregular polygonal reticulations are present on the whole of its surface.

The darkening of the developing fertile egg caused by the formation of colouring matter in the head capsule and prothoracic plate of the embryo, and the processes involved in the hatching of the larva from the egg, are all as discussed in the case of the leaf miner.

Temperature has a marked influence on the duration of the egg stage if this factor alone is responsible for the difference between the length of the incubation period of eggs laid in the winter and those laid in summer. Early in August in Cairns the egg stage was invariably either nine or ten days, but by the end of the month it had shortened to six days, while during October, November, and December, the egg stage usually lasted only four days (Table 5). Thus in Cairns the duration of the egg stage varies from as much as ten days in winter to four days in summer.

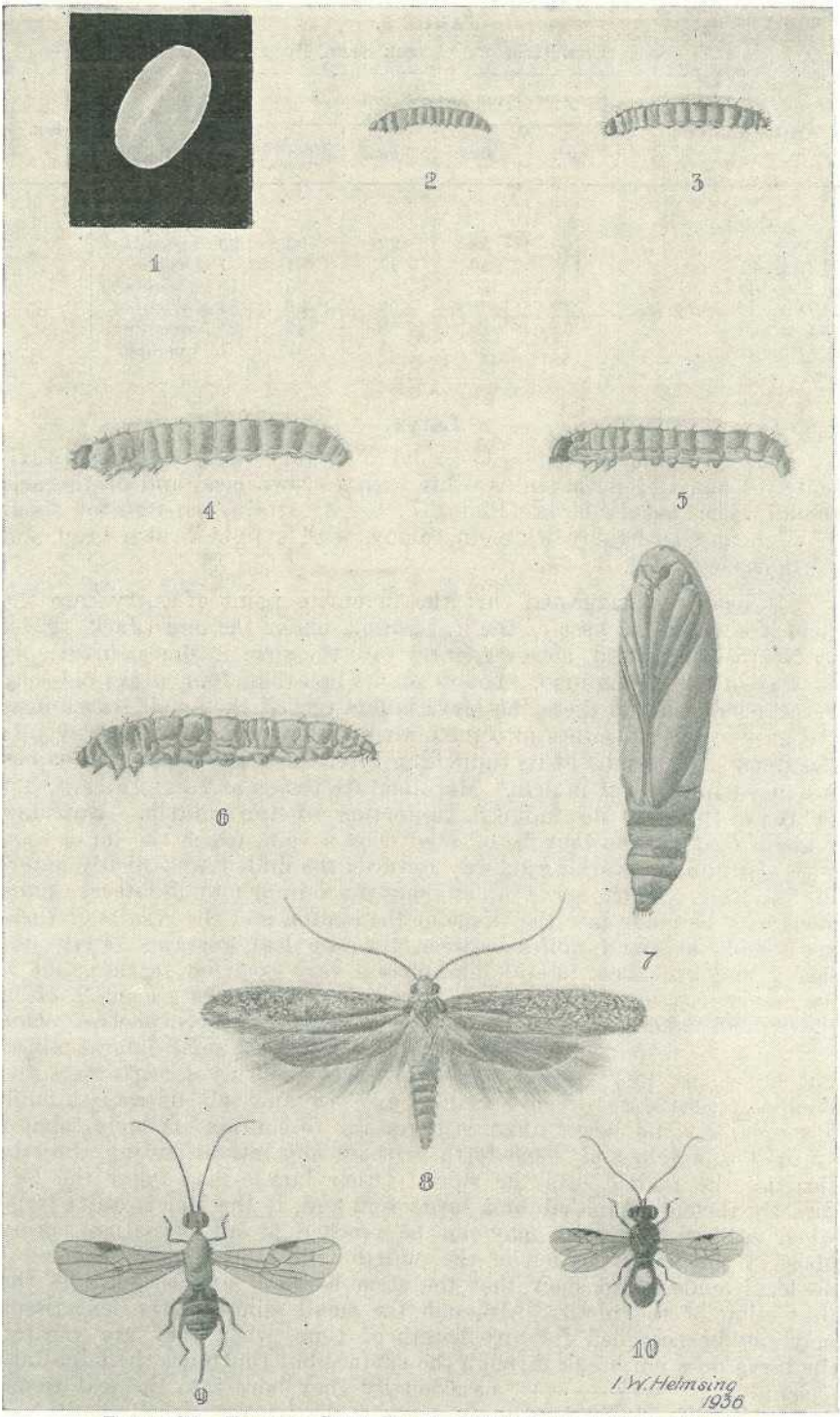


Plate 37.—Tobacco Stem Borer (*Phthorimæa heliopa* Low.).

Fig. 1.—Egg x 35. Fig. 2.—First larval instar x 10. Fig. 3.—Second larval instar x 10. Fig. 4.—Third larval instar x 10. Fig. 5.—Fourth larval instar x 10. Fig. 6.—Fifth larval instar x 4. Fig. 7.—Pupa x 7. Fig. 8.—Adult x 4. Fig. 9.—Larval parasite x 4. Fig. 10.—Larval parasite x 4.

TABLE 5.

LIFE HISTORY OF THE STEM BORER.

Date Eggs Laid.	Days Duration of Life History Stages.				Date Moth Emerged.	Sex.
	Egg.	Larva.	Pupa.	Total all Stages.		
1932—					1932—	
1 August	10	31	12	53	23 September	♂
1 August	10	40	11	61	1 October	♂
14 October	4	25	6	35	18 November	♀
14 October	4	26	9	39	22 November	♂
14 October	4	29	9	42	25 November	♀
22 October	4	27	9	40	1 December	♀

Larva.

The newly-hatched stem borer larva is very small, being approximately 1 mm. in length, and is white with a brown head and prothoracic shield. The mature larva (Plate 37; fig. 6) attains a length of about 11 mm. and is creamy white in colour, with a light brown head and prothoracic shield.

It has been suggested that the favourite point of entry into the stem is close to the base of the leaf petiole under the bud (Jack, 1927). In North Queensland, however, entry into the stem is almost invariably by way of the leaf midrib. Young plants less than four weeks old may be attacked, and in these the larva enters one of the small leaves near the growing point, mines into the midrib and thence makes its way into the stem. The results of its tunnelling afterwards appear as contortions produced in the leaf midrib. More mature leaves are also entered, but in these there is no induced contortion of the midrib. Entrance into the leaf lamina may be effected near a vein, which the larva soon enters, gradually working its way towards the midrib and finally entering the stem. As the larva mines along the vein or midrib lateral excursions may be made into the tissue of the lamina and the results of these are visible as small mines between the two leaf surfaces (Plate 38; figs. 1 and 2). This lateral mining is a very common feature, but is not necessarily always manifest. In any case the mines are small, often linear, and usually extend over less than 0.25 square centimetres. One larva may be responsible for as many as ten of these small lateral mines, but fewer are more usual. In other cases the tiny larva enters the lamina some distance from a vein of any size and eats its way through a small mine, no larger than is necessary to contain its body, almost straight to a vein and thenceforth, without any lateral mining, directly through the midrib into the stem. Other larvae may enter the leaf directly through a midrib or a large vein and, if the leaf is quite large when entered, the stem may not be reached at all, pupation taking place in the lower portion of the midrib (Plate 38; fig. 3.) There is no local evidence to show that the stem borer at any time leaves the protection of the plant. Although the small mines in the leaf tissue may not be occupied for any length of time, when they are vacated the larva does not break through the surface but continues the mine into a vein. c.f. "———— occasionally they bore into the leaf tissue and make holes in it, but in these cases, the larva generally quits the leaf tissue and begins a fresh burrow in a vein" (Keuchenius, 1915).

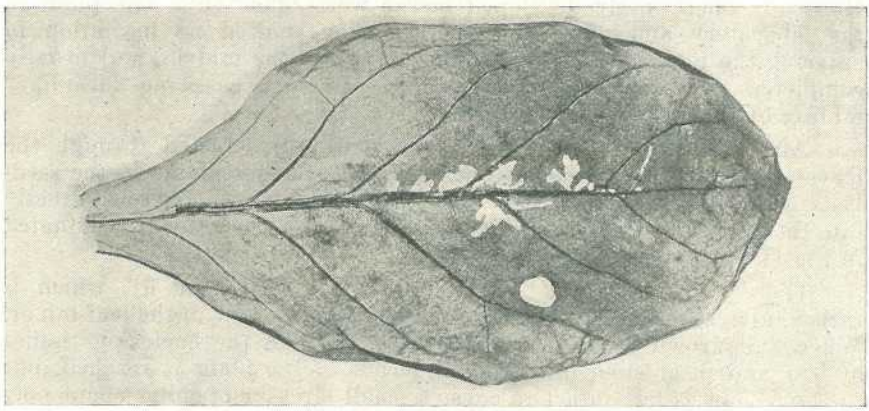


Fig. 1.

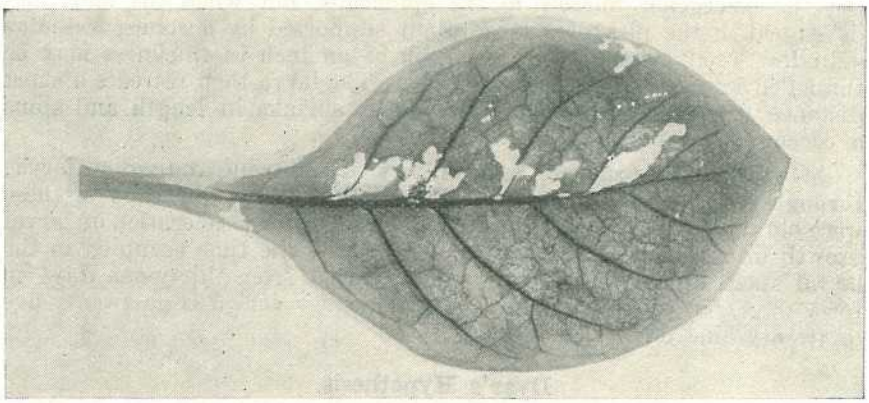


Fig. 2.

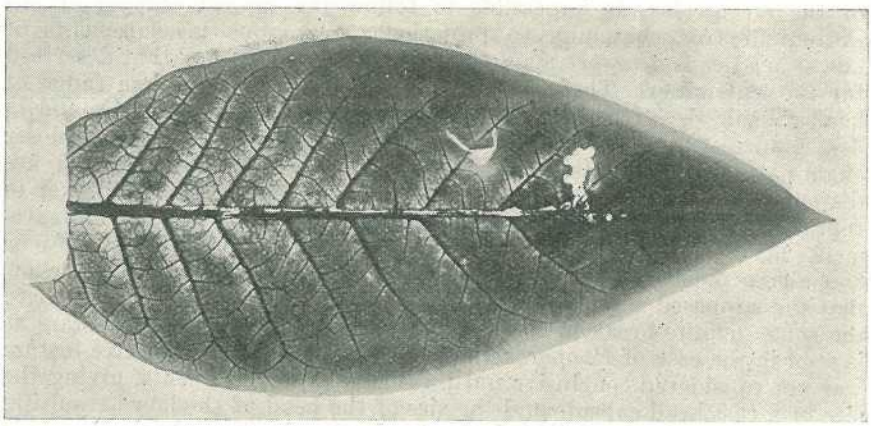


Fig. 3.

PLATE 38.

TOBACCO STEM BORER (*Phthorimæa heliopa* LOW.).

Figs. 1, 2, and 3 all display leaf mining activities by the larvæ of the tobacco stem borer. Pupation occurred in the leaf illustrated in Fig. 3.

However, when partly developed larvae were taken from one plant in the laboratory and placed on another they showed no hesitation in entering the new leaf, often through a vein or the midrib, and usually completed their development normally. In such cases no subsidiary mining of the leaves was observed.

Although entrance into the plant is usually effected through the leaves, other avenues are sometimes utilised. Larger plants in the seed-beds may be attacked through the stem. The larvae burrow directly into the pith through the vascular cylinder where the latter is attenuated in the vicinity of leaf petioles.

There are five larval instars (Plate 37; figs. 2 to 6), which is rather interesting in view of the occurrence of only four in the leaf miner. When full grown the larva eats its way through the enclosing tissues of leaf midrib or stem until the epidermis of the plant is reached, but the epidermis is left intact to cover a small circular opening about one-twelfth of an inch in diameter. When development takes place in a young plant the larva has very little woody tissue to traverse in extending the emergence burrow to the epidermis, but when the larva has developed in the pith of a large plant supported by a robust vascular cylinder, woody tissue up to one-sixth of an inch in thickness may be tunnelled in order to reach the surface. The larva then retreats a short distance from the future emergence hole, shrinks in length and spins a cocoon prior to pupation.

Owing to the practical impossibility of following individual larvae through their various instars no data on the relative duration of these were obtained. There was, however, a considerable acceleration of larval growth in summer as compared with winter. The time occupied in the larval stage during the Cairns winter varied from thirty-one days to forty days, but in early summer the same stage varied from twenty-five to twenty-nine days (Table 5).

Dyar's Hypothesis.

Without the aid of Dyar's hypothesis it was very difficult to determine the number of larval instars because, owing to the feeding habits of the larvae, it was impossible to follow the several ecdyses of one individual from hatching to pupation. Numerous measurements of larval head capsules were made, using the same method as that described for the leaf miner. These measurements disclosed a complete range of head capsule sizes from 7 to 42 divisions of the scale (Graph 4), and at first glance it appears impossible to apply the hypothesis, but a closer examination shows that the sizes of all head capsules measured are distributed in a series of five subsidiary ranges, each of which is taken to represent an instar. This is made clearer if three individual measurements are deleted from each of the sizes; where there are three only, or less, all are deleted from the relevant size. A glance at Graph 5 will show that the supposed range for each instar is very large. Nowhere is there the same definite break between groups of sizes for successive instars as is seen in the case of *P. operculella*. The evidence indicating five instars was not considered conclusive until a series of measurements, giving the size of a cast head capsule and the size of the head of the larva resulting from the ecdysis that yielded the head capsule, was obtained. This series is recorded in Table 6, and in every case there is no doubt that the larva whose head was measured was the same individual as that producing the corresponding cast head capsule.

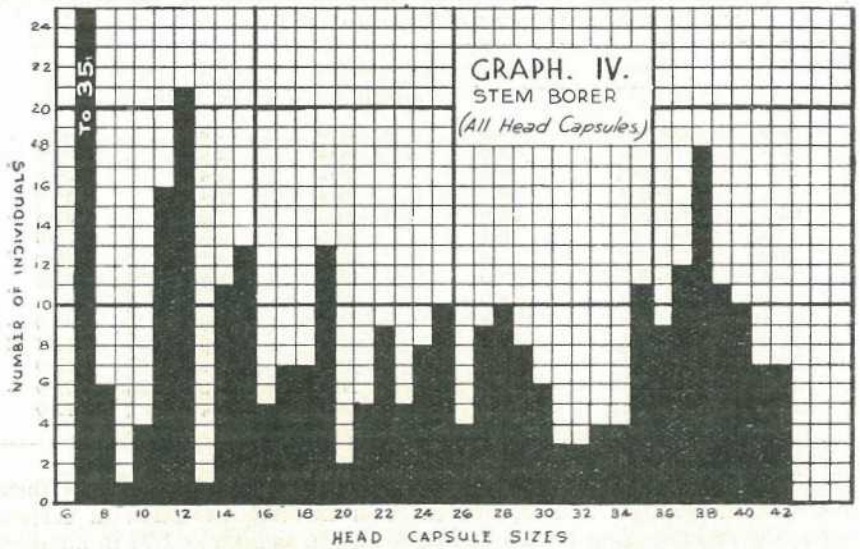


Plate 39.

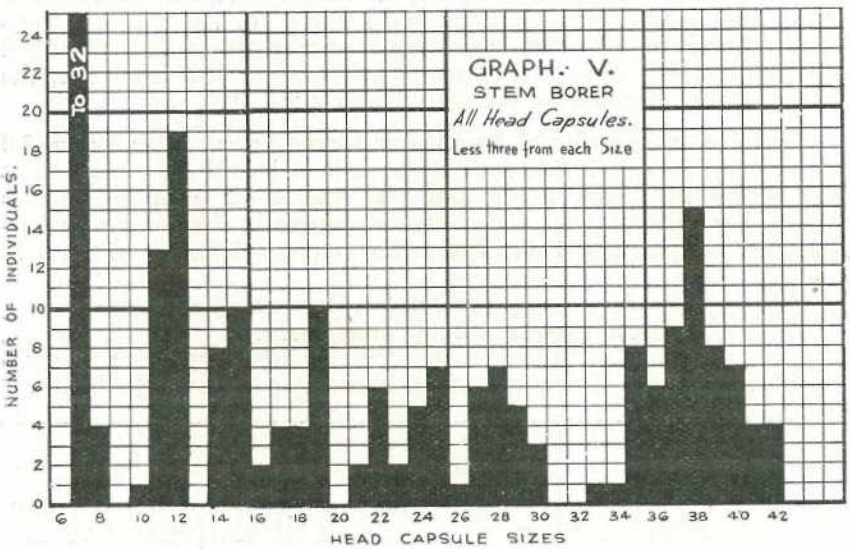


Plate 40.

TABLE 6.

HEAD CAPSULE SIZES BEFORE AND AFTER OBSERVED ECDYSES IN THE STEM BORER WITH THE RATIO OF INCREASE INSERTED (38 UNITS = 1 MM.).

Before.	Ratio.	After.	Before.	Ratio.	After.
7·0	1·429	10·0	19·2	1·563	30·0
7·2	1·666	12·0	23·0	1·479	34·0
11·0	1·318	14·5	24·2	1·488	36·0
12·0	1·283	15·4	24·4	1·475	36·0
13·5	1·704	23·0	24·5	1·526	37·4
12·0	1·533	18·4	24·5	1·551	38·0
14·2	1·972	28·0	25·4	1·296	38·0
14·5	1·862	27·0	26·0	1·346	35·0
15·4	1·559	24·0	26·0	1·538	40·0
15·4	1·571	24·2	27·0	1·333	36·0
16·0	1·437	23·0	27·5	1·513	41·6
16·4	1·677	27·5	28·0	1·250	35·0
16·5	1·346	22·2	28·0	1·393	39·0
18·5	1·324	25·5	30·0	1·400	42·0

The table shows that the average ratio of increase calculated form observed individuals is 1·48, but there is extreme variation in certain cases, the ratio ranging from 1·25 in one case to as high as 1·97 in another. However, if there is any reason for Dyar's hypothesis, it must be obvious from the average ratio that there are five larval instars for this species, and this evidence in conjunction with that presented in Graph 5 is considered conclusive. For example, if the average ratio of increase is 1·48 and the size of the first larval head capsule 7·0, then the succeeding larval head sizes would be 10·4, 15·4, 22·8, and 33·9. These sizes can be accommodated in the groups as shown in Graph 5, but the average size for the first and last groups in the same graph are 7·1 and 38 respectively. Thus, if there are five instars, these averages mean that calculated on a graph which disregards three individuals of each head size, the average ratio of increase for successive instars is 1·52.

Actual measurements of first instar larvae varied from 6·6 to 8·0 scale divisions, and if 1·52 is used as the ratio of increase the consequent range of the fifth instar group would be from 35·25 to 42·75, whereas actually it is from 33 to 42. The observed ranges in size for the various instars are compared in Table 7 with the ranges calculated on the 1·52 ratio.

TABLE 7.

HEAD CAPSULE SIZES OF STEM BORER.

Head Size.	Instar I.	Instar II.	Instar III.	Instar IV.	Instar V.
Calculated ..	6·6—8·0	10·0—12·2	15·3—18·5	23·2—28·1	35·3—42·7
Observed ..	6·6—8·0	10·0—12·0	14·0—19·0	21·0—30·0	33·0—42·0

Two further series of head capsule measurements of *P. heliopa* were made, one of cast head capsules and the other of larval head capsules (Graphs 6 and 7). It is obvious from Graph 6 that the sizes of cast head capsules in this case fall naturally into four groups, the average for successive groups being 7·0, 11·0, 16·5, and 25·9, while the average

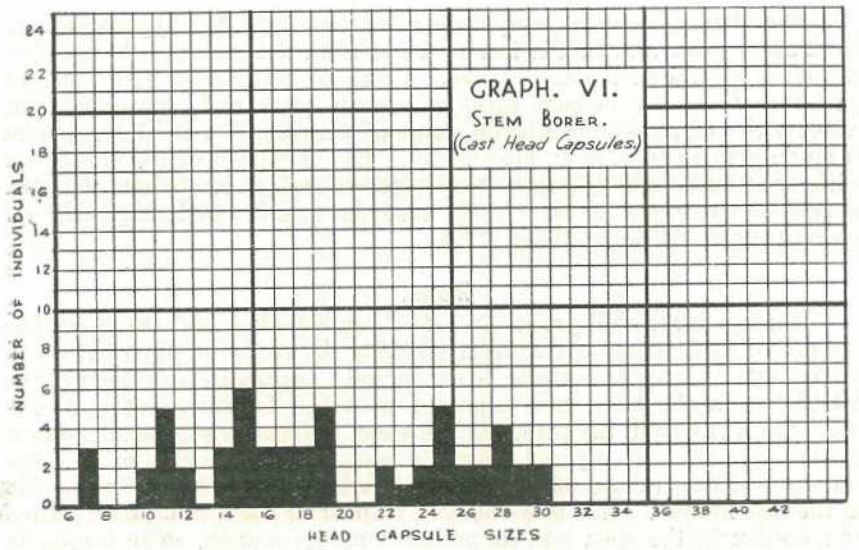


PLATE 41.

ratio of increase between successive instars is 1·55. A fifth group does not occur, as head capsules cast by final instar larvae are obviously too distorted for measurement. The grouping is less well defined with larval heads, but the average values for the sizes of successive groups are 7·2, 11·5, 16·6, 25·6, and 37·4, the average ratio of increase being 1·51. This comparison of the two series shows that the sizes of cast head capsules are comparable with those of larval heads and therefore all can be grouped together when applying Dyar's hypothesis to determine the number of instars.

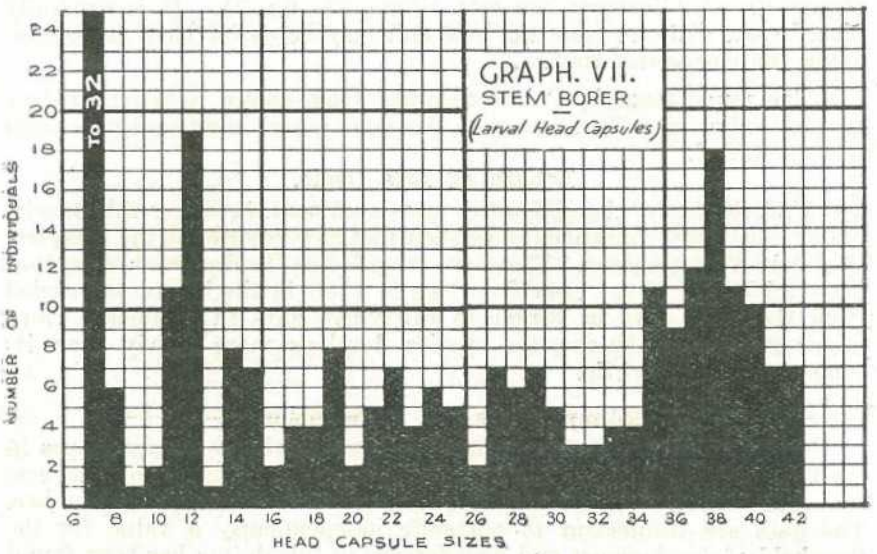


PLATE 42.

The above discussion emphasises the fact that the hypothesis can be of some value and that it has been useful in determining the number of larval instars in the stem borer. There is, however, a great deal of variation from the normal ratio in certain cases and throughout the whole series of measurements the range of variation for the later instars is much greater than in *P. operculella*. The extension of the size range with each successive instar is very marked and it is obvious that the hypothesis may not be so rigidly true as was implied originally by Dyar in his definition (Fisher, 1924).

Pupa.

When a large well-grown leaf has been attacked and the larva has completed its development without reaching the stem, the pupa is formed in the leaf midrib and there is no cocoon. Normally development is completed in the stem and pupation with the formation of a cocoon occurs in a cavity in the pith. In the stem, particularly of small plants, growth around the injured parts induces the formation of a large calloused cavity (Plate 43; fig. 3), but there is no large cavity formed in the leaf midrib. This may account, in part at least, for the formation of a cocoon in the stem and its omission in the midrib. The cocoon in the stem (Plate 43; fig. 3) is often modified so that parts of the walls of the cavity can be used. Its silk matrix is similar to that used by the leaf miner for the same purpose, and particles of frass are often found attached to the sides of the structure. One end of the cocoon frequently fits as a sleeve into the inner end of the emergence burrow, but seldom extends as far as the epidermis covering the hole.

The pupa (Plate 37; fig. 7) is light green in colour when first formed but soon darkens to light brown and later becomes almost black. Pupae naturally vary in size, but the average length is about 7 mm., and as a rule the male pupa is slightly smaller than the female, the abdomen in the latter being less acute than in the male. The cocoon may be formed either above or below the emergence hole, but the head of the pupa is always directed towards the exit (Plate 43; fig. 3). It is generally placed some distance from the hole and may be as far back as 10 mm. along the emergence burrow.

The pupal stage in Cairns occupied from eleven to fourteen days in winter, but in early summer at the same centre eight and nine days were recorded.

Length of Life Cycle.

Unfortunately, the difficulties associated with breeding this species under laboratory conditions were such that few records of the complete life cycle were obtained. These are recorded in Table 5 and show that the total length of the cycle from egg to adult in the laboratory varied from sixty-one days in winter to thirty-five days in summer. Thus, under similar conditions, the species develops more slowly than its congener *P. operculella*.

Temperature and Development.

As detailed figures recording the duration of the several stages in the life history of this species are so meagre, the correlation of temperature and development must be made from somewhat inadequate premises. The data are insufficient to postulate independently a value for the threshold of development and no reference to this datum has been found in the literature. However, it has been considered justifiable, for the

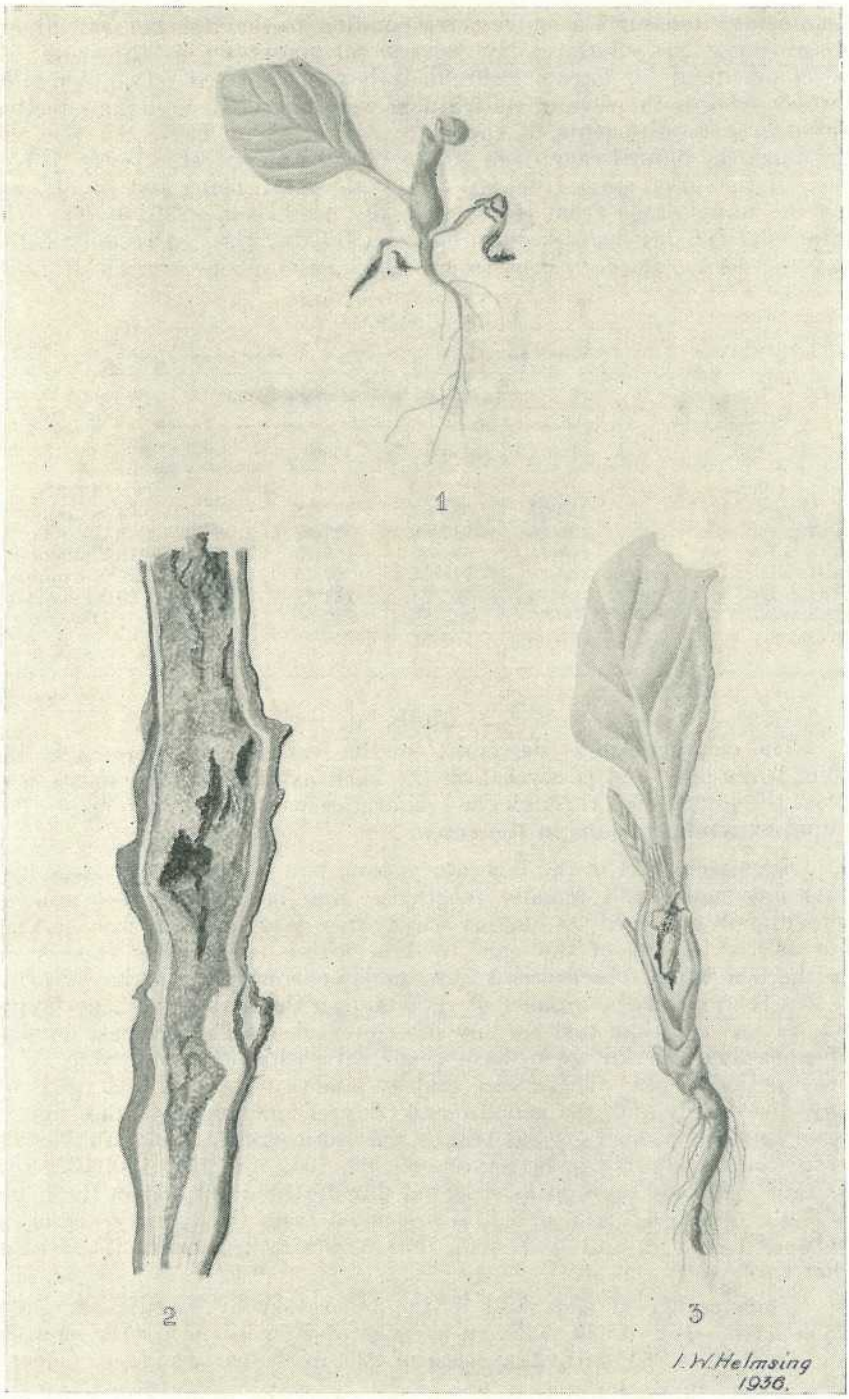


PLATE 43.—TOBACCO STEM BORER (*Phthorimæa heliopa* LOW.).
Fig. 1.—Seedling showing gall development; Fig. 2.—Mature stem tunnelled by stem borer. Fig. 3.—Plant showing pupa *in situ*. Cavity of gall exposed.

time being, to assume a figure corresponding to that for the leaf miner. Accordingly the effective day-degrees calculated on a threshold of development of 52 degres Fahrenheit have been used. Complete life history records for several individuals were obtained, and the effective day-degree requirements of these are presented in Table 8. For the egg stage the figures vary from 109 to 126, the mean value being 117 ± 8·6; for the larval stage from 555 to 797, the mean being 703 ± 81; and for the pupal stage from 158 to 252, the mean being 230 ± 36. The total effective day-degrees required from the day the egg is laid till the day the adult emerges varies from 907 to 1,158, about a mean of 1,050 ± 95.

TABLE 8.

TEMPERATURE AND DEVELOPMENT OF THE STEM BORER AT CAIRNS IN 1932.

Date Eggs Laid.	Effective Day—Degrees.				Date Moth Emerged.
	Egg.	Larva.	Pupa.	Total.	
1932—					1932—
1 August	126·25	555·32	225·75	907·32	23 September
1 August	126·25	712·82	247·25	1,086·32	1 October
14 October	108·75	694·50	158·25	961·50	18 November
14 October	108·75	718·75	247·75	1,075·25	22 November
14 October	108·75	797·25	251·75	1,157·75	25 November
22 October	120·75	741·25	247·00	1,109·00	1 December
Averages	116·58	703·32	229·63	1,049·52	..

Moth.

The eclosion cap as described for the leaf miner is present in the stem borer also, and is carried on the head as the moth bursts its way from the pupal shell through the epidermis covering the exit hole. The pupal exuvium remains in the cocoon.

Eggs were laid in the laboratory from two to eight days after first enclosing males and females together. Egg laying may continue at irregular intervals for as long as twenty-two days after the first mating, but as a rule most of the eggs are laid within ten days of this event. In the laboratory, observations were made once each day and very often it was found that the number of eggs laid on the first day of egg laying was far greater than that for any subsequent day. The greatest number of eggs definitely known to have been laid within any one twenty-four hour period is 149. These were laid by a moth which had emerged two days previously and was mated on the day of emergence. Other figures recording the number of eggs laid by one moth within twenty-four hours of the beginning of egg laying are 80, 89, 103, 105, 107, 110, 132, 133, and 139. No egg laying was observed during the day between the hours of 9·0 a.m. and 6·0 p.m. and it is presumed from the activity displayed between 6.30 p.m. and 10.30 p.m. that eggs may be laid in the field at that time.

The number of eggs laid in the laboratory by fertilized females varied from 151 to 413, with an average of 238, in the winter months; and from 42 to 364, with an average of 205, in the early summer months.

It was impossible, however, to determine the number of eggs laid under field conditions. Under laboratory conditions eggs were laid indiscriminately on both glass and cloth surfaces enclosing the moths. Laboratory evidence also indicated that the moths prefer the plant for

oviposition and that very few eggs are laid on the ground. Observations in seedbeds showed that eggs were laid singly on the leaves of plants and they occurred on either surface, though the majority were found on the under surface. Numbers of eggs were laid on the midrib at its base close to the petiole and eggs were found also on the stems of plants in seedbeds. It has been recorded that elsewhere "the fact that the plants are close together prevents oviposition and only those on the borders of the beds are attacked" (Keuchenius, 1915). In closely planted experimental seedbeds near Cairns, however, numbers of eggs were found on plants even in the middle of the beds.

At odd times throughout the laboratory observations eggs were laid by unmated females, but except in one instance, such eggs were infertile. Infertile eggs had a normal appearance when laid, but the usual darkening in colour, associated with embryonic development, failed to materialise and the eggs retained their creamy hue for several days. Later the chorion commenced to wrinkle as the enclosed food materials were dessicated and shrank until, by the time a normal egg would have hatched, the infertile eggs were quite shrivelled. The single unmated moth already referred to as having laid fertile eggs was isolated in the pupal stage and after emergence was given no food. A number of eggs were laid by it and from four of them apparently normal larvae developed, but only one of these was successful in establishing itself in a leaf and in due course it began tunnelling down the midrib. After this larva had reached the fourth instar it died, presumably from starvation, during an unavoidable absence from the laboratory.

One male is capable of fertilizing more than one female, and in the laboratory a single male fertilized three females which thereafter laid over 400 fertile eggs between them in ten days. There are indications that repeated acts of coition are necessary for the continuance of normal oviposition, the evidence in support of this view being as follows:—Two females were mated on 23rd November, and separated from the males on the following day, and after the 30th of the month the percentage of fertile eggs decreased. Between the 25th and the 30th, inclusive, 191 eggs were laid and all were fertile, but of 87 eggs laid between the 1st and the 6th of December, only 40 per cent. were fertile, all the eggs laid on 6th December being infertile. When the female and male were kept together continuously the percentage of infertile eggs was always small.

The number of eggs laid by unmated females, quite apart from the question of fertility, is definitely far lower than the number usually laid by mated moths. Some unmated females died without laying, but others laid from 5 to 103 eggs. Unmated females laid their first eggs from nine to thirty-one days after emergence. Females mated soon after emergence laid more eggs as a rule than those not mated until several days thereafter. If moths were mated within twenty-four hours of emergence eggs were often laid within two days, but if mating was delayed several days the commencement of oviposition was appreciably retarded.

From the evidence obtained during the laboratory observations on the life history of this species it appears that unmated moths live longer than mated individuals. One unmated female lived six weeks in winter, whereas the longest time a mated moth lived during that season was three weeks and the average life of mated females was only two and a-half weeks.

Injury.

The presence of this injurious insect is seldom noticed until it has done a great deal of damage in the seedbeds. The leaves of small seedlings are not large enough for the midrib to afford sufficient nutriment to carry the larva through to maturity and in such plants the stem borer invariably makes its way into the stem before completing development. A more or less pronounced gall formation in the stem of the seedling (Plate 43; fig. 1) is characteristic evidence of attack by this pest, and as a rule the gall is formed about an inch below the growing tip. After entering the stem the young larva continues feeding on the available succulent tissue, which in this case is the pith, and the resultant irritation to the young tissues of the plant causes an abnormal proliferation of cells around the larval mine. Thus, eventually, a well-pronounced gall is formed in the interior of which the larva feeds. The larva may eat its way up into the growing tip and the destruction of the meristematic region results in the death of the terminal bud, followed by a general wilting and the death of the whole plant. As a rule, however, the injury is not so severe and the plant lives on, although galled and distorted. The more severely affected seedlings assume a rosette-shaped top as a result of the bunching in the original growing tip and suckers, the latter of which are produced in some profusion. Unfortunately, the gall formation does not take place until the larva has reached an advanced stage in its development, and until the gall has been formed the presence of the stem borer is far from obvious. Thus there is always the danger of planting infested seedlings in the field, with a resultant loss of time when replanting becomes necessary. Sometimes several larvæ are found in each of the plants in the seedbed, although one is sufficient to ruin small seedlings. Later infestation which takes place in the field has, however, less severe effects on the vitality of the plant. The rapid growth after the seedling recovers from transplanting during favourable weather is probably responsible for this, but should dry conditions occur immediately after planting out losses may be severe. Under optimum conditions the transplants generally grow very quickly and thus have developed a large amount of pithy tissue before the larva has reached a size at which appreciable destruction is possible. Sometimes, however, infestation at the base of the plant is heavy and practically all the pith and part of the wood of this area may be destroyed. These attacks at the base result in an obvious distortion of the stem just above ground level and they weaken the supporting woody tissue. After the moths have emerged, their exit holes leave the way open for the entrance of various saprophytic growths, which further weaken the plant and thus lead to heavy losses during windy weather. In Greece bacterial diseases on tobacco first appear on plants attacked by stem borer and afterwards spread to other plants (Cavadas, 1927).

Infestation of the more mature plant may be less localised and the larvæ are then found tunnelling in the pith (Plate 43; fig. 2) throughout the whole length of the plant. Mature leaves may also be heavily infested and as many as eight stem borers have been taken from the midrib of one large leaf. These general attacks so weaken the plant that the quality of the leaf is seriously affected and may be lowered to such an extent that the crop is not worth harvesting. Such extreme cases as the latter are fortunately rare, but frequently many individual plants in a crop are rendered practically valueless.

Direct losses of 5 per cent. to 30 per cent., or even more, occur in seedbeds through the obvious necessity of discarding galled seedlings and are not uncommon throughout infested areas in North Queensland. These losses may be supplemented by further losses after transplanting when stem borer has been overlooked at the time of the removal of the seedlings from the seedbeds. It is more difficult to estimate the numerical losses in the field, but occasionally they are very severe. The damage is not confined to the loss of the actual plants, but is increased by the resultant loss of time necessarily implied.

The importance of stem borer as a pest in the field varies considerably from time to time, even in the life of a single crop. This point was well illustrated early in January, 1935, during a survey of the Dimbulah district, which showed that large areas had been planted five and six weeks previously and had since then received no rain. Most of the plants were from nine to fifteen inches in height and from 50 per cent. to 80 per cent. were infested by stem borer. Fortunately, however, rain fell after the six weeks' drought and was followed by good growing weather. Infested plants were then cut back to a selected sucker and nine weeks later all heavily infested fields had apparently recovered and carried fair crops of well-grown leaf, much of which cured to satisfactory commercial grades of tobacco.

[TO BE CONTINUED.]

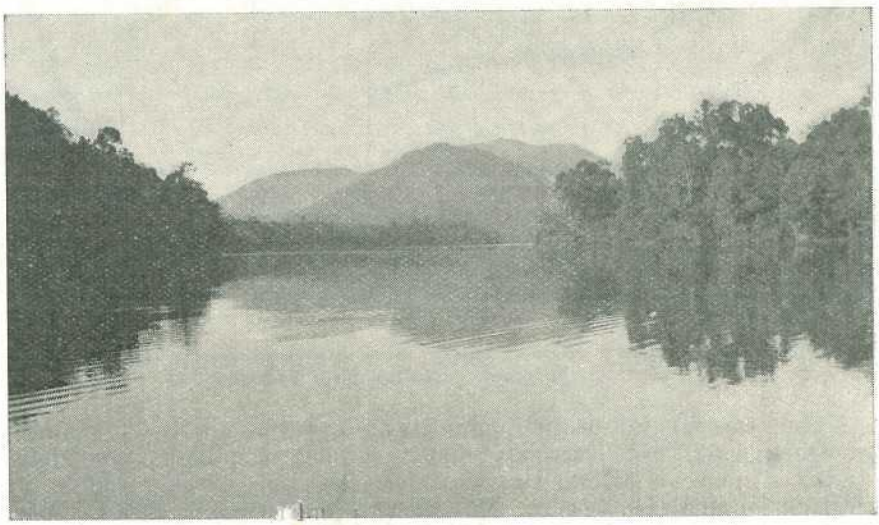


PLATE 44.
Junction of Mulgrave and Russell Rivers taken from the Mulgrave.

Paspalum Ergot.

By R. B. MORWOOD, M.Sc., Plant Pathologist.

PASPALUM is still the most popular summer growing pasture grass in the coastal dairying districts. The widespread occurrence of a serious disease in this grass in therefore of considerable concern to farmers and all connected with agriculture. The disease described in these notes does not lead to the depletion of the pasture but its presence is injurious to stock.

The disease is first seen as a dark sticky exudate on the heads oozing from the developing seed. The exudate contains countless spores which are given off together with the gummy matrix by a fungus growing between the glumes. This is the summer stage of the fungus which causes the disease.

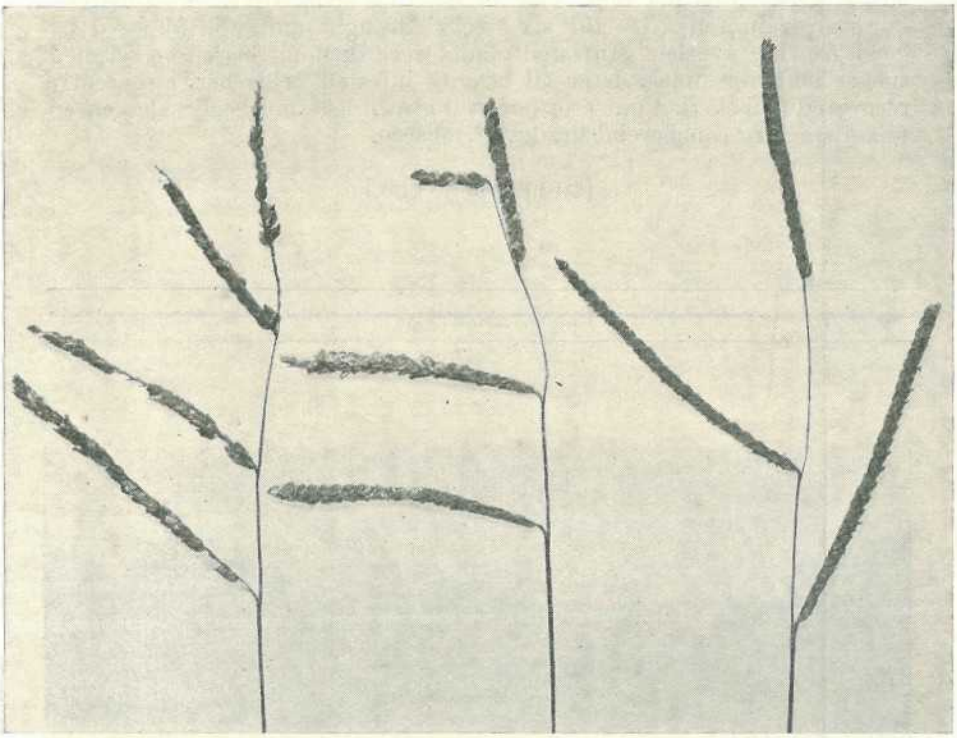


PLATE 45.

The summer stage of the disease. Sticky drops are present when the disease is seen on the plant. Healthy head to right.

The seasonal cycle of the fungus has not as yet been followed through in Queensland, but elsewhere under suitable conditions the stage described above is followed by the formation of resting bodies or sclerotia on the seed heads. The sclerotia are globular, about $\frac{1}{8}$-inch in diameter, and consist of compact fungus tissue. They are yellowish grey in colour and give the infected paspalum head an irregularly swollen appearance. The sclerotia are formed in the Autumn and fall

to the ground, where they lie during the winter. Late in the following Spring the sclerotia germinate and develop into small structures which produce special spores known as ascospores. These spores serve for the initial infection of paspalum heads and the disease is subsequently spread by the summer spores in the sticky exudate already noted. The spores are doubtless spread by insects and by adherence to clothing, animals' legs, etc. The fungus is known to science as *Claviceps paspali*, and the summer stage is referred to the genus *Spacelia*.

Paspalum ergot is closely related to ergot of rye, and like it is poisonous. The summer stage characterised by the sticky exudate contains little, if any, of the poisonous principle. This is produced in the sclerotia, becoming concentrated as they get older. The symptoms produced on cattle resemble staggers. The poisoning does not usually result in the death of the stock, but losses may occur due to bogging of cattle in their weakened condition or to starvation if they are unable to rise.

The eradication of a disease of this nature from pastures is a very difficult problem. It can be kept in check, however, by the adoption of intensive rotational grazing, thereby largely preventing the formation of seed heads. Where a mower can be used this provides a supplementary means of getting rid of the seed heads before they form sclerotia. If, in addition to mowing, a quick fire can be got through the cut grass the disease may be eradicated—at least temporarily. If badly diseased grass gets out of hand it should be burnt over at the first opportunity. Where difficulty is encountered in dealing with this disease serious consideration must be given to the replacement of paspalum with kikuyu or other suitable grass.

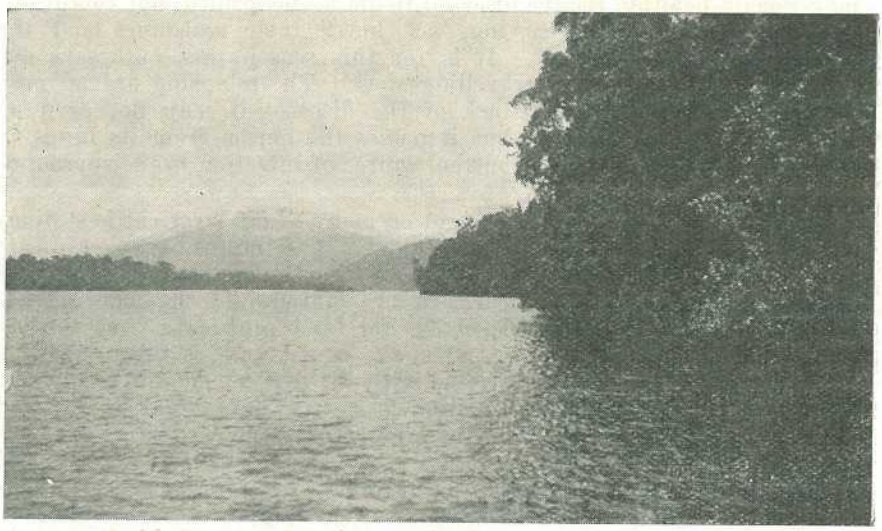


Plate 46.
The junction of the Mulgrave and Russell Rivers taken from the Russell.

Contagious Bovine Pleuro-pneumonia.

By C. R. MULHEARN, B.V.Sc., Animal Health Station, Yeerongpilly.

CONTAGIOUS bovine pleuro-pneumonia, commonly known as "pleuro," is a highly infectious disease of cattle affecting the respiratory organs. It is caused by a very minute organism which can only be seen by the aid of a high-powered microscope. This germ is present in the virus and in certain organs in natural cases of the disease and it can be isolated and is now used in the preparation of a vaccine for inoculation purposes.

It is considered that the infection is air-borne—i.e., the germs are passed out from the lungs of the diseased animal and are taken into the lungs of the susceptible animal in the act of breathing. It is by this means that the disease spreads from beast to beast.

All types and ages of cattle are susceptible to the disease, and outbreaks are commonly encountered in travelling stock. Experimental cases have been produced in sheep and goats, although there is no record of the disease in these animals under natural conditions.

The Carrier Problem.

Contagious pleuro-pneumonia is a highly fatal disease and in some outbreaks a large percentage of the susceptible cattle become affected with up to a 50 per cent. mortality. In every outbreak which is not under control a certain number of the affected animals recover and, undoubtedly, a large number of these retain diseased tissue within their lungs, although, to outward appearances, they look perfectly healthy. These animals are known as carriers and they are responsible for fresh outbreaks often widely separated from the centre in which they originally contracted the disease. Under normal circumstances the carriers may remain healthy, for the diseased tissue is encapsuled, but conditions such as starvation, overdriving, &c., lower their resistance and the disease may reassert itself. It is for this reason that outbreaks are frequently encountered in travelling stock. The relapsing animal may not suffer from a severe attack of the disease—it may not even be detected as being diseased—but it passes the germs from its lungs to the exterior and so acts as a constant source of infection to the surrounding animals.

The disease is constantly present on many of the large cattle stations of Northern Australia and, unfortunately, it is impossible to eradicate it from these areas. Consequently each year a number of apparently healthy animals, which are carriers, are moved into the more closely settled areas and they are responsible for fresh outbreaks from time to time. It is obvious, therefore, when the broad view is taken, that no animal, once it has become infected with the disease, should be allowed to recover. If all the infected animals and carriers could be detected and destroyed the disease could be eradicated from Australia, as it has been from other countries, within a few years. However, this is not possible under the present grazing conditions of the large cattle stations, but the elimination of carriers will play a very important part in the control of the disease in the more closely populated areas of this State. As a result of recent research work by the Council for Scientific and Industrial Research, carrier animals can be detected by means of a blood

test,[1] and this test could be used to eradicate the disease should outbreaks occur in the dairying districts.

Symptoms.

The susceptibility of individual animals varies considerably. Some may pass through a mild attack of the disease without showing noticeable symptoms. However, the majority of the infected animals show obvious evidence of the disease.

In travelling cattle one of the first signs of the disease is an inclination of the affected animals to drop to the rear of the mob, whilst with dairy cattle there is a marked falling-off of the milk supply. If the temperatures are taken at this stage it will be found that they are abnormally high, ranging from 103 degrees to 106 degrees. The sick animals seek the shade, and show evidence of thirst, although the appetite is diminished and cudding is restrained and it eventually ceases. The coat becomes ruffled and the ears droop, and the beast has a generally dejected appearance. Intermittent coughing may be noticed, and this is particularly evident after exertion. A common method of detecting the disease is to race the suspected animals around for a few minutes, when the positive cases show fits of coughing. This, of course, is not diagnostic of contagious pleuro-pneumonia, but it is a useful method of picking out suspicious animals for closer observation. As the disease advances the respirations become quickened and a normally docile animal, when disturbed, will often charge the attendants. At a later stage the animal stands with its head extended, its forelegs wide apart, its back arched, and its flanks heaving owing to respiratory distress. In fatal cases death usually follows in from four to seven days after the onset of obvious symptoms. In cases that recover the animal gradually regains a normal appearance and recommences feeding, but it will still cough following exertion during the convalescent period.

Post-mortem Findings.

As the name implies, the disease affects the lungs and surrounding tissues, and it is in these organs that the changes are detected in the dead animal. On opening up the chest cavity a quantity of fluid commonly known as the "virus" may be found therein. The virus may vary in amount from a cupful or less to 1 gallon or more. It also varies in colour from a clear amber to that of a port wine. The darker colours are usually due to the presence of blood. This fluid may be quite clear or it may be slightly turbid, and it usually contains jelly-like masses. The name "Dry Pleuro" is sometimes applied to those cases in which very little virus is present, and some stockmen consider it is a different disease. However, this is a fallacy, as there is only one contagious pleuro-pneumonia.

The lungs are usually found attached in various places to the chest wall, and both the covering of the lungs and the lining of the chest wall are considerably thickened. On inspection it will be found that the diseased portion of the lung is considerably swollen and much firmer than normal. In consistence it resembles liver rather than lung tissue. The cut surface of the lung in most cases presents a typical picture, and it somewhat resembles a piece of marble, the veins of which are of a whitish colour and are formed by the greatly thickened connective tissue which separates the reddened areas of lung tissue. These typical lung changes are not present in all cases of contagious

pleuro-pneumonia, for sometimes the marbling effect is not present in the lung lesions, which then more or less resemble a normal interstitial pneumonia. In the typical cases a small quantity of virus frequently flows from the cut surface of the lungs. The mediastinal and bronchial lymphatic glands (between the two lungs) are often enlarged, and may show pronounced changes.

Prevention and Control.

There is no treatment for contagious pleuro-pneumonia. Once an animal contracts the disease it should be destroyed. If animals are allowed to recover they frequently become carriers, and may be responsible for a serious outbreak of the disease at some future date.

The most important methods of dealing with an outbreak of "pleuro" are to destroy the diseased animals and to keep the "in-contact" animals well under control. All "in-contact" animals should be inoculated to give them an immunity so that no fresh cases, other than those already infected, will occur. As the period of incubation or the latent period between infection and obvious symptoms is considerable and may vary from a week to two months or more, a large number of animals may have become infected and be incubating the disease before the outbreak is discovered and inoculation carried out. It is for this reason that a number of cases occur for a varying period following successful inoculation, and consequently it is necessary to hold "in-contact" animals in quarantine for long periods to ensure that all the latent cases will be detected before the suspected animals are liberated.

Preventive inoculation is also carried out amongst healthy animals to render them resistant in case they are exposed to infection. Travelling stock coming from known infected areas or those which have to pass through infected country are usually treated in this manner.

Methods of Inoculation.

Inoculation as practised in Queensland consists in introducing a small quantity of fluid containing the germs under the skin towards the tip of the tail. When this is carried out a mild reaction is produced at the site of inoculation, and the animal gains a resistance to the disease. The area towards the tip of the tail is selected for inoculation because it is far removed from the centre of circulation and because if the local lesion following inoculation becomes extensive it can be controlled by cutting off the tail. If inoculation was carried out with fresh virulent virus on various parts of the body the lesions could not be controlled and they would spread extensively, causing heavy losses.

The fluid commonly used for inoculation purposes is that which collects in the chest cavity in active cases of the disease, and it is known as "natural virus." This fluid gives good results when used in the fresh state—i.e., when only a few days old—but its keeping qualities are uncertain, and it should not be used after it has been stored for long periods.

A vaccine for contagious pleuro-pneumonia inoculation has been evolved by the Council for Scientific and Industrial Research at its Townsville laboratory, and this product has been widely tested and has given good results. The writer actually had control of the testing of 10,000 doses of this product on travelling and station stock, and it proved

very satisfactory. The vaccine is superior to the natural virus for many reasons, although good samples of the latter, when freshly taken, usually give satisfactory results.

The pleuro-pneumonia vaccine prepared by the Council for Scientific and Industrial Research, together with setons, can be obtained at the Animal Health Station, Yeerongpilly.

The common method of inoculation is that known as the seton method, and it consists of introducing a piece of wool saturated with fluid containing the germs under the skin of the tail. Special needles are required for this purpose. Another method consists of injecting three to five drops of the fluid under the skin of the tail by means of a special syringe, whilst in a third method the fluid is introduced by a special spoon-shaped needle.

No matter what method is used, it is essential to practise strict cleanliness in carrying out the operation.

It is the usual practice to bang-tail animals immediately after the operation to indicate that they have been inoculated.

Sometimes a number of "bad tails" follow inoculation. These are due to two causes:—

1. An excessive virulence of the virus.

Such virus sometimes produces extensive lesions which may spread up the tail and involve the muscles of the rump. If these lesions become infected with outside germs the area may become pussy and putrid. When such cases are detected in an early stage the tail should be cut off above the lesions with a clean knife to prevent the rump muscles from becoming involved. An occasional uncomplicated case of this nature is looked upon favourably, as it indicates that the virus is alive.

2. Dirty inoculations or contaminated virus.

The "bad tails" in these cases are due to foreign germs, introduced either by dirty methods or in the virus at the time of inoculation. The normal reaction following inoculation produces a condition which is favourable for the growth of the foreign germs, which then produce the "bad tail."

The inoculation gives an immunity against the disease, but the immunity does not always persist in 100 per cent. of the animals treated. Occasional cases may occur in inoculated animals, but a successful inoculation will prevent the spread of the disease through the mob. The period during which the immunity lasts is not definitely known, although it is thought to be at least twelve months.

Collection of Virus.

When virus is required an animal in a fairly advanced stage of the disease should be selected, shot, and bled. It is then propped up on its back, the abdominal cavity is opened up, and the intestines are removed without opening the chest cavity. One or both forelegs may also be removed. If a quantity of virus is present it causes the diaphragm (skirt) to bulge outwards. The virus is then collected by puncturing the chest cavity by means of a trocar and canular either through the diaphragm or externally between the ribs. The trocar is pulled out and the canular is left in position, and the virus flows out through it.

It should be collected in sterile bottles and 25 per cent. pure glycerine should be added. If jelly-like clots form in the virus they should be removed by straining through sterile cotton wool or through a piece of muslin or cheese cloth which has previously been boiled and wrung out. After collecting the virus the animal, and particularly the chest cavity, should be examined for the presence of other diseases, especially tuberculosis. If such disease is found the virus should be discarded.

Good virus should be clear, and it should be of a straw to amber colour. Discoloured or turbid virus should not be used. It has been estimated that on an average only one animal out of every four examined will yield suitable virus.

REFERENCE.

1. A. W. Turner, D.Sc., D.V.Sc., A. D. Campbell, B.V.Sc., and A. T. Dick, D.Sc. (1935). "Recent Work on Pleuro-Pneumonia Contagiosa Boum in North Queensland." The Australian Veterinary Journal, Vol. XI., No. 2.

SELECTING A SIRE.

The job of selecting a herd sire is probably one of the most difficult tasks assigned to a breeder of dairy cattle. A breeder should confess concern about his herd sire selection. Procurement of the right bull ensures improvement in his herd, whereas the wrong bull may completely destroy the results of several generations of careful breeding. How, then, may the thoughtful breeder be guided in this important decision?

First, he should make a very careful analysis of his existing herd. By so doing he thereby establishes a standard of both type and production to be maintained or improved by the new bull. This standard should be set not by the average cows in the herd, but from the top end of the herd.

Second, the bull selected should be healthy, well grown, and an active breeder.

Third, the actual selection of the bull will be confined either to an aged or meritorious sire or to a young bull. Very few meritorious proved sires are for sale. For this reason most breeders will be forced to limit their selection to young bulls. In selecting a young bull what evidence of transmitting ability is worth considering?

The transmitting ability of meritorious proved bulls has been established through the records of their daughters. It is reasonable to believe that a bull capable of siring 400 lb. daughters will transmit this same production to his sons. Therefore a son of a meritorious sire carries considerable promise. However, this sire is only one of the parents.

The dam also contributes to the inheritance of the bull. In considering the dam we should expect answers to the following questions:—

1. Is she of acceptable type?
2. Has she a good udder?
3. Is she a consistent producer and a regular breeder?
4. What are her lifetime production records?
5. Is she a daughter of a meritorious sire?
6. Has she any producing offspring?

We might also inquire as to the producing and transmitting ability of the maternal granddam, asking the same questions. The old adage "A good bull must have a good mother" is well written, and merits careful consideration in selecting a herd sire.

This procedure of analysis builds an inheritance pedigree of the young bull in question. A bull can transmit only those characters inherited from his parents. It is therefore important to measure this inheritance as completely and accurately as possible. Too often a bull rises to unearned fame through the records of a few high-record daughters. Uniformity of offspring is far more important and gives a more accurate measure of true transmitting ability.

A reputable and successful breeder should gladly co-operate in assembling this information. If he happens to be your neighbour, so much the better. Distance and foreign names do not make a bull more valuable.—E. T. Wallace, Purdue University (U.S.A.).

Problems of Pasture Maintenance and Rehabilitation in Semi-arid Queensland.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy).

Introduction.

IN the early days of settlement in Western Queensland the productive stands of native pastures that covered immense areas provided in most years sufficient feed for the livestock depastured thereon. For some years the major portion of the area occupied was devoted to cattle-raising and the meagre watering facilities kept the livestock carried at a fairly low figure. The native pastures were regarded as an inexhaustible supply of forage, and so lightly were the areas stocked that if the feed ran short in one place it was only necessary to move to a new area. With the development of watering facilities and the consequent splitting up of the large holdings, the grazing became more intensified and sheep have now replaced cattle over most of the western country. This intensification of grazing has resulted in a degree of utilization of the pasture more intense than hitherto experienced, and in the absence of authentic information concerning the best method of utilisation of the pasture many areas have been subjected to grazing conditions inimical to the good condition of the pasture. The ill-effects of injudicious stocking on Mitchell grass pastures over a period of years have been accentuated by recurring droughts, with the result that a demand has arisen for information on the problem of restoring depleted pastures. Though this is an urgent question it is no more so than the elucidation of the method of grazing a high-producing pasture which will afford the best utilisation of the forage and maintain the pasture in good condition.

Both problems are concerned primarily with the preservation of the best elements in the pastures and their extension to the exclusion of less valuable constituents. There is no question that the Mitchell grasses rank foremost in the list of useful pasture plants and that primary attention should be devoted to their reaction to various grazing treatments as well as to the other factors—climatic and soil—concerned in their development. Observations made and information obtained regarding the behaviour of Mitchell grasses under different conditions are summarised below in a preliminary statement of the pasture problem as it appears to the writer.

Three factors determine the period of growth of Mitchell grasses, viz., rainfall, temperature, and soil type, and so throughout Western Queensland we find at any particular time pasture heterogeneity corresponding with variations in these three factors.

Influence of Soil Type on Mitchell Grasses.

The Mitchell grasses grow for the most part on two types of soil, viz., the heavy soils of the "rolling downs" and the pebbly downs soils. In the central-west the two types are found alternating, but the north-west is mostly rolling downs country. Important distinctions between the vegetation on these two broad types are due probably to differences in physical properties of the soils. The distinctions are quite marked and include a larger covering of timber carried by the pebbly soils, a tardier response of the grass on the clay soils to small showers of rain,

and a higher degree of palatability of the growth on the pebbly soils. The proportion of clay in the rolling downs soils is very high, and this is responsible for features such as high run-off of rain, slow and often shallow penetration of moisture, low rate of capillarity, swelling on wetting and cracking following shrinkage on drying—all features which are antagonistic to tree growth and to highest pasture production under semi-arid conditions. Though the response of the grass to showers is less on the clay downs than on the pebbly rises, during a wet season the downs are capable of yielding a heavier growth of grass than are the lighter soils.

Influence of Rainfall on Mitchell Grasses.

Of all the climatic factors whose variations are responsible for the changes in behaviour of Mitchell grasses, that of precipitation shows the highest correlation with growth characters. Variations in factors such as temperature, evaporation, and wind strength produce changes in the behaviour of the grasses, but none comparable with those induced by the vicissitudes from year to year and from season to season of rainfall.

An examination of rainfall records reveals that four divisions may be recognised in western areas. These have been classified as follows:—

(*a*) The Far-Western Division, characterised by light and erratic falls, the reliability of the rainfall being very low and evaporation high;

(*b*) The North-Western Division, experiencing the heaviest rainfall in January and February, with little winter rainfall and the rainfall period almost restricted to the summer;

(*c*) The Central-Western Division, enjoying a better distribution of summer rainfall, which occurs in less heavy falls than those of the North-West; useful autumn and winter falls are more common;

(*d*) The South-Western Division, with a somewhat lower summer rainfall, but a compensating factor in the longer rainfall period; useful winter rains often occur.

A study of rainfall tables for stations in all divisions shows significant variations in the amount recorded at each station during different years, during the seasons of the year, and during the same season in different years. Observations and inquiries concerning the influence of the annual precipitation and its seasonal distribution on growth and reproduction of Mitchell grasses have provided information regarding the growing period and productivity of Mitchell grasses in different years, the density of the stand, the lateral spread of tufts, the formation of seed, the establishment of seedlings, &c.

As a general rule the main growing period coincides with the rainy season, which ordinarily begins in December in the south-west and central-west and in January in the north-west. In certain years growth may begin with storms in October or November, or it may be delayed through lack of rain until March. In those years when the summer rainy season provides adequate and well-distributed precipitations growth continues into April. In occasional years, when temperatures are not too low, unseasonal precipitations may evoke a growth of leaves in August or September, but growth is not sustained into the growing season proper because of the very light precipitations and the severe drying winds common in October and November. Erratic falls during

the summer may produce quite a substantial amount of feed if they provide abundant moisture, but heavy showers are of little use if followed by dry spells of lengthy duration. Volume production appears to be closely and positively correlated with the current summer rainfall total, though there may be a closer relation between volume production and the conditions which prevailed from the commencement of the previous summer growing season to the current seasonal conditions. If the latter is true the reason may lie in the vigour of the grass as affected by growing conditions during the previous year or more. The size of individual tufts is affected by the available moisture. Under favourable rainfall conditions the stand is maintained and improved by the building up of large tufts by a process akin to tillering. The increase in area will depend upon the vigour of the plants at the commencement of the season, as well as upon current seasonal conditions, and the thinner the stand the better the opportunity for individual plants to enlarge. Drought conditions, with the gradual depletion of the available soil moisture, cause a decrease in the size of tufts. This is effected by the centres of the large tufts dying out. Upon the return of good conditions these centres fill up slowly, but the greatest development takes place away from the periphery of the tuft, where no dead crown and root material is present to interfere with extension of growth.

Ordinarily only one flowering period occurs during a season, its advent being generally four to six weeks after the commencement of growth, provided rainfall conditions are satisfactory. Thus the flowering period may be expected in January or February and the fruiting period in March. The dissemination of seed by animals and wind begins in April and all seed is shed by the end of May or early June. One or two instances of two flowering periods in one season were mentioned, October rains producing the first and January rains the second, but a dry November is fatal to seed maturation in the early growing period. Badly distributed summer rainfall very often prevents the maturity of seed—especially in the north-west, but also to some extent in other areas —so it would appear that in general the viability of Mitchell grass seeds is fairly low, though a fair amount of viable seed is produced occasionally. Should dry years follow these good seed crops, the effect of drought at the time of germination or during the seedling stage would prevent seedlings from establishing. Only once in ten years on a property in the Maranoa have seedlings been observed.

Influence of Grazing on Mitchell Grasses.

The Mitchell grass pastures of Western Queensland, upon which millions of sheep and cattle are now raised, were developed under conditions of extremely light and intermittent grazing. Prior to settlement marsupials were the chief grazing animals, and they followed the patchy rains which produced green growth, with the result that any particular pasture area would be grazed intermittently and not continuously. With the advent of domestic animals the pastures were subjected to conditions vastly different from those to which they had become attuned, and with the upsetting of the existing balance a fresh equilibrium had to be established. In some areas a desirable balance has been reached and is being maintained; in some cases the pasture is being maintained at a higher level than before settlement; on the other hand, limited areas which once carried good pasturage are rapidly approaching desert conditions because of the stocking conditions imposed.

It is quite obvious that to maintain a good pasture it must be grazed in conformity with the requirements of the best elements (that is, the Mitchell grasses), and investigational work is necessary in order to determine the degree of utilisation of Mitchell grass pastures that will give the best economic use, and at the same time maintain a good plant cover or improve a depleted pasture. Clearly, then, there are two sides to the grazing question, and unless both sides are well considered inefficient pasture utilisation will result.

Consider first the case of a good Mitchell grass pasture which has been subjected to heavy over-grazing year after year for a number of years. Such areas occur not infrequently. The depletion of native pastures by over-grazing is a cumulative process and does not occur suddenly, but eventually the grazing capacity becomes much reduced and the vegetational cover inferior in grazing value. The cumulative effect of over-grazing (that is, trying to feed too many sheep on too few acres) is brought about by never allowing the grasses to produce a normal crop of leaf which would allow them to replenish the reserves of food stored in underground parts which have been exhausted by the continual removal of green shoots year after year. Any conditions that seriously interfere with the normal physiological processes of pasture grasses may lead to a restricted development of underground organs, and a curtailment of the storage of reserve food therein. Impairment of the vigour of Mitchell grasses by heavy and continued grazing leads to a breakdown of the stand consequent upon the weakening and death of individual plants. Increase of the surviving plants by lateral spread is hindered, natural reseeding is handicapped, and eventually the pasture comes to consist almost entirely of less useful plants.

Continuous over-grazing is undoubtedly a harmful practice, and any system of continuous grazing which each year removes the whole forage production from a pasture will sooner or later cause a decline in the grazing capacity of that pasture. On the other hand, under-utilisation of a pasture also is deleterious to the vegetation (though not to such a pronounced extent as full utilisation), permitting as it does the development of weeds and the accumulation of dead leaves and stems. It would appear from observations made that something less than full use of the forage is necessary to maintain a pasture in good condition under continuous grazing, and it is suggested that a stocking rate which in average years would leave about 20 per cent. of the vegetation unused at the end of the grazing season would give best results. During the flush period of growth very light use would be made of the pasture, and this would provide the Mitchell grasses with ample opportunity to make a vigorous growth and reproduce. In better-than-average years and in slightly dry years the under or over-utilisation would not matter much, but during years of very severe drought no system of grazing can be expected to furnish feed for the normal number of animals.

Whilst conservative continuous grazing offers one method of pasture management which takes cognisance of the requirements of the pasture plants, the short spelling of paddocks in rotation to allow of the production of a normal crop of leaf and seed would seem to offer possibilities. A number of graziers are employing this more or less definite system of grazing with good results, though it is admitted that some difficulties might be experienced in districts of erratic rainfall.

In this connection attention is drawn to the operation of the "deferred and rotation system" of grazing adopted on national forest ranges in the southern United States. As a grazing system for productive pastures its virtue lies in its physiological effect upon the pasture, since grazing is deferred and rotated over the holding to enable the plants to store up reserve food to aid in the production of the next year's crop, to allow a seed crop to mature, and to allow seedlings to establish unhampered by grazing animals.

The plan of grazing is as shown hereunder:—

Year.	Period.	Section.		
		A.	B.	C.
1936-37	Spring	////////		
	Summer		////////	
	Autumn-Winter ..			////////
1937-38	Spring		////////	
	Summer	////////		
	Autumn-Winter ..			////////
1938-39	Spring		////////	
	Summer			////////
	Autumn-Winter ..	////////		
1939-40	Spring			////////
	Summer		////////	
	Autumn-Winter ..	////////		
1940-41	Spring			////////
	Summer	////////		
	Autumn-Winter ..		////////	
1941-42	Spring	////////		
	Summer			////////
	Autumn-Winter ..		////////	

//////// indicates grazed section.

Unfortunately, the reliability of the rainfall in the west of Queensland is so low and the precipitation period so restricted that any uniform plan of rotation such as the one diagrammed seems to be out of the question. However, its basic principles—to invigorate grasses by allowing them to mature a crop of foliage, and to aid natural reseeding—might form the foundation of some method to suit Queensland conditions. If it is correct that the seeding of Mitchell grasses in most seasons is poor, the object of the grazing system might be narrowed down to provide for normal development of the useful pasture grasses in as many years as possible.

Improvement of Depleted Pastures.

There appear to have been few attempts made to restore depleted pastures to a condition of high production, and the usual method employed—exclusion of stock for a long period—has proved abortive. It should be stressed, however, that the paddocks were almost entirely denuded of Mitchell grasses before being closed to stock, and the thin stand of grass, together with a series of years inimical to seed production and seedling establishment, have militated against natural regrassing.

The density of the cover of Mitchell grasses in a pasture depends upon the number of plants and the size of the tufts, as well as upon current seasonal growth. As already stated, injudicious grazing, combined with drought, has a cumulative effect on the pasture. A pasture which has not suffered very severely may show a reduction only in the size of the tussocks of Mitchell grass, and the total number of plants of Mitchell grass may not be seriously affected. Severe pasture depletion is shown by a large decrease in Mitchell grass plant numbers (due to deaths) and a reduction in size and vigour of the remaining plants.

Owing to the gradual falling-off in productivity of a pasture it is difficult to recognise the early stages of pasture depletion by general observations of condition of the stock and luxuriance of the vegetation as a whole. The first sign of deterioration of a good pasture is shown by the impairment of the growth of the better elements, and as soon as the stand of desirable plants is weakened or opened up, annual or short-lived perennial weeds appear in the pasture, develop, and reproduce. It may not always be possible to recognise the initial stages of weakness in the Mitchell grasses, but a knowledge of the weeds indicative of slight deterioration would enable the grazier to take steps to halt the decline. For this reason the indicator plants should be determined and listed.

Slightly depleted pastures may, perhaps, be restored to full vigour and so to full productivity by allowing the Mitchell grasses to develop unhindered during a complete favourable growing period. The thickening up of the pasture by the encouragement of vegetative spread should almost completely rehabilitate a pasture showing slight depletion, but since there is always a certain proportion of plants dying from inherent causes, in occasional years the replacement of this decadent element in the pasture by new plants should be attempted. For this purpose natural reseeding is the most attractive proposition if it involves little or no spelling of the pasture, and it is probable that the seedling requirements of a dense pasture would be met by those which develop from the small amount of seed produced by a pasture under conservative grazing conditions.

The rehabilitation of a pasture which has suffered a severe diminution in the number and/or density of its most useful constituents is likely to be a slow process if natural methods, even if aided by judicious grazing, are relied upon. There would seem to be a definite need for the elaboration of some method of artificial reseeding of such areas, but how such a method, in the light of the unreliable rainfall, may be applied to our western areas, it is difficult to see. Three separate problems present themselves for solution, viz., (1) the provision of viable seed; (2) the dissemination of the seed over the pasture area; (3) the establishment and survival of seedlings.

If the evidence of seed production has been correctly interpreted, and it is a fact that the production of viable seed over most of the

western areas is at a low level in most seasons, and that only in occasional years is a seed crop of any magnitude matured, then the large-scale collection of seed is an operation which may be performed only at rather long intervals. The prediction of the extent of a seed crop can have no reasonable chance of accuracy owing to the vicissitudes of climate; consequently, if seed is to be collected the individual pastoralist must be prepared to harvest a seed crop at any time during the growing season and in any year. That is to say, the necessary equipment must be on hand; it is too big a gamble to anticipate a crop. For harvesting the seed crop several methods suggest themselves. Motor or horse-drawn strippers or reapers may be employed, while for small-scale operations an American hand comb seed-stripper, as illustrated below, should prove useful.

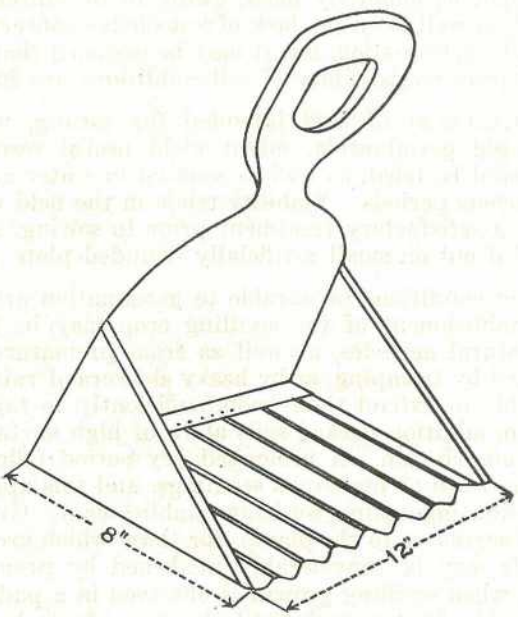


Plate 47.

The distribution of seed over extensive areas of depleted pasture is a problem fraught with many difficulties. The cost of collection is likely to be fairly heavy, hence no extensive wastage can be countenanced. Though the physical stimuli for normal Mitchell grass seed germination are not yet known, it appears reasonable to assume that early covering of the seed after dissemination is advisable; consequently, it would seem desirable to follow any mechanical distribution with some covering agent, such as harrows or sheep, the latter trampling the seed into the ground. Just what device is used for sowing the seed will depend upon the extent of the country to be seeded, the amount of seed available, the nature of the country, &c. Sowing from an aeroplane has been advocated, but for all practical purposes, scattering from a motor vehicle should prove as useful.

Where the amount of seed available is small a method of "strip-seeding" may prove useful. A long, narrow strip of land, running across the direction of the prevailing winds, could be fenced off from

stock, ploughed or well cultivated, sown with Mitchell grass seed, and the seed covered by harrowing. The favourable seed-bed conditions should induce the development of a good stand of grass, and any seed produced would be carried by wind over the adjacent area. The addition of superphosphate to these strips might possibly result in a heavier production of viable seed, and experimental work to test this point might be carried out on various soils. Where bore water of fairly good quality exists, strips might be sown along the drains and flooded periodically to keep the plants growing until the seed has matured. In wind-swept areas, in addition to the protected strips, a few furrows could be run across the paddocks to capture blown seed.

The period of the year at which artificial reseeding should be attempted cannot be definitely fixed, owing to the unreliable character of the rainfall, as well as to the lack of knowledge concerning the conditions essential to germination, but it may be assumed that early summer sowing would prove satisfactory if soil conditions are favourable.

The pre-treatment of seed intended for sowing, with a view to facilitating rapid germination, might yield useful results. Chemical treatments should be tried, as well as soaking in water and drying, and storage for various periods. Viability trials in the field would probably give a lead to a satisfactory treatment prior to sowing, and such trials could be carried out on small artificially denuded plots.

Even when conditions favourable to germination are provided, the percentage establishment of the seedling crop may be low because of losses from natural agencies, as well as from premature grazing. On soil packed hard by tramping, or by heavy showers of rain, the seedlings may not be able to extend their roots sufficiently to tap soil moisture reserves, and in addition packed soils allow of high surface run-off, and do not freely absorb rain. A prolonged dry period following germination causes the death of numerous seedlings, and this appears to be the chief factor militating against seedling establishment. Grazing seedlings of grasses is destructive to the plants, for those which are not pulled up by the animals may be considerably weakened by premature grazing. Consequently, when seedling growth is observed in a paddock, the stock should, if possible, be removed until the new plants have been either thoroughly established or destoyed by natural agencies.

Recommendations for Experimental Work.

With a view to the determination of the most efficient methods of grazing both good and depleted Mitchell grass pastures, and in order to ascertain the value of methods of artificial reseeding of pastures, the following trials, it is suggested, might be carried out over a number of years, viz.:—

A.—On stands of medium to high density—

1. Comparison of—
   - (*a*) Heavy over-grazing year after year;
   - (*b*) Conservative continuous grazing;
   - (*c*) Light continuous grazing;
   - (*d*) Deferred grazing.
2. Artificial reseeding.

B.—On stands which have suffered severe depletion—

1. Comparison of—
   (*a*) Conservative continuous grazing;
   (*b*) Light continuous grazing;
   (*c*) Deferred grazing;
   (*d*) Long spelling.
2. Artificial reseeding.

The first consideration in experimental work of the nature outlined is a measure of efficiency of a grazing practice or other system of management, and such a measure must include all the factors concerned. The aim on most of the western areas is to produce wool, though during critical drought periods this object may become subservient to the effort to keep the sheep alive and in fair condition. However, for the purpose of the experiments, the wool production per head or per acre may be regarded as one of the main factors. As there may not be a high positive correlation between weight gains and wool production, the live-weight increments or losses of the stock will need to be measured. In addition, there is the effect of the grazing on the pasture to be considered.

Based on a United States measure of efficiency, the following measure is formulated:—The most efficient system of grazing is one that will ensure sufficient forage during the entire year to produce the greatest total gain (in wool and/or body weight) with the least number of sheep on the minimum unit of land, without permanent injury to a good stand of grass, and with definite improvement (with the minimum disturbance and loss in forage use during the revegetational period) to depleted pastures.

The measurements required are gains per head and per acre and pasture changes. With regard to measurements of pasture values, volume production, and nutrient value of the pasture as a whole will be measured to some extent by animal gains, but precise information on these points can be obtained only by intensive study of the vegetation itself. In addition, changes in vegetation must be noted in detail. Although to trace changes in botanical composition of the pasture periodic examination of plots selected at random at each inspection is sufficient, to follow the effects of different systems and intensities of grazing on individual plants (which is highly desirable), small permanent plots are essential, and such permanent plots could be designed to serve for botanical studies of the pasture as a whole, as well as of individual plants.

For sequential studies of vegetation, permanent plots are essential, and while a permanent narrow belt traversing the experimental plot could be utilised, it is thought that a much more convenient method would be to scatter permanent small square plots or quadrats over the trial areas. Such quadrats, each one square metre in area, would require to be properly marked by metallic pegs and, perhaps, located by means of painted wooden stakes.

Various methods of examination of quadrats could be employed, depending upon the purpose of the analysis.

Mapped quadrats, in which ordinarily all the vegetation within the quadrat plot is mapped on a chart in its actual position, are valuable for recording changes in individual plants, but much tedious work is involved, and for this reason mapped quadrats are unsuitable for determining changes in the vegetation of a large plot as a unit. Individual

plant studies are conveniently conducted by mapping or charting, of which three variations are in use, viz., freehand charting, pantograph charting, and camera charting.

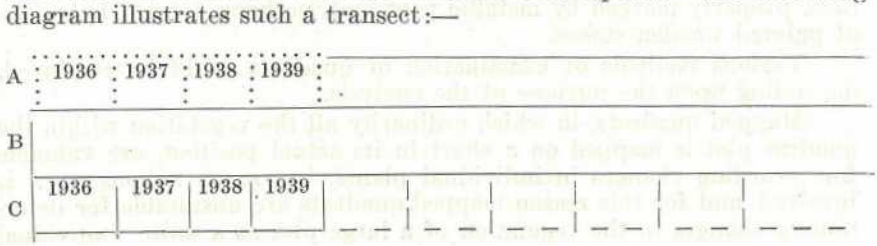
In freehand charting the relative position of each individual plant within the quadrat is marked on a square chart. Usually the ground cover of each plant is indicated. For reproducing the outlines of tufts the pantograph is claimed to be speedy and reliable. An instrument set to reduce to 1/3·75 would require a map of 10·5 inches square for charting a metre quadrat. Two persons are, however, required for charting with a pantograph.

A camera method of charting quadrats has recently been developed in Africa, in which the camera is focussed over the quadrat, and the image of the vegetation is traced on a sheet of oiled paper attached to a sheet of plain glass substituted for the frosted focussing glass.

For accurate botanical analysis of a pasture a fairly large number of sample plots must be examined, and charting in position is too slow. The usual listing method, which consists in noting the number of plants of each species in a quadrat, is hardly suitable for grazing studies in which ground cover of individual species is of considerable importance, and a method combining charting and listing is of greater value. In this method the quadrat and the map are both divided into a number of equal-sized segments, and on the appropriate division of the map are recorded not the number of individual plants of each species, but the percentage of ground cover formed in the corresponding unit of the quadrat by the different species, and the density of cover within that unit. The mapping is quickly done and the records easily summarised.

Clipped quadrats have been used to furnish a record of the volume production of forage by pastures, but the action of clipping is different from that of grazing in many respects, notably—(1) The vegetation is cut uniformly at a given height; (2) the natural preferences of live stock are not copied; (3) the trampling action of live stock is absent; (4) no nutrients are returned to the soil as animal excrement. While the forage produced under different grazing methods cannot be accurately determined by clipping, the use of clipped quadrats may show a number of points, such as relation of yield to soil moisture, relation of plant cover to soil moisture, relation of height growth to yield, relation of nutritive values to soil moisture, &c.

Isolation transects, which are really experimental plots within experimental plots, have proved useful in the United States of America in semi-arid pasture investigation. Within an experimental plot (which is usually some acres in extent) an area 300 feet long and 60 feet wide is pegged out and divided into three long sections each 20 feet wide, and each section is subdivided into units 20 feet square. The following diagram illustrates such a transect:—



The three series A, B, and C are designated as grazing series, permanent series, and regeneration series, respectively. At the commencement of the experiment, sections A and B are fenced and section C is unfenced. One of the units in series A is opened to grazing each year (the dotted lines indicate where fences will have been removed each year). Series B is not subject to grazing or cutting at any time. One unit of series C is closed to grazing each year (the dashes indicate where fences will subsequently be erected).

The isolation transect allows of intensive study during a period of years of small plots grazed for various periods following spelling for various times, of other plots spelled for different periods after grazing for different periods, and of comparison of such plots with plots totally protected from grazing.

Acknowledgments.

The writer desires to acknowledge, with thanks, the very material assistance and the useful information provided by pastoralists throughout Western Queensland, by the United Graziers' Association of Queensland, by the Selectors' Association of Queensland, and by Mr. J. E. Thomas. In drawing up suggestions for future experimental work free use has been made of technical reports and other matter prepared by pasture workers in the United States of America and in Africa.

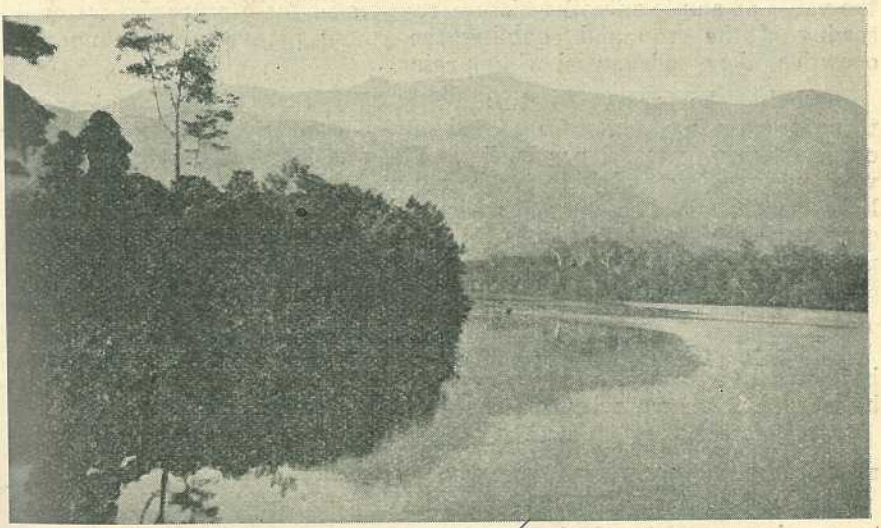


Plate 48.

A view of the Mulgrave River at Deeral, the Bellenden Ker Range forming the background.

THE good rains received during January have completely altered the outlook throughout the agricultural and dairying districts of the State. Pastures and young growing crops have responded to the favourable conditions and present a pleasing picture, while farmers are now able to proceed with the preparation of land for autumn-sown crops under ideal conditions.

Wheat.

Under Queensland's climatic conditions it is imperative for all wheatgrowers to work the land as soon as possible after harvest and maintain the fallow in good condition until seeding time. This practice is now becoming general, as previous dry seasons have demonstrated the value of ample subsoil moisture reserves in facilitating the seasonal sowing of the crop and enabling the young plants to make normal growth without substantial winter rains.

During the present month the State Wheat Board will endeavour to finalise the payment of a second advance on the recently harvested crop, amounting to 1s. per bushel. The rise in world wheat prices is very encouraging, and if it can be maintained will compensate for the lighter yields received by the majority of growers. Given favourable conditions until sowing it is safe to anticipate an increased area being placed under crop during the coming autumn, resulting in a heavy demand for seed wheat.

Tobacco.

January rains have completely altered the outlook in the tobacco industry, and given fair conditions from now on splendid returns should be secured in the majority of districts.

The good stands obtained in the Texas and Miriam Vale areas have received the necessary impetus to ensure the harvesting of ideal crops.

Curing has commenced at Texas and this will be closely followed by growers at Miriam Vale.

In the Northern areas early planted crops should receive the necessary assistance to tide them over until curing commences, while general planting has been carried out under ideal conditions.

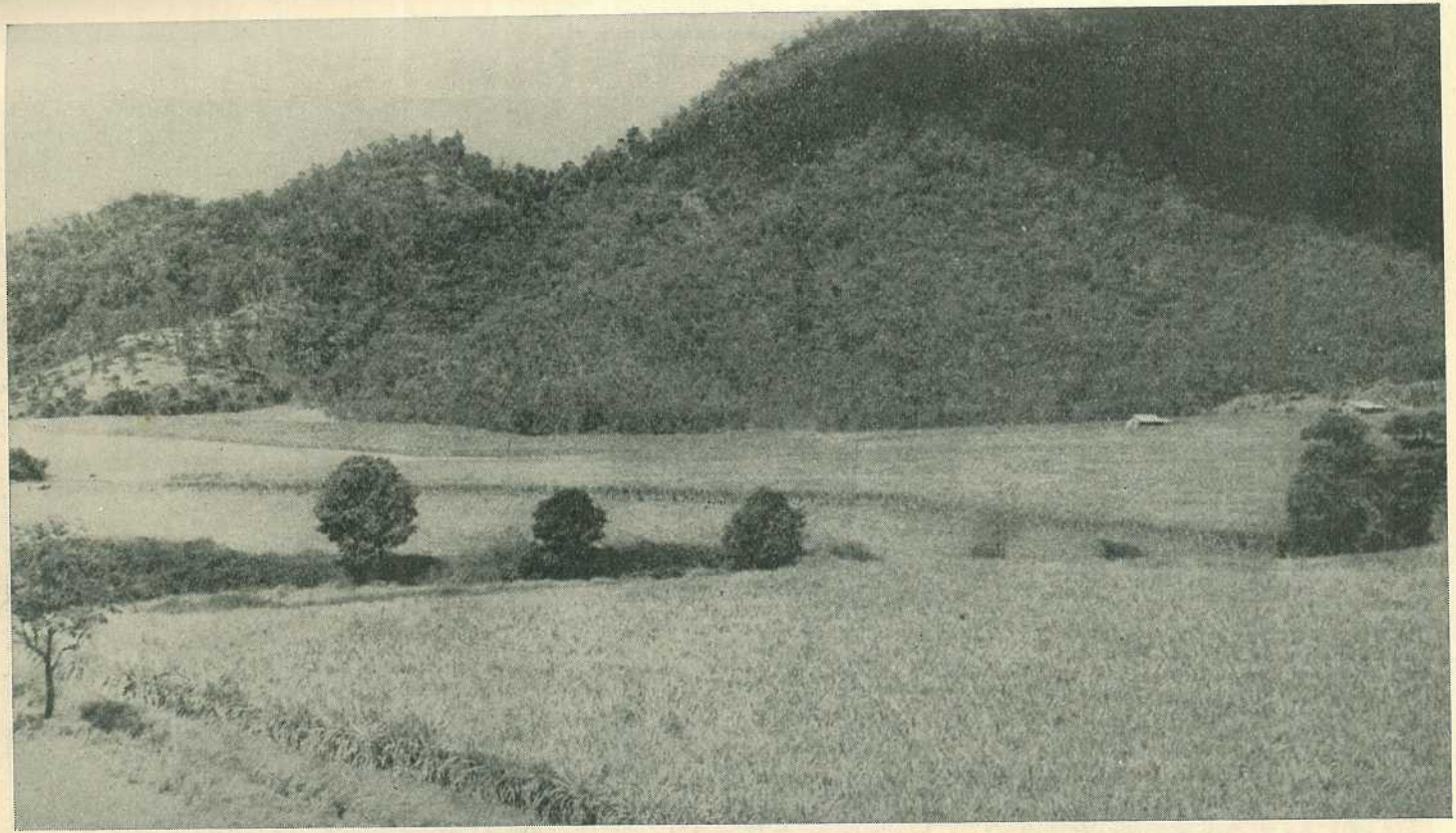


PLATE 49.

Rich cane lands sheltered by forested foothills of the Bellenden Ker Range, near Cairns, North Queensland.

[Photo. by courtesy Telegraph Newspaper Co. Ltd.

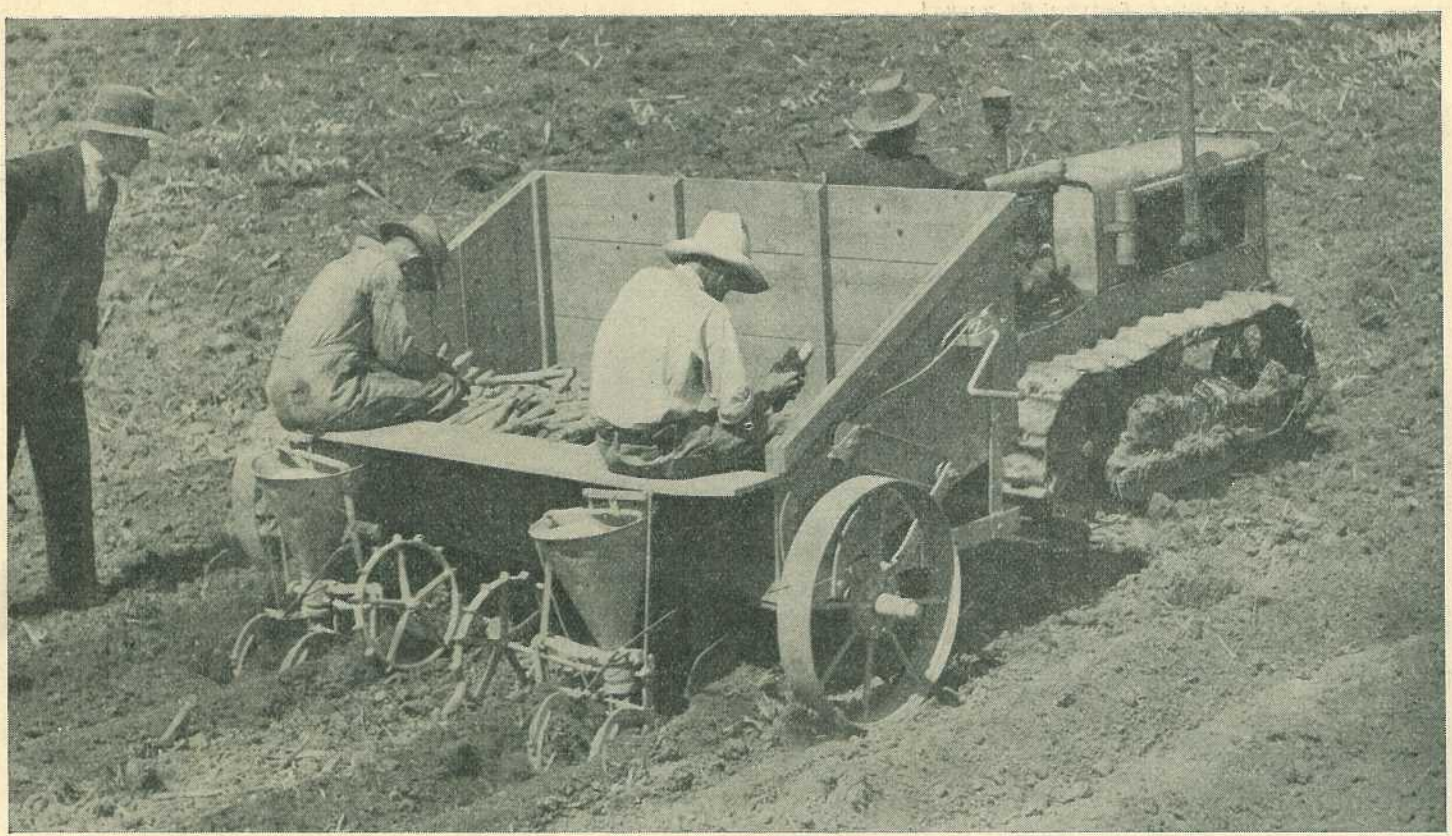


PLATE 50.
Planting cane near Mackay.

[*Photo. by courtesy Telegraph Newspaper Co. Ltd.*

Sugar-cane.

Beneficial rains were experienced in all cane areas during January, and although in certain districts the falls were heavy, in the aggregate no flooding resulted. With the high atmospheric temperatures which have prevailed rapid crop growth has been recorded.

At the present time the southern areas would benefit from further rains, but in all prospects for the 1935 crop are particularly bright.

General.

Approximately 14,000 acres have been sown to peanuts, being a considerable increase on last year's total of 10,500 acres. The early-sown crops are making rapid progress, but owing to the dry conditions experienced during November and early in December a large area was not placed under until January, which fact renders it liable to suffer damage if early frosts are experienced.

A steady development in the breeding of draught horses is now taking place throughout the Commonwealth, having been encouraged by the lower prices received for primary produce during recent years and the resultant necessity for economy and the local production of farm power. The horse is recognised as an economical and efficient power unit and is necessary even on the more extensive areas where tractors provide power for the main cultural and harvesting work. High prices are now readily obtainable for good quality draught horses, as indicated by the record figure of £90 per head paid for the four New Zealand-bred geldings which formed the champion team at the Melbourne Centenary Show.

Owing to the indifferent results obtained from the early established potato crop, it is expected that the main February planting will be unusually heavy. For late planting whole seed is preferred, as cut sets are liable to rot if warm moist weather is experienced. Seed treatment with hot formalin is recommended as a control of seed-borne disease, using 1 pint of commercial (40 per cent.) formalin to 15 gallons of water. The solution is heated to 125 degrees Fahr. and kept at this temperature during treatment, the tubers being immersed for two and a-half minutes. Cover with bags or canvas for an hour to retain the formalin fumes, then spread out to dry before planting.

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in January, and have not been renewed. A further large number expires with this issue.

Subscribers whose term has expired have been continued on our mailing list, and a yellow wrapper on this month's Journal (February) is an indication that their subscriptions are now due.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Lucerne Cultivation.

LUCERNE requires three essentials—heat, moisture, and calcareous soil of a sufficient depth. Given these, lucerne will flourish and produce heavy crops over a number of years. Light, sandy soils are not suitable; in fact, better results, comparatively, are obtained from the heavy soils of basaltic origin.

Where lucerne has ample sub-surface moisture or where its roots can penetrate into sub-surface soils similar to those which are found on alluvial flats it flourishes to perfection. Land intended for lucerne is best cropped with a cereal prior to its preparation for lucerne. Wheat, oats, barley, rye, panicums, and millets are suitable for this purpose, as ample time is available between the harvesting of one crop and the sowing of the lucerne.

Stubbles should be cultivated to induce volunteer growths of weeds and other seeds; these should be turned in subsequently, preferably by ploughing. Two deep ploughings should be given at right angles to each other as a sort of initial cultivation. Moisture should be conserved by frequent cultivation.

It may be necessary, in order to improve the tilth of the land, to carry out another light ploughing before the period of sowing, but if this is necessary cultivators and harrows must be used freely in order to reduce the tilth to that which is usually associated with an onion bed. Twelve to 14 lb. is ample for sowing, provided a drill is used and the lucerne is distributed from what is known as a grass seed box.

Where lucerne is being established as a nut grass preventive it is advisable to drill at right angles, using half the quantity of seed each way, which for the purpose should be increased to 20 lb. per acre. Lucerne is often sown over a lightly-rolled surface, and if this system is adopted one very light harrowing will be sufficient to give it a covering.

Lucerne germinates in from five to nine days, according to the soil moisture which is present. After the appearance of the first leaf its progress appears to be checked; this is due to the young root system becoming established, and fully a month or six weeks will have passed before the young plant is fit for its preliminary cutting by the mower. In no circumstances should young lucerne be permitted to flower; this only brings about a weakening of the plant, and causes a drain on its vegetable system which will show its effects later on.

An early mowing acts as a pruning and stimulates the root growth. The result of the first cutting may not be worth gathering, but it is best to give the lucerne a light harrowing after the crop has been cut. A second cutting may be obtained in from three to five weeks, provided weather is suitable, and the plant should not be allowed to show too much flower, say 10 per cent., before being cut.

When dry weather sets in and cracks appear in heavy soils, cutting should be followed by immediate cultivation and efforts made to conserve all subsurface moisture possible. Hay making with lucerne requires considerable knowledge of the plant and also local climatic conditions before you can claim to be an expert at curing lucerne hay.

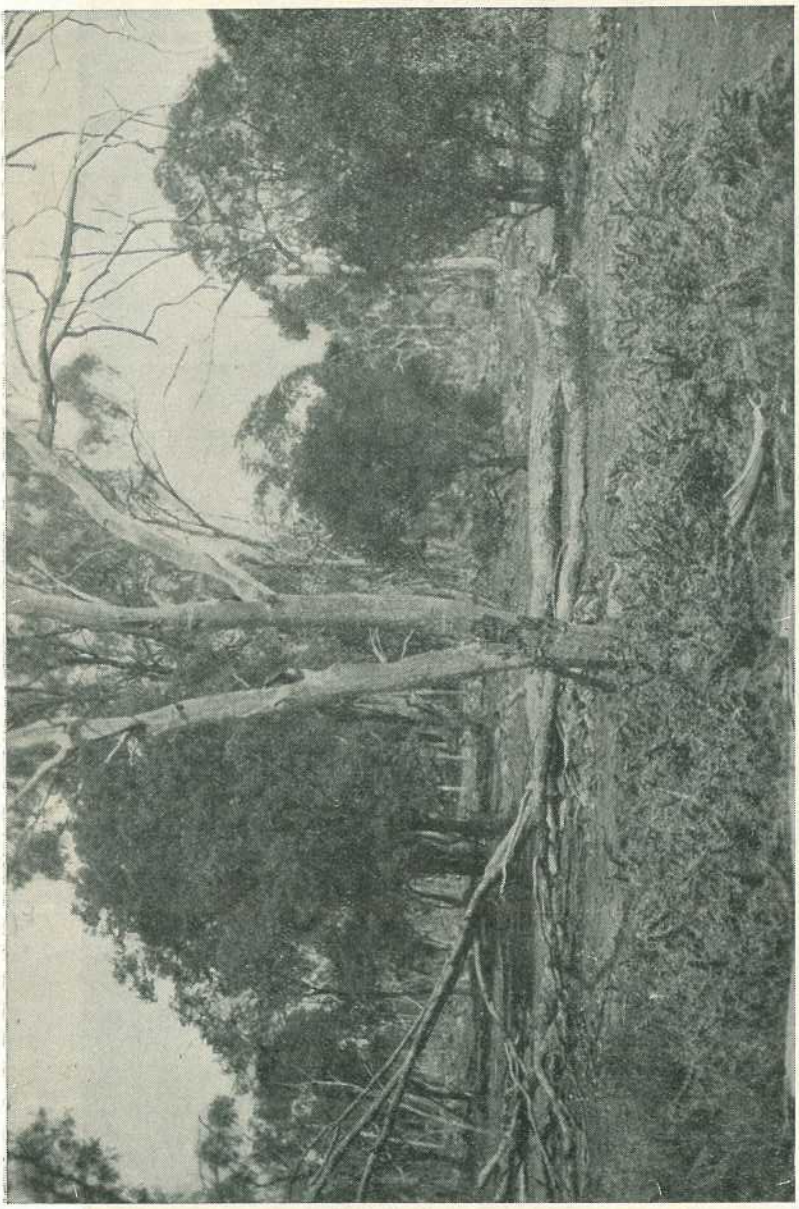


PLATE 51.

Bushland infested with Tiger Pear. Now cleared by employees of the Prickly-pear Commission, equipped with atomizers for poisoning the pest.

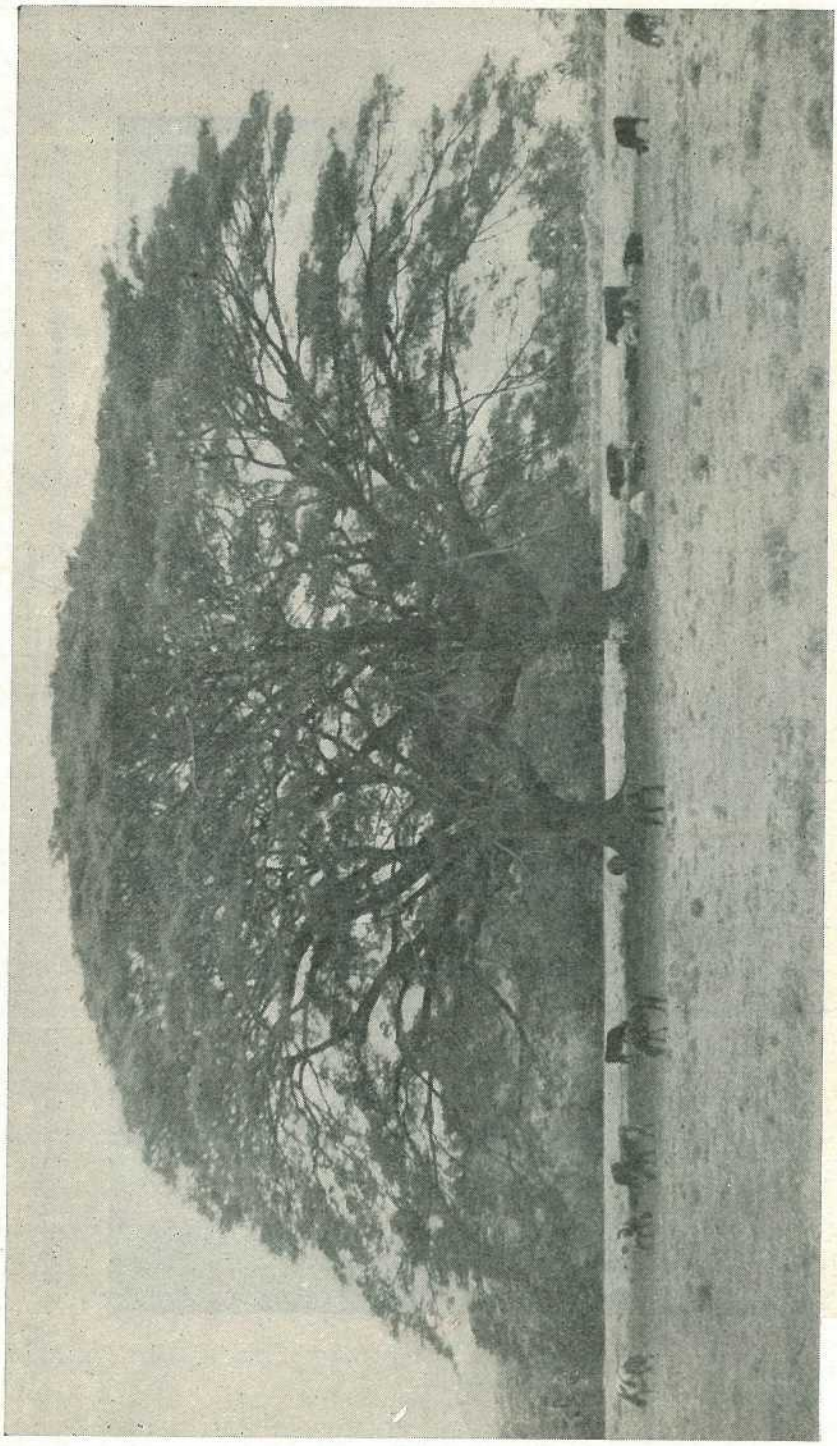


PLATE 52.

Park-like country at Macknade, near Ingham, North Queensland.

[Photo. by courtesy Telegraph Newspaper Co. Ltd.

Perfect lucerne hay contains only 25 per cent. of its original moisture, and has retained its leaf and colour and is soft and palatable to stock.

The only pest that has so far proved itself a serious menace to lucerne growing is the lucerne moth, the larvæ of which spin their cocoons at the terminals of the plant and so limit their growth. Frequent cutting of the plant when this pest is present will control it.

Dodder, the parasitical plant, is more likely to prove troublesome than insects or fungus diseases. This is easily distinguishable by its threadlike vine and golden yellow colour. The surest way of destroying dodder is to chip the plants to the crown, or straw should be carted on to the patches and burnt. Burning is the safest remedy, and if not carried out too drastically will not injure lucerne plants to any extent.

A good rainfall cannot always be depended upon at seeding time, and light falls of rain may have the effect of germinating the seed without being sufficient for further growth. For dry districts, therefore, fallowing is essential, and the land should be ploughed in autumn or early winter the year before it is intended to sow the seed. The depth of the ploughing is governed by the character of the soil. Alluvial soils should be ploughed to a depth of about 7 inches, but on other classes of soil of lighter or more porous nature a depth of 4 or 5 inches is sufficient.

The ploughed land should then be allowed to lie in the rough state for a month or so and be broken down in the beginning of summer with harrows. During the summer months the land must be frequently worked with harrow or cultivator, so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows a one-way disc cultivator or roller will soon do all that is necessary. If the land is rolled it should be harrowed immediately after the rolling.

Success in establishing lucerne in dry districts depends almost entirely upon the thorough preparation of the soil, and the ideal conditions to be aimed at are a well-worked soil, in which the previous year's rainfall has been conserved, together with a reasonably finely worked surface mulch.

About a month before the seed is sown a light ploughing or disc cultivation should be given, and immediately prior to sowing the land should be well harrowed, and. if necessary, rolled to level the surface and give a firm, fine seed-bed. Generally, about three or four harrowings and one good rolling are required on alluvial soil, but it may be necessary to roll twice. If weeds or grass are still present they should be worked out with a springtooth cultivator and removed. Lighter soils can be brought into condition with considerably less working.

Since the surface soil undergoes the greatest change it follows that it becomes the most fertile, and it is necessary to retain it where the young plants will be benefited by the enhanced fertility. The seed is planted near the surface, and it is there that the young roots gain the sustenance required by the plant. If deep ploughing is given the second time, this improved soil is inverted and put beyond the range of the young roots. The second ploughing should, therefore, be shallow.

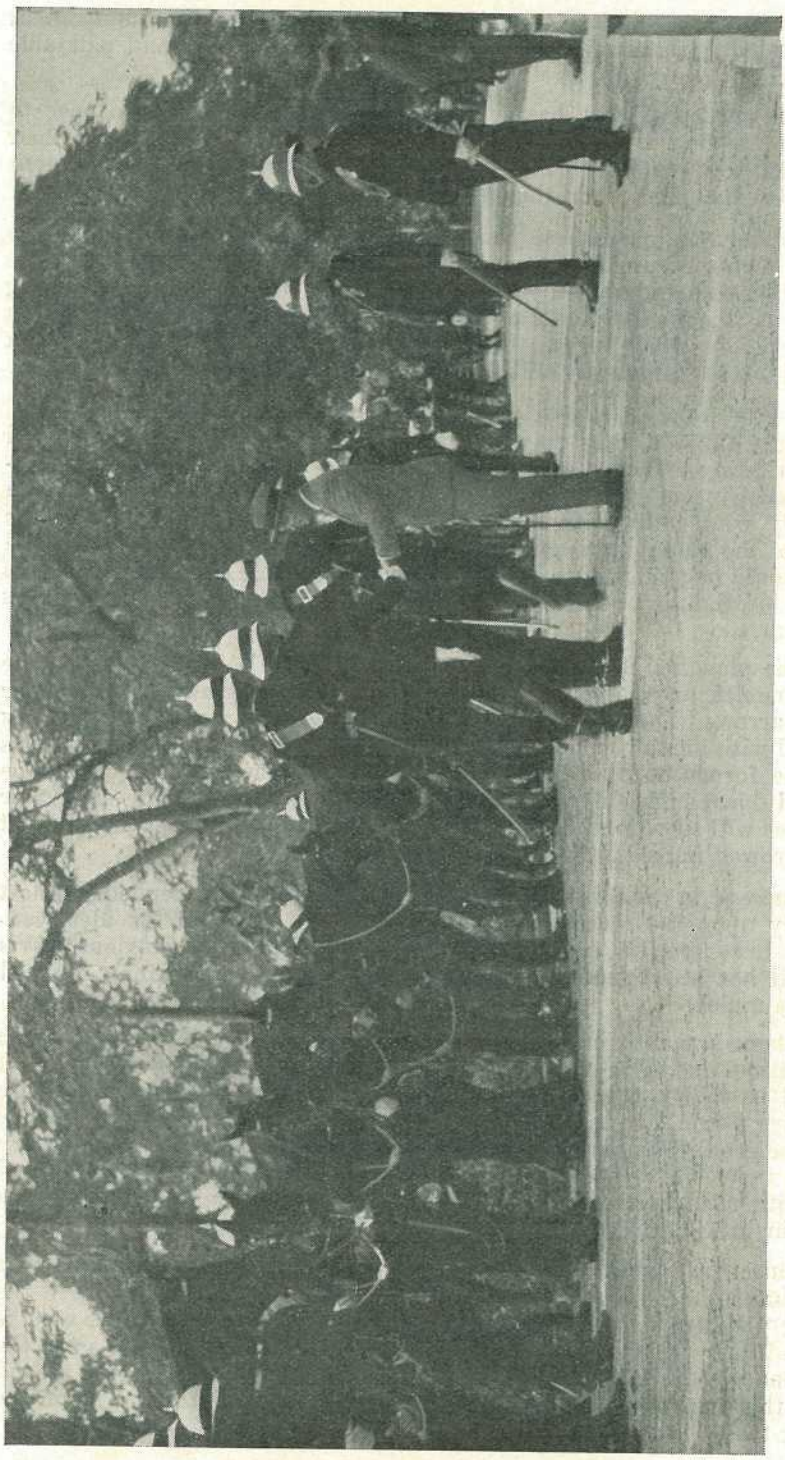


PLATE 53.
King Edward VIII. thanking informally his police escort at Parliament House, when, as Prince of Wales, he visited Brisbane in July, 1920.

Skeleton Weed.

Danger of Introduction to Farming Areas in Queensland.

SKELETON weed (*Chondrilla juncea*) has become a serious pest of the wheat areas in New South Wales in recent years, where it has been responsible for drastically reducing yields and in some instances of rendering lands totally unsuitable for farming purposes. As there is a distinct possibility of introducing "skelton weed" to this State per medium of the normal purchases of New South Wales wheat, farmers are advised to give attention to the immediate eradication of isolated plants which may appear in the paddocks.

The recently harvested Queensland wheat crop of approximately 3,000,000 bushels will be inadequate for the State's requirements, and as the bulk of the wheat consists of sound milling grain it is certain that a large proportion of the grain required for feed purposes will be drawn from New South Wales supplies of F.A.Q. wheat. The following note which appeared in the January, 1936, issue of the "Agricultural Gazette" of New South Wales is therefore particularly opportune:—

BEWARE OF SKELETON WEED.

The Seed may be in Chick Wheat.

The danger of spreading skeleton weed per medium of wheat supplied to poultry farmers, both in poultry farming districts and throughout country districts generally, has recently been brought under notice by the discovery of numerous seeds of the weed in samples of wheat obtained from stores.

Poultry farmers should, therefore, keep a sharp lookout for weed material resembling lettuce seed heads, or like the heads of the common milk thistle, and having a greyish appearance, in samples of chick wheat. Should the wheat have come from the Riverina there is a big chance of skeleton weed seed being present in quantity, and this will almost certainly lead to the establishment of the weed in the vicinity of the fowl pens, &c.

Special precautions should be taken to prevent any such material being fed to horses, for the seeds of skeleton weed can pass unharmed through the digestive tract of these animals and thus be distributed upon cultivation land in horse manure.

Skeleton seed can be dealt with if steps are taken early enough. To enable this to be done, it is obviously necessary for land holders to recognise the weed and take vigorous action to prevent the plants reaching maturity.

CITRUS NOTES.

By R. L. PREST.

IN orchards where unprofitable trees have been cut back preparatory to budding over with selected varieties, the thinning of new growths may be completed, leaving two well-grown shoots suitably placed near the end of the shortened arms. When the new shoots have attained some ⅜ inch in diameter and the sap is flowing freely, budding may be commenced.

When the shoot is ready to receive the bud a perpendicular cut is made in the bark in some suitable position near the base of the shoot from 1 to 1½ inch long through to the cambium layer. Another cut is made across the perpendicular one. The two cuts when made appear thus—T.

Budwood should only be taken from selected trees which are healthy and noted for their consistent production of heavy crops of quality fruit. Such budwood should be chosen from well-rounded, mature wood about the thickness of a lead pencil and not more than one year old. Before the buds are cut from the budstick, the leaves are trimmed off, a piece of the leaf stalk or petiole being left, and by this means the bud can be more easily handled after cutting. The buds may be cut off the stick upwards or downwards. The general practice is to cut from below the bud up, starting about ½-inch below the bud, ending about ½-inch above.

The cut should be made with a sharp thin-bladed knife, cutting just deep enough to remove a very thin layer of wood. The wood may be carefully removed from behind the bud, care being taken not to damage it. The bud is then inserted down and under the bark by raising the latter with the budding knife. In order to bring the bud and stock in close contact they are bound tightly together with a raffia tie. In two or three weeks the bud, if it remains green, will have taken. The

tie should then be cut to prevent throttling. When the budding has been done in the autumn it is better to leave the shoots as they are until the following spring, when growth may be started by removing a portion of the top of the shoot to within 3 or 4 inches of the bud, the stub being utilised to tie the bud to until it is strong enough to support itself. The stub may then be removed by a sloping cut from just above the bud.

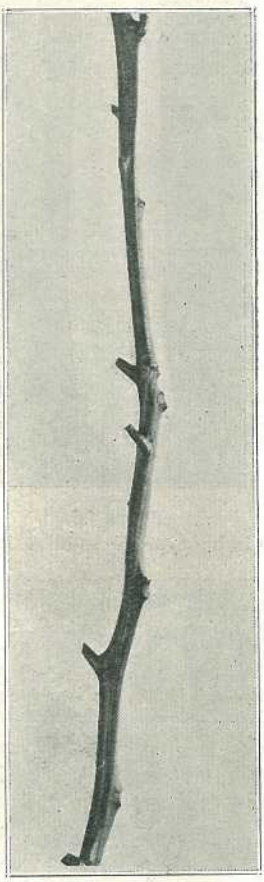


Plate 54.

Budstick showing two periods of growth. The joint is plainly seen, indicating where the previous growth terminated and the last growth commenced. The last growth is discarded as the buds are somewhat immature, whilst those at the base of the previous growth are flat and likely to be blind, and therefore unsuitable. Those in the middle are full and well developed and ready to use.

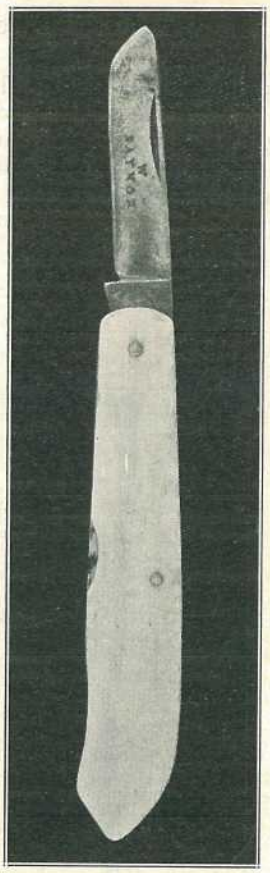


PLATE 55.
Suitable type of budding knife.

PLATE 56.
Method of holding budstick and of cutting the bud from below the bud up in the case of citrus.

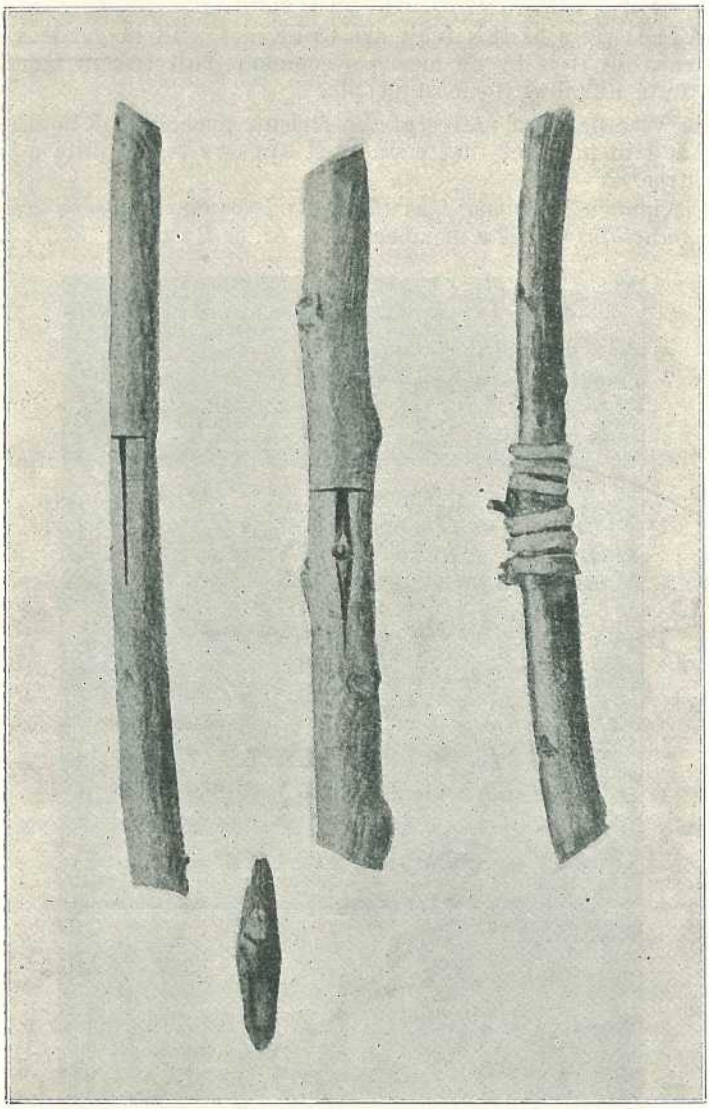


Fig. 1 Fig. 2 Fig. 3 Fig. 4

PLATE 57.

Fig. 1.—T-shaped cut in stock. Fig. 2.—Well-developed bud cut ready for insertion. Fig. 3.—The bud in position. Fig. 4.—Method of tying.

SOME TROPICAL FRUITS.

No. 6—THE WAMPEE.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

ISOLATED trees of this fruit are to be met with in gardens around Cairns, but it is by no means a common fruit tree in Queensland, and is quite unknown to most people.

The Wampee is a native of the Orient, probably of South-eastern China, and in parts of that country it appears to be quite a common garden tree.

It is known botanically as *Clausena lansium*, *Clausena wampi*, or *Cookia punctata*, and is a member of the order Rutaceæ.

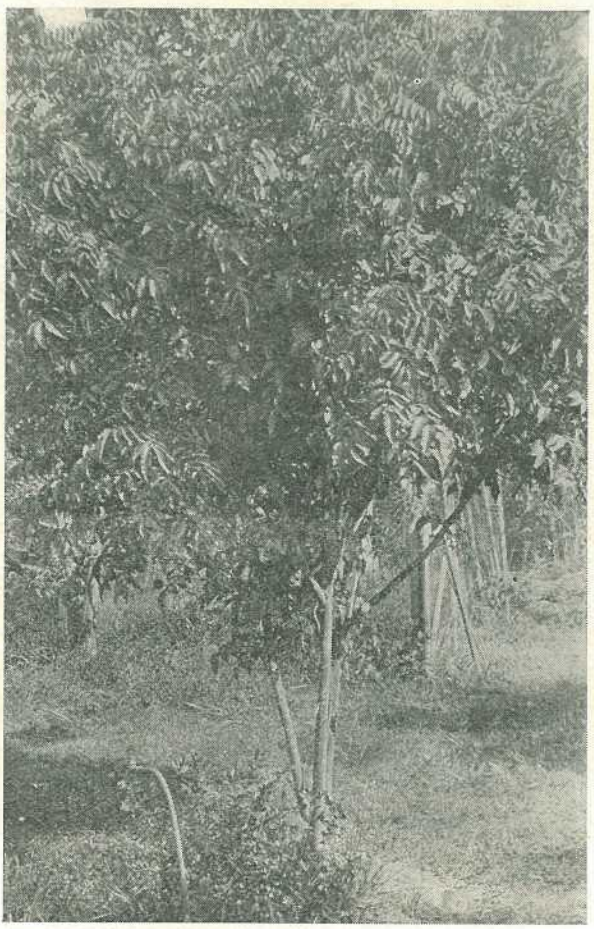


PLATE 58.
A seven-years-old Wampee Tree.

The tree is a fairly quick, upright growing one, with dense, dark green foliage. A characteristic is the long, upright branches, which are extremely flexible. The bark is grey-brown in colour and very raspy

to the touch. The leaves are compound and consist of nine to thirteen leaflets placed in pairs almost opposite and with one terminal leaflet, on a common petiole 7 to 9 inches long. The leaflets are ovate-lanceolate from 2 to 5 inches long, the length of each pair between the base and terminal being progressively greater than that of the preceding pair.

PLATE 59.
THE WAMPEE. Illustrating the fruiting habit.

The flowers are small and carried on green, raspy panicles arising from the terminal and sometimes three or four preceding axillary buds of the branches. The panicles may set and carry to maturity anything from six to eight up to about eighty fruit. Well-grown specimens of fruit attain to a size of about an inch in diameter. When young the fruit is deep-green in colour, and as it grows it gradually changes through light-green to yellow as it approaches maturity. This in turn changes to light-brown and finally to dark-brown as the fruit becomes over-ripe.

The skin is slightly pubescent and raspy, and is thin. The flesh or aril is clear, jelly-like and juicy, and slightly acid in flavour.

Enveloped in the flesh are the seeds, one to five in number. These are flat and oval in shape, about one-half inch long by one-quarter inch broad. About one-third of the seed at the upper or broad end is of dark-brown colour and the remaining two-thirds bright-green.

The tree is usually raised from seed, which germinate readily in a few days. Experiments in vegetative propagation have been carried out in the Philippines, where P. J. Wester has found that the tree may be shield-budded. He recommends the use of scarcely ripened, petioled budwood, from which a shield 1½ inches to 2 inches long should be cut. He states that the age of the stock at the point of insertion of the bud is unimportant.

This fruit is tropical in its requirements and thrives best on a rich well-drained soil. Plenty of moisture is needed to obtain good results. Light dressings of fowl manure are beneficial, both to the growth of the tree and the size of the fruit. The seedling tree will commence to bear at five or six years of age. In the Cairns district the tree blooms during July and August and the crop ripens in November and December. Both the fruit and the crushed leaves have a strong and distinctive scent, similar to that of a Brazilian Cherry.

The fruit is eaten fresh or may be made into jam or jelly. The jelly has a pleasing flavour, slightly acid and very distinctive. It is made similarly to grape jelly.

The Chinese, who are very partial to the fruit, have a method of preparation involving salting-down for about forty-eight hours, and they claim that fruit so treated has a better flavour than the fresh fruit and has the added advantage that it will keep longer.

FRUIT INDUSTRY IN NORTH QUEENSLAND.

QUARTERLY REPORT.

Mr. S. E. Stephens, Instructor in Fruit Culture, reports:—

IN the Cairns district the quarter ended 31st December, 1935, produced favourable weather conditions for the growth of the various crops. Other portions of the Northern area were not so fortunate, however, conditions in Townsville being almost disastrous.

In Cairns the rainfall recorded was 547 points in October, 291 in November, and 62 in December, which fell on eleven, thirteen, and two wet days, respectively.

Coastal centres visited during the quarter were Mossman, Port Douglas, Cairns, Babinda, Innisfail, Cardwell, Rollingstone, and Townsville. Tableland centres were Atherton, Herberton, Evelyn, and Ravenshoe.

Citrus.

Orchards throughout the North were found to be in reasonably healthy condition. In coastal orchards the cultivation frequently left much to be desired, whilst pruning throughout is very haphazard.

Trees throughout the Northern district carried a small late crop of fruit, which was harvested in the early part of the quarter.

The crop of oranges, mandarins, and lemons which set early in the quarter is developing well, and gives promise of a very fair harvest.

During December harvesting of the new season's lemon crop commenced in the Cairns district. The fruit being of good quality and the market under-supplied, these found a ready sale in an uncured state.

A small quantity of new season Naval oranges, fit for marketing, have been noticed in the Cairns area during the last fortnight of the quarter.

Pineapples.

Probably owing to the dry and hot conditions the pineapple crop in most parts of North Queensland matured rapidly and harvesting extended over a short period only. The Magnetic Island harvest lasted for approximately four weeks and was practically completed by mid-December. In Rollingstone district harvesting commenced in late November and will now be almost over. The Cairns season commenced in late October and extended to Christmas. The crop was a good deal lighter than that harvested last year. The size still continues small, even in young areas, most of which have been planted on used land without any addition of fertilizer. The industry in Cairns is in the hands of Chinese, who cannot be persuaded of the benefit to be obtained from feeding the crop.

Bananas.

The banana industry is now so restricted that some Northern centres have found it necessary to purchase supplies of fruit from the South. Planting during the year 1935 shows an increase over 1934, the figures being 33 acres in 1935 against 18 acres in 1934. There is room for further expansion to meet local demands. The general quality of fruit marketed is still very poor.

Mangoes.

The mango crop this year was fair, but in most districts the fruit was somewhat below normal size. This was particularly noticeable in the Magnetic Island area, where total absence of rain since the setting of the fruit adversely affected its growth.

Cairns district, on the other hand, had fair spring rains and the mangoes were up to the average in size.

The search for good mangoes in the North has been continued and has produced several trees of good quality, from which it is hoped to carry out propagation work.

Papaws.

These were in fairly plentiful supply and were of excellent quality. Several plantings of young trees have been made around Cairns during recent months.

Litchis.

The promise of a good crop mentioned in last report was not materialised. Only odd trees carried fruit. What fruit there was, however, was of good quality, and was selling in local shops at 3s. 6d. per lb.

Avocados.

A number of trees throughout the Northern district are carrying fruit this season.

Miscellaneous Tropical Fruits.

Sugar Apples, where pruned and cultivated, are carrying good crops of fruit, which is developing well. On neglected trees the fruit is generally somewhat stunted.

Wampees have carried heavy crops which are now almost finished.

The Cashew is ripening its crop.

Breadfruit, Jack fruit, Mabolo, Carambola are all carrying crops.

Several other tropical fruits are blooming.

Temperate Fruits.

The grape crop in the Tableland districts is generally good.

The plum crop is good, but rather late on account of a late frost having cut the first crop of blooms, causing the trees to throw a second crop, which set well and ripened during December. Fruit Fly became prevalent towards the end of the month.

Persimmons are carrying a heavy crop.

Tung Oil.

Trees in the Queensland Forest plantations in the Innisfail district bloomed during the quarter and have set a better crop than was obtained last year.

PINEAPPLE-GROWING IN HAWAIIAN ISLANDS.

By JOHN DUTHIE.

Mr. John Duthie, Manager of the State Cannery, Brisbane, visited Hawaii recently to investigate canning methods. In the course of his three weeks' stay in the Islands, he took the opportunity of looking into production methods, and has kindly supplied the following notes concerning his investigations.

PINEAPPLES are grown on the following Hawaiian Islands:—

	Acres.
Oahu	43,000
Molakai	12,000
Maui	15,000
Lanai	18,000
Kauai	5,000
	93,000 acres ap.

The rainfall varies between 10 and 100 inches per year, average about 50 inches per year. It rains mostly at night, good steady rain. There are distinct dry areas on the different islands and trial plantings, rain registrations, and soil analysis are first made by the Association of Hawaiian Pineapple Canners, University of Hawaii, Honolulu. In some instances only 10 inches of rain per year may be registered but they get heavy dews, which with the use of paper mulch would give the plant the necessary moisture.

The temperature varies between 70 and 90 degrees.

Pineapples are grown from 900 to 3,000 feet above sea level. Sugar cane is grown on the lower levels where irrigation is practicable. Pineapple plantations on the Island of Oahu are situated near Kipapa, 20 miles from Honolulu. These plantations would be about 1,000 feet above sea level and the ground generally consists of easy slopes. The main road passes through for 6 miles with pineapples either side, not even being fenced off.

PLATE 60.
Twelve-months-old pineapple plantation in Hawaii.

Soil.

The soil is all volcanic and is red in colour, and also sticky when wet. Analysis show that it contains up to 40 per cent. of iron, but owing to the presence of manganese the plant cannot get it, hence the use of a sulphate of iron spray. It is considered that it does not pay to work less than 40 acres in one plot. The canners all grow their own fruit, and use 70 h.p. Deisel tractors to plough and work the soil. These tractors cost 7,500.00 dollars. Deisel oil costs 7 cents per American gallon.

In the repreparation of a pineapple plot—that is when the crop cycle is considered spent—a high powered pulverizer is driven through the fields, and the old plants shredded up and worked back into the soil. This land is spelled for two years, and periodically the soil is turned up to the sun, which helps to kill soil pests. They do not now plant any other crops, as they consider that this will only encourage pests and diseases. Iron spikes 18 inches to 24 inches are used for subsoiling. Care is taken not to turn up the subsoil to the surface.

Planting.

First of all the ground is surveyed and the intended rows are marked off with poles or pegs. Attention is given to the fall of the ground in case of heavy rains which would bring about wash-outs also to provide suitable drainage. A border line say approximately 20 feet wide is pegged all around the main plot. This would be used as a border

planting. Then a road 10 feet wide is made between the border and the main plot. Pests, particularly mealy bug, would get in here first before they came to the main area. A rigid watch is kept on this border planting. In some cases a strip of 6 x 1 hardwood is placed outside of this again. A machine keeps this timber sprayed with creosote. In Hawaii all pineapples are grown with the aid of paper mulch. The ground all being pegged out, the mulch is run out by a machine. This mulch costs two and a quarter dollars per roll, the roll being 600 feet long and by 3 feet wide.

Two row planting is the favourite method and evidently gives the best results.

	Inches.
Width of paper	36
Between rows of paper	30
Between 2 rows of slips of paper	26
Between a row of slips	12
Plants to the acre	15,800

It has been found that by setting out this number of plants per acre, fruit of good but not over-large cannery size is obtained with maximum yields of fruit and minimum weed growth.

Slips or nibs are used, if obtainable, and are fumigated if necessary before planting. I understand that their plants throw slips both summer and winter. They favour planting in November-December, which is early winter, so that the first crop would come in the summer.

If a planting is successful they have a main plant crop (summer and winter) and two ratoons so that the cycle is 4 to 5 years. A fair average cycle is 45 tons of fruit per acre but the production goes as high as 100 tons per acre.

Fruit costs from 12.00 dollars to 25.00 dollars per ton at the Cannery.

Manuring.

Sulphate of ammonia is used as a fertilizer and sulphate of iron as a tonic to counteract the harmful effects of excessive manganese in the soil. I understand that with the exception of scrub soils in the Mary Valley, Queensland pineapple soils do not contain harmful quantities of manganese. Shortly after the slips have taken root a small quantity of sulphate of ammonia is placed in the base leaves. Care is taken in this application so as not to injure the centre of the plant. This application is probably the most important one, as it tends to give the plant a good start off. The plants are then sprayed with sulphate of iron, 25 lb. of this being diluted in 100 gallons of water. It has been proved that both iron and ammonia are necessary in Hawaii, and the one does not give the same results without the other. About two months before the plant crop (which takes 18 months with slips) 400 lb. per acre of sulphate of ammonia not diluted is placed in the base leaves and another 400 lb. two months after the crop. You will notice that I have not mentioned any fertilizers for the soil.

Fertilizing through the axils of the basal leaves is necessary, because the soil around the plants is covered with paper mulch, which is impervious to water. Little potash or phosphoric acid is applied to pineapples in Hawaii, since their soils are mostly well supplied with both these plant foods.

Grading and Trimming.

Fruit is carried to the end of rows in bags slung over the shoulders. The tops are then cut off slightly into the fruit and the base trimmed, there then being no sign of any leaves whatsoever. Fruit would be three-quarters to fully coloured. Only good fruit is graded into the crates, badly fanned types being absolutely discarded. The grades are similar dimensions to ours, but the No. 4 or large size would be 70 per cent. of the total crop. The tops are left to dry at the end of rows or if they become too plentiful and a nuisance broken up by a shredder.

Crates.

Inside measurement—Length, 18¼ inches; width, 14¾ inches; depth, 12¼ inches. This crate holds 56 lb. of fruit. The different canneries own their own crates.

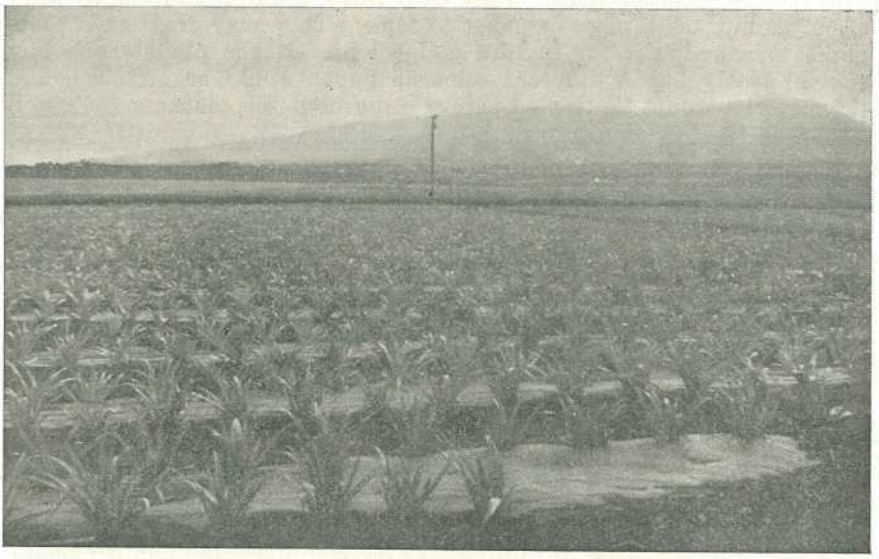


PLATE 61.

Newly planted pineapple field in Hawaii, showing use of paper mulch and method of setting out rows.

Pests and Diseases.

Mealy Bug and Nematode.—The chief cause of wilt in Hawaii is attributed to the mealy bug, and the industry was badly hit until a spray was found to effectively combat it. It seems that this bug is carried from one plant to another by an ant which fosters it and feeds off it. Where you find mealy bugs you will also find the ants.

Spray.

All oil spray to combat mealy bug wilt was patented by the Standard Oil Company, and was sold at 30 cents per gallon. A spraying machine with high powered mixer was also invented. These machines spray up to 450 acres per day, doing 32 rows at a time, 8 men each side. It takes a big pressure to displace the mealy bug from the eggs, and she generally gets at the base of the leaves and stems. In fact, the ants will pack soil

or dry grass around them to keep them away from the sun which will destroy them if exposed too long. The machine gives a pressure of 300 lb. and up to 150 lb. at the nozzle.

Nematodes.

Under a magnifying glass these pests resemble tiny eels. Two types of fungi have just been discovered which are parasitic on nematodes. I do not think that either of these fungi have been cited as a positive cure for this pest as yet.

Plant Selection.

This also plays a big part in fruit production. As I mentioned before, practically all slips are used as planting material, and when the crop is on workmen are detailed to mark off the different plants which give the best type of fruit. They each carry a knife, and simply split a leaf and attach a piece of paper to same. They may even cut a pine-apple to examine it for texture and colour. If the plant shows any sign of mealy bug a different coloured paper would be attached, and the material would be treated before being used for planting.

It is claimed that yields have been increased five to six tons per acre solely through systematic plant selection. In this, as well as in every other direction, the pineapple industry in Hawaii is endeavouring to reduce production costs by increasing yield per acre.

Conclusions.

My observations show that our Queensland pineapple-growers would be wise to give serious consideration to the following:—

1. Plant Selection.—This can be done by planting or otherwise marking plants bearing unsuitable and poor-quality fruit, and taking care that no planting material is taken from these plants.

2. Fumigation or dipping of all planting material to ensure the destruction and prevent the spread of mealy bugs at the start.

3. Follow more closely the Hawaiian method of close planting. This will eliminate a lot of unnecessary labour in keeping non-producing ground free from weeds.

4. Follow the Hawaiian practice of using quick-acting chemical fertilizers and, where manganese chlorosis occurs, spray with sulphate of iron and sulphate of ammonia.

CARE OF THE SEPARATOR.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, bucket, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

DRENCHING FOR WORMS IN SHEEP.

The Secretary for Agriculture and Stock (Hon. Frank W. Bulcock), has made available the subjoined memorandum on drenching for worms in sheep by Mr. F. H. S. Roberts, Entomologist, Animal Health Station, Yeerongpilly:—

IN recent years carbon tetrachloride has been used extensively throughout Queensland as a drench for stomach worms in sheep. The drug has proved very effective for this purpose, but in several instances, its use has been followed by moderate to heavy mortalities. Within the past two years examples of this toxicity have been very conspicuous, due most probably to the more extensive use of the drug. In other parts of Australia, similar mortalities among sheep drenched with carbon tetrachloride have also been experienced, notably in New South Wales.

The actual cause of these mortalities remains, in the majority of cases, undefined. In so far as sheep are concerned, a calcium deficiency is known to be predisposing condition to susceptibility and by feeding a lick containing the necessary element for some time before drenching the drug may be given without any subsequent ill-effects. Other conditions which may be concerned with toxicity are said to be cold, bleak weather, a sudden drop in temperature after drenching, the feeding of concentrates, and hard feed. There are many cases, however, which remain unexplained. Impure samples of the drug itself may be conducive to losses, but it is pointed out that, on several occasions in Queensland where losses have followed the use of carbon tetrachloride, a sample of the drug used has been proven to be pure and moreover, its use on sheep at this station, has not been followed by any untoward results.

At the present time, there are no precautions which may be taken so that carbon tetrachloride may be used with safety. Cases are known where this drug has been used over a long period without any subsequent noticeable toxicity, and then, for some unknown reason, heavy losses occur. These losses have become so serious that it is felt that the drug can no longer be recommended.

For the sheepman, who, despite this warning, still desires to use carbon tetrachloride, it is most desirable that a small number of animals be treated a few days before the mob and carefully watched for any ill results. Even this precaution may not safeguard against losses, as one case is known in which two mobs of sheep on the same holding were drenched with the same sample of carbon tetrachloride a few days apart. No symptoms of toxicity occurred in the first mob, but heavy losses were experienced in the second mob.

Carbon tetrachloride owes its widespread use to its great degree of effectiveness and ease of administration. The dose is small, five cubic centimetres, and no previous starvation is required. Bluestone is not quite so effective as carbon tetrachloride, and it was at one time considered that previous starvation was necessary to its efficiency. Recent work by the C.S.I.R., however, has shown that such starvation is not required, and that moreover if Blackleaf 40 is added to the bluestone, the mixture is highly effective against both stomach worms and hair worms. From results secured with a somewhat similar combination in other parts of the world, the mixture recommended in Australia should be effective against tapeworms also.

In this bluestone and blackleaf 40 drench we, therefore, have a vermifuge which is effective against three different sorts of worms, is cheap and very safe. Carbon tetrachloride is effective against stomach worms only and cannot be regarded by any means as being safe. It is also dearer than the bluestone mixture, and the only feature in its favour is the comparative ease of administration.

The formula and dosages of this bluestone in blackleaf 40 drench is as follows:—

Bluestone	1 lb.
Blackleaf 40	16 fluid oz.
Water	5 gallons

Dosages.

18 months and over	2 fluid oz.
12 months-18 months	1½ fluid oz.
4 months-12 months	1 fluid oz.
Under 4 months	½ fluid oz.

In country where liver fluke is present, carbon tetrachloride is by far the best drug that can be used against this parasite, but fortunately, liver fluke is not present throughout any of the sheep districts in Queensland. There is, therefore, no reason why carbon tetrachloride should continue to be used as an anthelmintic for sheep in this State, whilst we have at our disposal this bluestone-blackleaf 40 mixture, which is cheaper, decidedly safer, and more effective as an all-round vermifuge.

BRITISH DEMAND FOR PORK.

Reports received by the Commonwealth Department of Commerce indicate that there will be a fairly strong demand in Great Britain this season for Australian frozen pork. About 900 carcasses were shipped from Melbourne on 22nd November. The chief veterinary officer of the department in Victoria (Mr. Ross Grant) said on 21st November that there had been a general improvement in the quality of pork for export in the last three years. There was now a steady market in Great Britain for frozen bacon pork weighing from 100 lb.

The Dairy Produce Acts.

By G. B. GALLWEY, Inspector of Accounts.*

THE present Dairy Produce Act was passed as far back as 1920. Although it was then considered to be one of the most advanced and comprehensive works at that time, changed conditions and the march of science have made it necessary to have this Act reviewed.

In order to find out what was in the mind of the industry itself in the various matters which are subject to regulation, conferences of both the butter and cheese sections were held recently when the many aspects of the industry were discussed and resolutions suggesting alterations and additions to the original Act were passed.

The Department has now given further consideration to the whole matter of an improved Act. This has resulted in the passing of some important amendments to the Act, and these became law on the 5th of December.

The regulations are now being reorganised with a view to including those matters suggested by the industry and also to improve the existing ones. The object generally is one of quality uplift which means that in the interest of the farmer and the State some tightening up of the old regulations is both desirable and necessary.

Under the old Act some of the buildings on a dairy farm were not defined or else were defined as a building and a yard. Consequently there was always some doubt concerning these. However, by amendments the following are now clearly set out and defined in the Act:—

Bail, Milking Shed, Milking Yard.

The system of registering dairies has been changed. Under the old Act a dairy could not be registered unless the premises complied with the Act, and once a registration was granted it remained in force for all time.

The fact that many could not wholly comply and were not registered hampered administration and seriously affected the operations of other regulations.

The amending Act gives power for every dairy to be registered upon application, irrespective of its condition, and the registration then remains in force until cancelled, which power is vested in the Minister. The provision that any dairy may be closed by an Inspector is being strengthened.

These alterations do not mean that there will be less control over dairies than formerly. Actually the more direct action in the case of unsatisfactory produce being produced should hasten improvements, for the power to cancel a registration exists, and if that power is used it means that the dairy can be closed and the product prohibited from being sold for any purpose.

Further, should a dairy farmer persist in an attitude that work, which is considered for the good of the industry, should not be done, the Act has very definite powers that can be used.

---

* In a radio broadcast from Station 4QG, through the courtesy of the Australian Broadcasting Commission.

Any person who sells milk for local consumption must first have a license from the Health Department, and though his premises may be registered under the Dairy Produce Act it will be necessary for a certificate to be issued by an Inspector that the premises comply with the requirements of the Dairy Produce Act.

Provision has been made under this section of the Act for advice to be furnished of any transfer of a dairy.

A new section has been inserted to give more complete control over swine on dairy produce premises.

The audit powers of the Act have been strengthened by prescribing the books and accounts to be kept at a factory.

Section 16 of the Dairy Produce Act has been amended by the inclusion of three new clauses, the first fixes the method of payment for milk at a factory, the second prohibits the diversion of milk or cream from a factory without giving twenty-eight days' notice, and the third provides for returns to be furnished each month to the Under Secretary by a factory showing its manufacture, payment, and disposal of any dairy produce as defined by the Act.

The second amendment, the diversion of supply, is the most important from the farmers point of view. The clause is divided into three parts and deals first of all with cream. It says that no dairy farmer can transfer the whole or any portion of his cream from one factory to another until twenty-eight days after he gives notice to the factory.

It does not stop a farmer from leaving a factory, but it does stop him from making a transfer without first giving notice.

However, it must be obvious that in the interest of quality and economy the dairyman should send his supply to the nearest factory. This clause will give him time to consider and will also provide an opportunity for the Department to investigate the position as there are many instances where a change is now made on the slightest pretext. I might mention that the dairy farmer can always have his interests protected by applying to the Department.

The same conditions apply to a milk supplier to a cheese factory who wishes to transfer the milk to another cheese factory, but if he wishes to cease supply milk and supply cream to a butter factory, he must also have his dairy premises in compliance with the requirements of the Dairy Produce Act. A supplier shall not, however, be guilty of an offence if he can prove that this supply was diverted on account of circumstances over which he had no control.

Factories will also be required to furnish the Department with a return showing the names and addresses of suppliers who have commenced or ceased to suply during the month.

The Department will thus have a record of all transfers of supply, and where it is found the owner has failed to give the necessary notice definite action will be taken against such persons.

A very definite step in the control of transport of cream by road has been made by Section 16B of the amending Act.

The Act did not previously deal with transport arrangements, and as a result much overlapping in road transport is occurring in many localities. The new section provides for the proclaiming of certain roads

as cream routes. Factories will be empowered to call for and accept tenders for these routes. Subject to the carrier's equipment complying with the Act the Minister may issue a license if he approves of the terms and conditions. The intention is that the carrier will have to give an adequate service and in turn he will be protected from competition.

Under existing conditions a carrier may work up a good run and be giving service, yet he had no protection from competition. Any person with any sort of equipment could start in opposition and cut the rates of cartage, during peak periods, and spoil the work of the man who had established a satisfactory service. There is definite evidence that road transport has been used to increase inter-factory competition. Therefore this section has been designed to eliminate such evils and give a better service all the year round.

No person can run on a proclaimed cream route without a license and no factory can accept cream from a carrier who has no license. This does not prohibit a farmer from carting his own cream, but he cannot carry his neighbours' cream along a proclaimed route.

This may appear to be arbitrary, but if a carrier is prepared to provide a regular service it can only be successful if such a service is supported by all the dairymen. Of course there will be many places where it will not be possible to have proclaimed routes, and these will not be disturbed except that the conditions under which cream is to be carried will be tightened.

It may be pointed out that before this section can be put into operation regulations are necessary. These are in the course of preparation, and cover the following:—

Specifications of vehicle for cartage of dairy produce and the conditions to be fulfilled by a carter, who is licensed to carry dairy produce.

The Minister may appoint a Committee to investigate and report to him on any question or dispute of any nature on transport.

He may adopt the whole or part of the recommendation of the Committee and take any action he thinks fit regarding routes and the issue of licenses.

By an amendment of Section 17 the grades into which cream shall be classified have definitely been fixed and the grades of milk stated.

The power of a factory manager has been strengthened by Section 19 dealing with cream unfit for the food of man. Formerly he could only reject cream which was putrefactive, now he can reject any cream which he considers unfit for human food. He cannot destroy the cream but can colour it with cochineal or lamp black and return it to the supplier.

Section 20 has new clauses included, one fixes the standard for processed cheese, and another prescribes that milk shall be delivered by a fixed hour at a cheese factory.

This hour will be fixed by regulation. The section also prohibits the owner of a factory from buying or receiving milk or cream which does not comply with the standards prescribed.

Section 23 requires that butter or cheese makers must have the qualifications and pass the examination prescribed and hold a certificate. It also provides for the recognition of certificates obtained in other States of the Commonwealth or New Zealand.

By amending Section 31 the penalty for offences has been made uniform and shall not exceed £30.

To give power to make regulations under the sections that have been amended, the schedule has been amended accordingly.

The regulations have been carefully prepared and the field officers of the Dairy Branch have discussed them and are of the opinion that the regulations will do much towards the uplift of quality and incidentally assist the industry generally.

It is regretted that time and the fact that the Regulations have not been gazetted does not allow of a more detailed explanation.

However, let me conclude by assuring those interested in the industry that the earliest opportunity will be taken of outlining the principal changes and alterations.

RURAL RELIEF.

WITH the passage, through the State Parliament, of "*The Farmers' Assistance (Debts Adjustment) Act of* 1935," legislative authority has been provided for the distribution of Queensland's share of the Commonwealth fund provided for rural rehabilitation. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) has announced that necessitous farmers may now make application for assistance under the scheme. The moneys can be used only for the adjustment of debts, and an advance may only be made to a farmer who successfully arranges a composition of his debts or enters into some other suitable scheme of arrangement involving compounding with his creditors. This is a provision of the Federal Act, and the State's legislation is complementary to that of the Commonwealth. Applications for purposes other than compounding of debt cannot therefore be considered by the Rural Assistance Board. Debts and liabilities due to the Commonwealth or a State cannot be brought under the scheme, but rates to a local authority may be included in a composition or scheme of arrangement.

The scheme in Queensland will be administered by the Rural Assistance Board, using the machinery of the Agricultural Bank, and application must be made on the prescribed form. Any farmer desiring information concerning the scheme, or an application form, may obtain it on request direct to the Board. All inquiries must be addressed to the Registrar, Farmers' Rehabilitation Scheme, care Rural Assistance Board, Box 38A, G.P.O., Brisbane.

The Minister further explained that any person engaged in farming operations is eligible to apply for assistance. For the purposes of the Act "farming operations" include farming, agricultural, horticultural, pastoral or grazing operations, dairy farming, poultry farming, bee farming, and viticultural operations.

Bureau of Sugar Experiment Stations.

Review of Annual Report.*

Sugar Statistics.

Crop of 1934.

A review of the sugar yields for the 1934 season shows that some 612,570 tons of 94 n.t. sugar were produced in Queensland. The cane crop amounted to 4,270,000 tons, harvested from 218,426 acres. This gave an average yield of 19·56 tons of cane and 2·80 tons of sugar per acre, and 6·97 tons of cane were required to make a ton of sugar.

A study of the yields for the past thirty-five years shows the remarkable improvement in mill and farm efficiency which has been effected during the periods. The average values for 5-year periods are shown by the accompanying graph (Fig. 1).

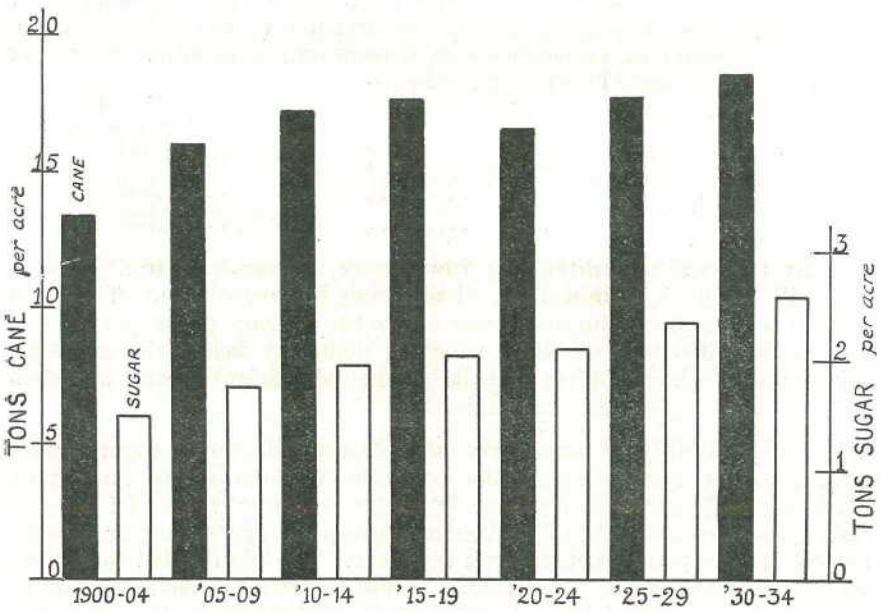


PLATE 62.

FIG. 1.—ILLUSTRATING THE IMPROVED ACREAGE YIELDS OF CANE AND SUGAR FOR THE PERIOD 1900-1934.

While cane yields have fluctuated somewhat, they show a distinct upward trend. The improvement in sugar yields is, however, most striking. From an average of 1·5 tons per acre for the period 1900-04, the figure has increased consistently until for the final period (1930-34) it attained the value of 2·60 tons; while for the years 1933 and 1934, the yield was 2·80 tons per acre. An analysis of the causes contributing to this improvement shows that it is due in almost equal proportions to improved field practices and increased mill efficiency.

* Reprinted from the current "Cane Growers' Quarterly," published by the Bureau of Sugar Experiment Stations.

Economic Review.

The end of the steady increase in acreage yields—which appear to be largely independent of the season—is not yet in sight. Each year more farms are brought under irrigation, and farmers are applying their knowledge of fertilizers and their use to greater advantage than ever before; while the full possibilities of the newer, disease-resistant, high-yielding varieties have still to be realised.

All these factors contribute their quota to a permanent downward trend in production costs; but, unfortunately, they are largely defeating their purpose through the failure of the grower to reduce the area planted to the crop, in proportion to the increased acreage returns; and this simple and obvious remedy for the present ills of surplus production becomes annually more difficult of accomplishment. Reduced costs are possible only where the production per grower exceeds a definite minimum tonnage, the magnitude of which must increase as the value of sugar falls. Moreover, the farmer finds it necessary to provide for his growing family; and whereas formerly, his sons were able to acquire blocks of new land on which to cultivate cane, the present assignment restrictions now necessitate further subdivision of the existing farm. That the number of canegrowers in Queensland is steadily increasing is evident from the following statistics:—

Year.	No. of Canegrowers.
1932	7,231
1933	7,386
1934	7,426

The average sugar tonnage which each grower may contribute to the mill "peak" is, therefore, diminishing in proportion. This is a serious matter in certain mill areas where the average quota per grower is less than 300 tons of cane, which is definitely below the economic minimum on which a farm may be conducted efficiently, and a system of permanent agriculture maintained.

The possibility of any early improvement in world sugar values is still remote, and each year the available free market for the export production of countries such as Australia is contracting. In August last, the signatories to the Chadbourne Agreement agreed not to attempt to prolong the plan which expired this year. The plan failed to achieve its full purpose, due to the action of those countries outside the Agreement, which increased their production in proportion to the restricted output. Certainly visible stocks have been very substantially reduced during the currency of the Agreement. It is realised, however, that something further must be done to stabilise the industry. The United States of America recently took measures to restrict domestic and insular production to actual requirements, while a trade treaty was entered into with Cuba, which country gained an increased sugar preference in the American market. In London, the International Sugar Council called a conference in March last, which was attended by representatives of the important sugar-producing countries of Europe, and also of the United States. Although this Conference failed to formulate a generally acceptable and constructive plan, appreciation of the need for concerted action is evidenced by the desire for a further Conference at an early date. As a preliminary the British Government has arranged

for a full discussion of the relationships between the Home country and her sugar-exporting Dominions, with a view to formulating a policy for the British Empire. The Conference will be held early in 1936, and Australia will be represented by a nominee of the Federal Government, while the Premier of Queensland (The Hon. W. Forgan Smith) will personally attend on behalf of the Queensland sugar interests. The present preference granted to Dominion sugar by the Government of the United Kingdom will continue until August, 1937—that is, for a further Queensland crop year. Any unfavourable modification of the present policy would be accompanied by serious results for at least a section of the Queensland sugar-growers; though it is not profitable to produce sugar at present overseas values, the loss of the British market and preference would necessitate the immediate reduction of production to the bare domestic requirements of this country; the consequences of such precipitate action need no recapitulation.

The announcement by the Federal Prime Minister that the Australian Sugar Agreement will be renewed for a further period of five years brings to the industry a measure of reassurance, and demonstrates in no uncertain manner that the Federal Parliament is appreciative of the national importance of the sugar producer. It now rests with the industry to take such measures as will effect a sustained policy of rationalisation, and thus establish the business of sugar production on a firmer economic basis.

Bureau Affairs.

Advisory Board.

The Advisory Board met on four occasions during the year, when matters of major importance were dealt with. The decisions of the Board are definitely playing a very important part in shaping the policy and guiding the activities of the Bureau.

The Board has paid very close attention to staff matters, and steps have been taken to make such appointments as will provide a balanced staff of competent officers in all fields of sugar technology. The weaknesses on the mill technology staff have been overcome to a large extent by the decision to appoint a Consulting Mill Engineer and a further Assistant Mill Technologist. The question of the efficiency of pest control was also dealt with, and the Board decided that a meeting of representatives of North Queensland Pest Boards should be called in Townsville, under the Chairmanship of Mr. A. F. Bell, to formulate plans for future co-ordinated effort. It was also agreed that Mr. W. A. McDougall, Assistant Entomologist, be delegated the duties of an intensive study of the life history and habits of the rat, for the purpose of devising more adequate measures of control.

A question which has also received careful consideration is that of the utilization of by-products in the industry, and extensive enquiries are being pursued for the purpose of obtaining information on the more adequate utilization of these materials.

Transfer of Experiment Stations.

During the year the building programme at Meringa was finalised. This Station is now equipped with adequate laboratory space for chemist and entomologist, a glasshouse has been provided for seedling work, and an irrigation plant for watering seedling canes and irrigation

experimentation. It has been possible also to electrify all power units from the Cairns Hydro-Electricity supply. The Station was officially opened on Friday, 13th September, 1935, by the Minister for Agriculture and Stock (The Hon. F. W. Bulcock), in the presence of the Advisory Board, on the occasion of the visit of the delegates to the International Society of Sugar Cane Technologists' Fifth Congress.

Good progress has also been made with respect to the transfer of the Mackay Station to its new site on portion of the Palms Estate, Te Kowai. The buildings are practically completed, and early in the new year the Station will be in full working order. The old Station was disposed of as a special lease, and the improvements, which were the property of the Bureau, were taken over by the lessee for a cash consideration. The new Station presents many problems which are common to a large area of the Mackay canelands, and it is felt that much useful work will be done at this centre.

The Bundaberg laboratory has been equipped to enable the resident Soil Chemist to carry out routine and investigational chemical work; this officer is also making a special study of irrigation matters, with particular reference to the duty of water. New stables and implement buildings will be constructed during the current financial year, utilizing as far as practicable materials from the existing collection of outhouses and farm buildings.

Irrigation Experimentation.

The first irrigation trial on a field scale, to be carried out by the Bureau, was harvested on the Bundaberg Station during the current season. This is merely the forerunner of a series of controlled experiments which should provide us with much valuable information concerning this phase of sugar-cane agriculture. Our water reserves are, unfortunately, not as extensive as one would desire, but they serve for a modest experimental block or two, in addition to taking care of the young original and selected seedling canes at that centre.

At the present time arrangements are being made for the installation of a rather larger pumping plant at Mackay, while the 3-inch pump at Meringa is operating successfully.

During the year the installation of a spray irrigation system was completed in the Burdekin district. Improved sprinklers, each capable of irrigating one-third acre, were employed, and reports to hand suggest that it gives a satisfactory spread. The trial block is intended as a means of studying the influence of variations in the rate of water application and fertilizer treatments, rather than as a spray system *per se*. It is electrically operated, and is under the direct supervision of the Field Assistant, Mr. A. P. Gibson.

Seedling Propagation.

The continuity of the work at the Northern and Central Stations has been disturbed somewhat by the change in the location of the respective Stations. More serious was the unduly low proportion of arrowing experienced at Freshwater during the past season; many of the canes failed to arrow, while others gave little seed.

A number of promising canes have now been selected for field trial on all three Stations, from canes bred during the past few years. In

the North, a number of Q series seedlings have been placed in yield trials on selected farms, while three of the most promising seedlings raised at Mackay are now in a plot trial at that Station. In Bundaberg, the final selections of the coming year will be similarly dealt with.

Some 25,000 new seedlings were planted in the field during the spring of 1935.

Work of the Experiment Stations.

Meringa Station.

As only sufficient land was available at Meringa for seedling propagation and the production of stocks of disease-free Badila for future plantings, no experimental plots could be planted. This will be effected, however, as the forest is cleared and the land is brought under the plough.

Mackay Station.

With the vacating of the old Station, it was necessary to speed up the harvest of the standing crop, and only one experimental block was harvested plot by plot. This was the trash conservation trial. The results did not reveal any increased yield benefits due to the treatment, but the piece of land on which the trial was conducted showed very pronounced variations. One point of interest, however, was the very decidedly improved c.c.s. value for canes from the trash-treated plots; this was 1·2 units higher than for the untreated cane, and while it appears to be significant we are at a loss to determine the true explanation.

On the Te Kowai site, a seedling trial and a qualitative fertilizer experiment were set out, and further trial blocks will be planted in the coming year. It will be possible to carry out our experimental work much more effectively than at the old Station, due to the absence of gross soil variations which marred many of our previous trials.

Bundaberg Station.

A series of interesting trials were harvested from the Bundaberg Station during the 1935 season. These embraced certain of the new disease-resistant canes, and the improved yields over the old standard (Q. 813) is reflected in average tonnage per acre for the entire Station, which this year rose to 22·65; having regard for the unfavourable season experienced, this is decidedly satisfactory. The following comments are offered on the individual trials:—

Irrigation Trials.

It will be recalled that an area of the Station was devoted to a small-scale irrigation trial, to demonstrate the value of liberal watering and manurial treatment on the red volcanic loam of the Bundaberg area. The results of the plant crop were reported last year, and the

first ratoon yields are now available. The following is a summary of the two crops:—

	Plant Cane.	First Ratoon.
Cane, tons, per acre	93·4	72·8
C.C.S. in Cane, per cent.	12·1	13·0
C.C.S., tons per acre	11·3	9·5

These results demonstrate beyond doubt the value of irrigation on this soil type, with a cane variety such as P.O.J. 2878. Over the two crops 166 tons of cane per acre were harvested, which yielded almost 21 tons of c.c.s. per acre. The trial will be continued to the second ratoons.

The first field-scale irrigation trial to be harvested on the Station was conducted during the past season. The variety was P.O.J. 2878, and the trial was set out to determine the relative value of *cane furrow* v. *interspace* watering. Though the former produced a somewhat heavier crop, the yield increase (2·2 tons of cane) did not compensate for the extra water required. The average crop was 44 tons of cane per acre, and no water was available until February.

Trash Conservation Trials.

Two trials of this nature were harvested during 1935. The first was designed to show the relative value of *volunteering* v. *relieving* v. *rolling* v. *burning;* as was the case in 1934, no treatment showed any definite superiority.

The second trial was harvested from the permanent trash plots which were established two years ago. The variety was Q. 813—a first ratoon crop following a heavy plant cane harvest. The excessive body of trash which had been rolled into alternate interspaces was definitely responsible for a poor ratoon on the trash plots, and a crop loss was actually recorded due to the treatment. This should not be interpreted as evidence against the practice, but rather as demonstrating the necessity for a vigorous ratooning variety where trash conservation is desired.

Varietal Trials.

Two varietal trials embracing the new, gum-resistant canes which are now becoming popular in the southern areas were harvested. One of these was a second ratoon crop, in which the outstanding superiority of Co. 290 and P.O.J. 2725 over the standard Q. 813 was clearly demonstrated. The following is a survey of the yields for three crops of these varieties:—

Variety.	Plant Cane.	First Ratoon.		Second Ratoon.	
	Cane per Acre.	Cane per Acre.	C.C.S.	Cane per Acre.	C.C.S.
	Tons.	Tons.	Per cent.	Tons.	Per cent.
Co. 290	22·8	49·4	15·1	36·2	14·5
P.O.J. 2725	16·8	48·1	17·2	24·0	16·2
Q. 813	9·3	17·8	14·1	11·5	13·0

It is not necessary to emphasise the value of these drought-resistant canes which produce consistently satisfactory crops on the dry red volcanic loam. While they yielded heavy ratoon crops in both years, the Q. 813 ratoons were virtually a failure.

The second trial (first ratoon) included a further series of new varieties; the yield differences between the standard (Q. 813) and the best of the selection were more pronounced than was the case with the plant crop. U.D. 1 and 39 were definitely superior to Q. 813, but it is doubtful whether either is superior to P.O.J. 2725 or Co. 290.

Time of Application of Sulphate of Ammonia.

It is the policy of the Bureau to advocate the early application of manures, and it is considered that sulphate of ammonia top dressings should be applied when the plant cane is stooling vigorously. The influence of time of application of ammonia was tested with a crop of P.O.J. 2878. The following were the yields for the respective treatments:—

Time of Application of Sulphate of Ammonia.	Cane Yield.
	Tons.
1. In planting furrow	21·2
2. Half in furrow, half in October	21·0
3. One-third in furrow, one-third in October, one-third in December	20·3
4. One-third in November, one-third in January, one-third in March	19·3

Though the reduction in yield due to the later applications is not highly pronounced, it is anticipated that the ratoons will supply more definite figures.

Cultural Trial.

A combination trial with P.O.J. 2878 was set out, to determine the value of subsoiling, cultivation, and interspace distance with the new variety. Any benefits from subsoiling were not apparent, which is in agreement with our previous findings on this soil type. Again, cultivation was of little benefit, provided excessive weed growth was controlled. Slight influence in yield was effected by reducing the interspace distance from 4 ft. 6 in. to 4 ft.

An interesting side issue of this experiment was the fact that due to a poor strike portion of the block was replanted in the spring, whereas the balance had been planted in the previous March. The yields for the autumn and spring planted cane were—

—	Cane per Acre.	C.C.S.
	Tons.	Per cent.
Autumn plant	27·9	15·2
Spring plant	19·0	14·1

The influence of time of planting on both yield and c.c.s. is strikingly demonstrated.

Division of Entomology and Pathology.

The investigational work of the Division was a good deal hampered by climatic conditions, but "it is an ill wind which blows nobody any good" since that also means that diseases and pests have been less of a problem than usual.

The new quarantine glasshouse is being put to good use. Two varieties have been imported from the United States, one from India, and two seedlings from the nurseries of the C.S.R. Company; the variety from India is a cross between Co. 290 and P.O.J. 2878, and its future will be watched with interest. We have also imported a reed somewhat closely related to sugar-cane to be used in breeding experiments and, in addition, four sugar-cane-sorghum hybrids from India. These hybrids are lacking in vigour but have good sugar content and mature in about six months. We are hopeful that when moved to North Queensland they will not prove to be "mules" but will yield pollen which will enable them to be crossed back to cane. If this can be done then our chances of building up an early maturing cane would be very promising.

Gumming disease in the South showed a further decrease with the reduction in the amount of old susceptible varieties grown. Fortunately, it is comparatively easy to breed canes which are resistant to this disease, but it frequently happens that some of the most resistant are also highly susceptible to Fiji disease. A Fiji disease resistance trial concluded during the year, served further to confirm the high susceptibility of Uba and P.O.J. 2725, 2875, 2878, and 2940. P.O.J. 213 and P.O.J. 234 exhibited high resistance, while Co. 290 made a pleasing showing in the preliminary trial.

In a downy mildew trial carried out in the Lower Burdekin area the variety S.J. 7 showed some susceptibility, and it is apparent that the numerous fields of badly-diseased B. 208 will prove a menace to this cane if they are allowed to stand. P.O.J. 2878 again showed that it is more susceptible even than B. 208.

Chlorotic streak disease was again very evident in the districts north of Townsville and is unquestionably responsible for considerable damage in the lower, wetter areas. A series of plantings of clean plants, made in several districts, shows that spread is rapid in the low, wet areas, but at least very slow on the elevated red volcanic lands. We are now testing the rate of spread in these low areas when the whole field is planted with clean plants.

It may be recalled that last year we carried out a trial at Tully to determine the field losses due to planting diseased plants and found that the yield decreased from 30·4 tons per acre in the healthy plots to 20·7 tons per acre in the diseased plots. This cane was ratooned, and although the disease then soon appeared in practically all stools of the previously healthy plots, nevertheless it was apparent that the stand was much better than that in the plots planted with diseased cane. On harvesting at the beginning of December it was found that the yield from the originally healthy plots was 28·2 tons per acre as compared with 21·2 tons from the diseased. Thus the benefit of the healthy plants has persisted through to the ratoon crop.

The greyback beetle population was decimated by the unprecedentedly hot weather and little experimental work could be carried out. It had been intended to undertake extensive trapping experiments, but these had to be abandoned. An early emergence took place in the Highleigh area, and over one hundred thousand were trapped on one farm. However, since no adjacent areas had any grub damage owing to the heat, it was impossible to tell whether any benefit had resulted. Experiments which were carried out with white arsenic again gave little benefit, but other methods of applying this cheap insecticide will be investigated.

A further attack on the greyback was launched in June when a colony of one hundred giant American toads was introduced into Queensland. Our Entomologist, Mr. Mungomery, had made a close study of the habits of these toads in Hawaii, and as a result we were able to construct a type of pond in which they bred freely although they had not previously been bred in captivity. Stocks have been liberated in the far northern district and appear to be thriving well. Unfortunately, the Commonwealth Government has prohibited their further distribution, at least for the time being, and we are unable to try the toads out in other districts. It is hoped, however, that further investigation will convince the Health authorities of the desirability of more extensive release of these animals.

The problem of rat control is now receiving specialised attention. Mr. W. A. McDougall, of the Mackay Station, has just spent some six weeks in the Ingham area, observing the problem at first hand, and during the current month will proceed to Sydney and Canberra for further study. He will then return and take up headquarters in the field.

PLATE 63.
A picturesque bend in the Russell River.

PADDOCK SYSTEM OF PIG-KEEPING.

THE modern method of keeping pigs, often referred to as the paddock or open air system, has much to commend it and is much to be preferred to intensive housing or the keeping of pigs in small covered-in sties. This does not, of course, infer that pigs need no housing or special feeding, for pigs are not profitable if kept under unnatural conditions. They need shelter and protection even where kept in paddocks, and they certainly need regular and efficient feeding and management at all times.

The flooring of pig sties is also an important part of sty feeding, the objective being a dry impervious floor that is not costly, and that can be kept clean with little expense. Sawn hardwood flooring tongued and grooved and strongly affixed is recommended for sties so constructed that a concrete or stone floor is unsuitable, especially where the sheds are for general purposes and not especially for continuous intensive housing. For the latter purpose, concrete or brick and cement floors are most essential in order to permit of constant use and of being kept clean every day.

These matters are referred to in detail in the pamphlet "The Pig Farm," available free of charge on application to the Department of Agriculture and Stock, Brisbane. In this pamphlet, Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, deals at length with the question of housing and accommodation, and illustrates his pamphlet with plans and specifications and with drawings and photographs of sties and sheds such as are recommended for use on Queensland farms.

It is emphasised that ventilation should be provided in all pig houses and that the walls should be so constructed that cleansing is simplified. The flooring should be laid upon a gradual slope, the fall being outwards from within, to expedite surface drainage and facilitate removal of dung, urine, &c.

Where the sleeping portion of the floor is of concrete or brick and cement, that portion should also be covered with a permanent wooden platform, for which purpose used railway sleepers are ideal, if carefully dressed and placed in such a position that drainage off this platform on to the concrete and from thence to outside drain is convenient.

The drains should be in the form of an open concrete channel leading to a concrete cesspool which can be regularly cleaned out and disinfected. All manure, straw bedding, and other refuse from the piggery should be carted away and ploughed into the cultivation land and should not be placed in heaps open to infestation by flies, for if this is done a breeding ground for house flies, blow flies, &c., is established, and these pests will be a source of constant annoyance; the valuable manurial content of pig manure is also leached out by rain if placed in heaps exposed to the weather. In suburban piggeries where ploughing is not possible, a properly constructed concrete manure pit should be provided, and if this can be made fly-proof it is a considerable advantage. The manure should be carted away regularly.

Every effort should be made in providing accommodation for pigs, to provide the best that is possible with the money in hand, and for that purpose the buildings and yards should be constructed to a definite plan, and be completed before being brought into use.

Write for a copy of the pamphlet "The Pig Farm, Accommodation, and Equipment."

E. J. SHELTON, Senior Instructor in Pig Raising.

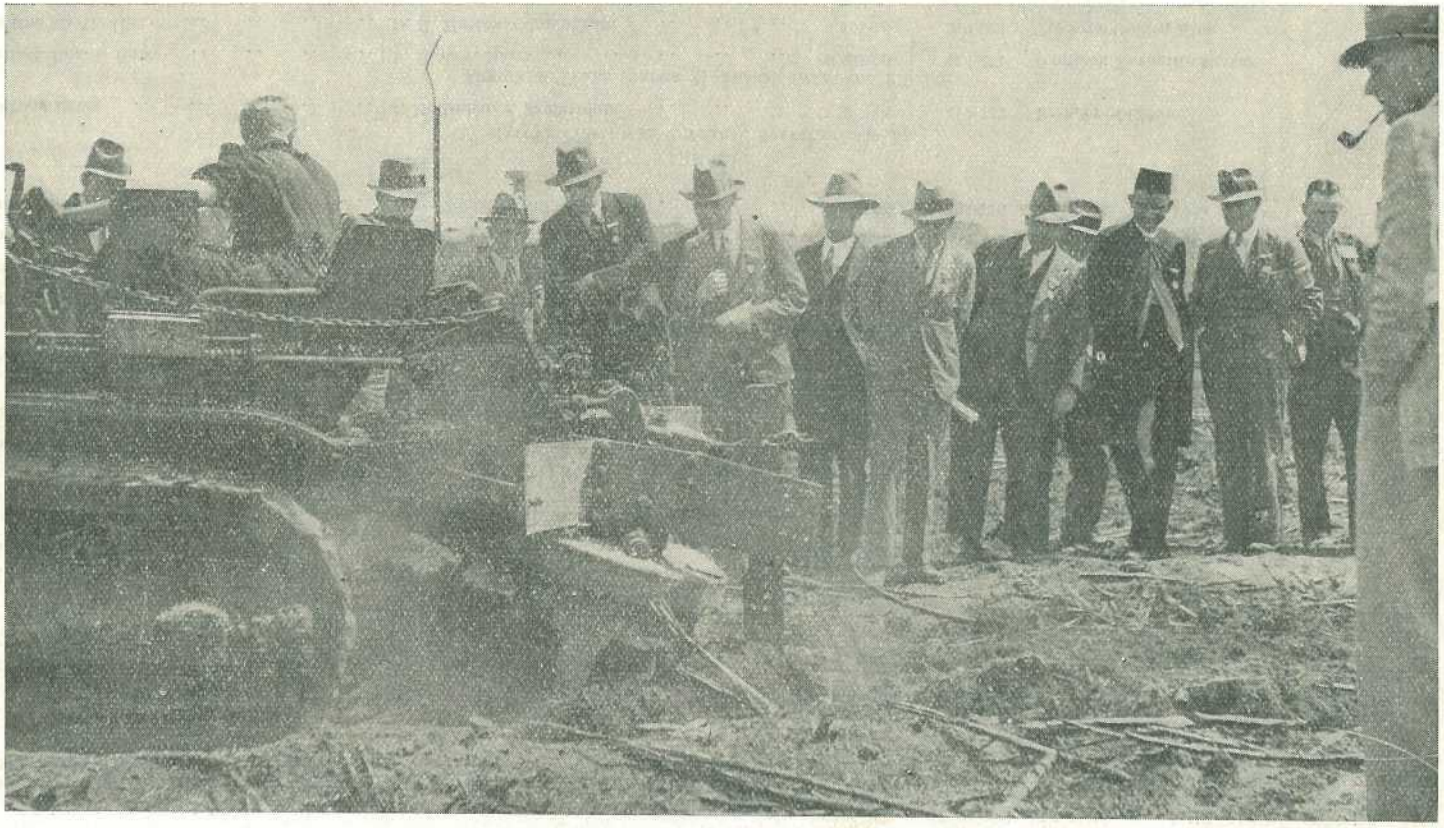


PLATE 64.
Rotor tiller in action, Bingera Plantation.
[*Photo. by courtesy Telegraph Newspaper Co. Ltd.*

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of December, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Clonogan Constance	T. Strain, Wondai	10,068·92	452·718	Blackland's Courageous
Queenie 5th of Fairholme	Queensland Agricultural High School and College, Gatton	9,329·64	409·332	Regent of Greyleigh
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Brundah Elfin 2nd	K. Henry, Greenmount	9,043	338·19	Enchanter of Karowarra
Brundah Fanny 3rd	K. Henry, Greenmount	9,212·5	323·796	Greyleigh Osiris
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Navillus Shamrock	Con. O'Sullivan, Greenmount	9,033	325·683	Midget's Sheik of Westbrook
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Diamond Dale Gem	V. C. Ensley, Yandina	6,989·5	285·444	Diamond Boy of Burradale
Sunnyside Daisy 22nd	Paul Moore, Wooroolin West	6,846·19	257·981	Patrol of Cosey Camp
Rhodesview Fanny 23rd	W. Gierke and Sons, Helidon	6,340·16	253·204	Red Knight of Rhodesview
Montcairn Favour	A. E. Vohland, Aubigny	5,399·95	235·476	Dandy of Wilga Vale
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Billabong Pansy	J. Mollenhauer, Moffattdale	7,365·44	413·747	Premier of Calton
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Overlook Remus Hazel	F. Maurer, Darra	8,895·96	453·851	Overlook Favourite Remus
Trecarne Myrtle 4th	D. R. Hutton, Cunningham	5,865·18	310·801	Trecarne Golden King

Senior, 2 Years (over 2½ Years), Standard 250 Lb.				
Lyndhurst Mary	J. B. Keys, Gowrie Little Plains	7,385·5	437·877	Lyndhurst Glider
Oxford Buttercup 8th	E. Burton and Sons, Wanora	5,694·77	372·511	Oxford Robin
Junior, 2 Years (under 2½ Years), Standard 230 Lb.				
Camelon Bluebell	H. Neil, Brassall	6,017·9	357	Carnation Prince's King
Wyreene Creole	Mrs. M. Allom, Toowoomba	6,844·35	340·65	Lyndhurst Majesty
Bellgarth Pearl	D. R. Hutton, Cunningham	5,606·26	292·115	Trecarne Renown II.
Bellgarth Napoleonette	D. R. Hutton, Cunningham	5,242·09	278·262	Bellefaire Blonde's Bellringer
Windermere Floret	M. J. Dunn, Laidley	4,315·46	243·96	Glenmah Victor's General

A NEW TRASH-CUTTING DEVICE.

A novel plough attachment for cutting trash into short lengths preparatory to ploughing under is illustrated in Fig. 12. It is the invention of a Bundaberg canegrower, and should be received favourably by those farmers desirous of accomplishing this operation with ease and complete success.

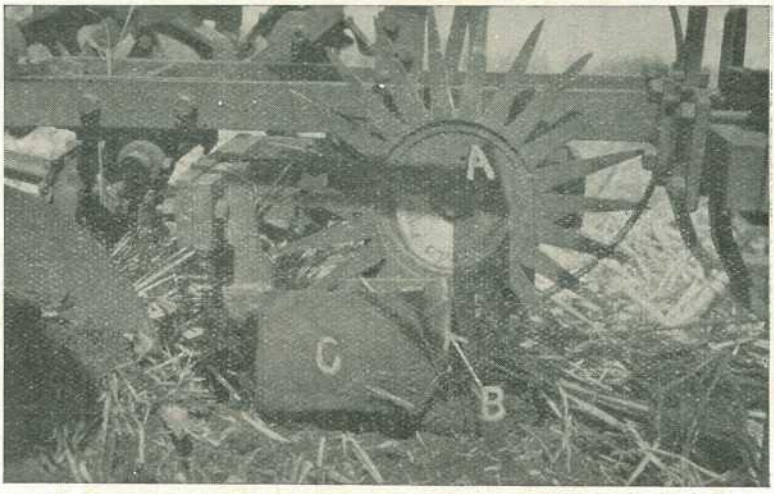


PLATE 65.
Showing the Essential Features of the Trash Cutter.

The cutting of the trash is effected by a star-wheel (A) and fixed knife (B) which are attached to the plough frame just ahead of the disc. As the implement moves forward the star-wheel revolves, and the points effectively pin the trash to the soil surface, when the sharp knife shears the trash and tops into lengths equal to that of the

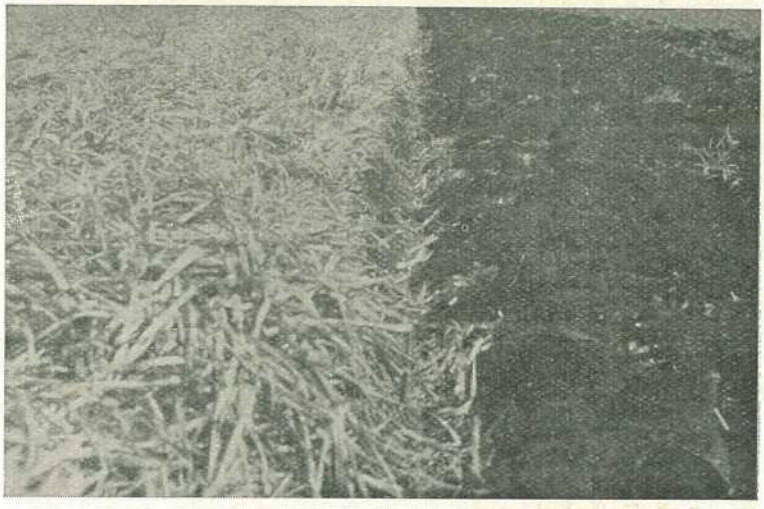


PLATE 66.
Illustrating the Effective Work Performed by the Attachment.

plough-cut width. The short lengths of trash are guided into the preceding furrow by the small mouldboard (C), to be effectively covered by the next plough slice.

The attachment was demonstrated to the overseas sugar-cane technologists on the occasion of their visit to Bundaberg. The excellence of the work which was being performed is demonstrated by the accompanying illustration (Fig. 13). It will be observed that scarcely a blade of trash is evident on the ploughed section of the block. The soil type was red volcanic loam.

—H.W.K., in the "Cane Growers' Quarterly Bulletin," Bureau of Sugar Experiment Stations.

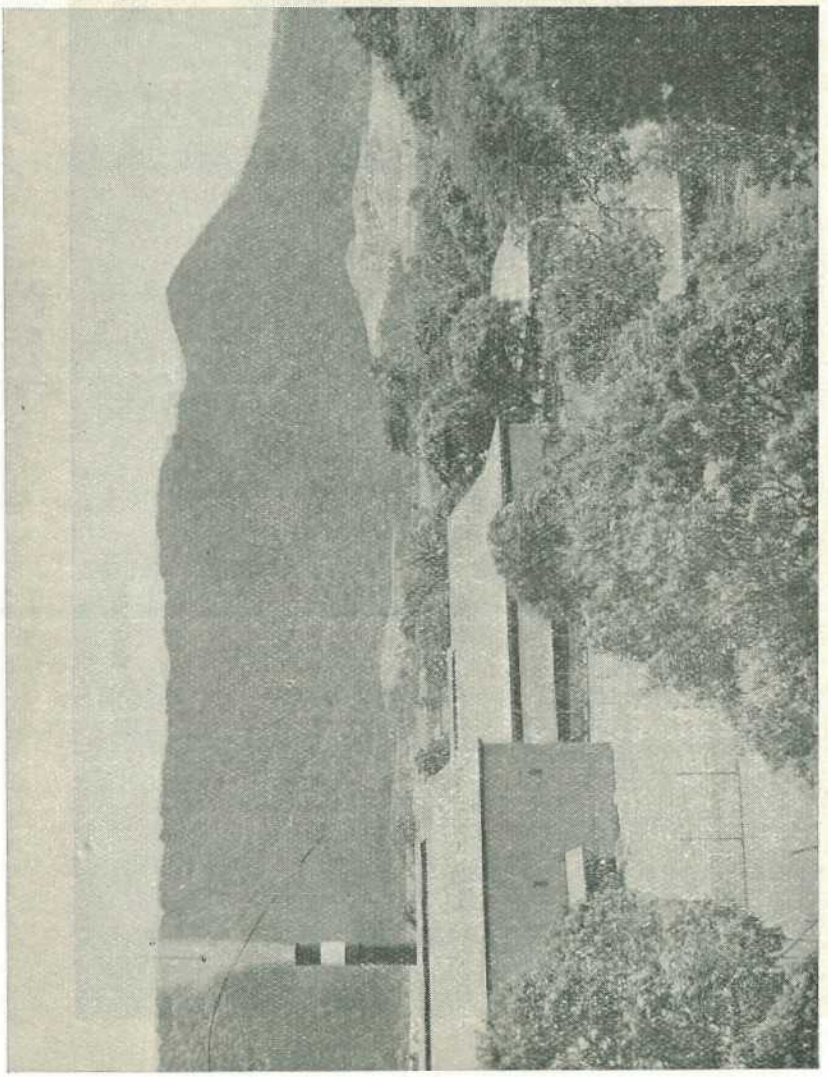


PLATE 67.
Hambledon Sugar Mill, near Cairns.
[Photo. by courtesy of "The Telegraph," Brisbane.

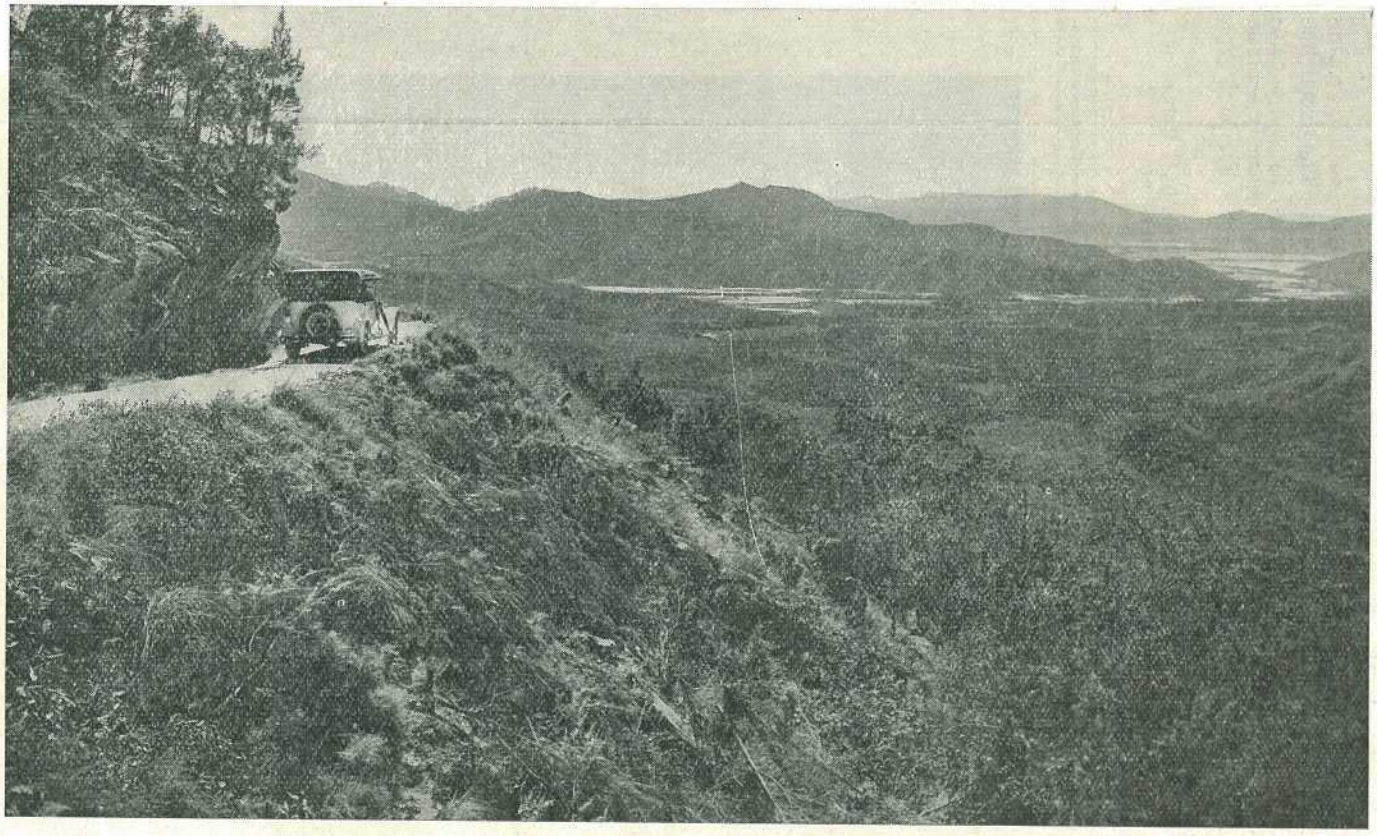


PLATE 68.
View from Heale's Lookout (2,000 feet), Gillies Highway.

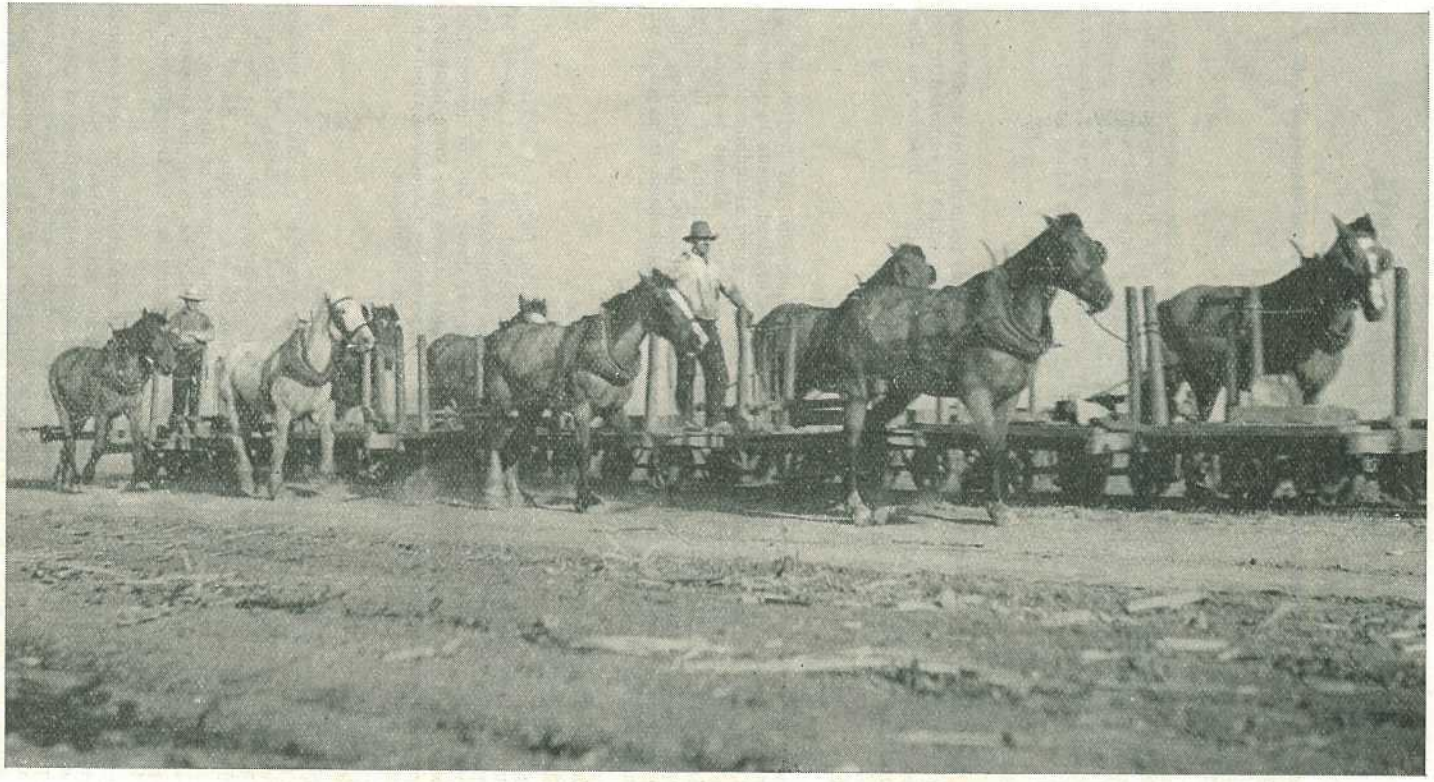


PLATE 69.

A CANE TRAM IN A NORTH QUEENSLAND SUGAR MILL AREA.

Horse power remains an economical factor in efficient farming in some sugar districts.

[*Photo. by courtesy of "The Telegraph," Brisbane.*

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Feather Top Grass.

H.C.Q. (Brisbane)—

The specimen collected in the Blackall district has been determined as *Chloris virgata*, feather top grass. This grass is common in Eastern Queensland, and, although it looks very tempting, stock, as a rule, will not touch it. The light seeds are easily blown about by the wind, and the grass has become a pest in lucerne paddocks, considerably reducing their carrying capacity. It has been reported that stock are fond of it when cut and made into hay.

Hop Clover.

C.S.C. (Mackay)—

The specimen collected in the Eungella district has been identified as hop clover (*Trifolium procumbens*). This is an annual clover which is reported to be palatable. It often grows on fairly poor soils. It is inferior to the ordinary white clover.

Cape Cotton.

G.H.R. (Kaimkillenbun)—

The specimen is Cape cotton or balloon cotton (*Gomphocarpus fruticosus*), a native of South Africa, but now a common naturalised weeds in parts of Queensland and New South Wales. It is often in great abundance in newly cleared scrub country, and at times we have seen it almost as thick as inkweed and some other well-known plants. It is capable of becoming quite a pest. It belongs to a dangerous family of plants, Asclepiadeæ, but, generally speaking, so far as we have observed, stock seem to avoid it or not eat it in sufficient quantity to cause trouble.

Smooth-leaved Stinging Tree.

J.R. (Beaudesert)—

The specimen represents the smooth-leaved stinging tree, *Laportea photiniphylla*, a very common tree in scrubs of coastal Queensland. It is not known to possess any harmful or poisonous properties when eaten by stock. It is, we think, the least virulent of all the stinging trees, but of course the stinging hairs cause a good deal of irritation. These are more abundant on older trees than the younger ones. We would be pleased to report on any weeds you care to send or of which you are suspicious.

Tree Lucerne.

H.C.K. (Mareeba, N.Q.)—

The plant generally grown in Australia as tree lucerne is Tagosaste, a species of Cytisus. This is grown on a fairly large scale in New South Wales and Victoria, and to a somewhat limited extent in Queensland on the Darling Downs. Seeds are listed in Arthur Yates and Co.'s catalogue at 1s. 6d. per ¼ lb. If your land is fairly high, we think it would grow at Mareeba, and is worthy of a trial. The seed should preferably be sown in autumn in prepared boxes or seed-beds, and later the plants can be transplanted to their permanent positions.

The true tree lucerne (*Medicago arborea*) is grown only to a very limited extent in Queensland, and we have not seen a single plant. Seed is procurable from Messrs. A. Yates and Co., Sussex street, Sydney, at 2s. 6d. per oz., but if you only want a small packet for trial, we have no doubt they would put up small packets of both sorts for you. Probably this would be best sown in its permanent position, but most of these plants transplant if care can be taken.

Plants from Mount Isa District Identified.

T.H.D. (Oban, Mount Isa)—

1. *Euphorbia Drummondii,* the caustic creeper. A very common weed in Queensland. On the whole, paddock stock, when they do eat the plant, seem to suffer little or no ill-effects from it. With travelling stock, however, much trouble has been reported. In New South Wales tests with the plant have on many occasions given a positive reaction for the presence of a prussic-acid-yielding glucoside, but repeated tests with the Queensland specimens have always given negative results, and the symptoms described by experienced stockowners in Queensland are certainly not those of prussic-acid poisoning. The head and neck of affected animals swell considerably. If the swelling be pierced, an amber-coloured fluid exudes and the life of the beast may be saved.
2. *Fugosia australis,* a plant of the mallow family closely allied to hibiscus. Not known to possess any poisonous or harmful properties.
3. *Cassia Sturtii.*
4. *Cassia desolata.* Species of cassia in Western Queensland are commonly called turkey bush. The senna leaves of commerce are yielded by different species of cassia, and most of them, including our native ones, of which we have a number, possess purgative properties.
5. *Sphæranthus hirtus.* A very common western weed, for which we have not heard a local name. It is not known to possess any harmful properties, but we cannot say we have ever seen stock eat it.
6. *Cassia* sp. Not known to have any harmful properties.
7. *Ipomœa plebeia.* Not known to possess any poisonous or harmful properties, but the vines of these plants sometimes cause impaction.
8. Leaves only. Seed-heads required for determination.
9. *Aristida prœalta,* a three-awned or three-pronged spear grass.
10. *Pappophorum* sp., a species of whiteheads.
11. *Chenopodium rhadinostachyum.*
12. *Helichrysum ramosissimum,* a small everlasting. The flower-heads are sometimes said to cause impaction by forming balls in horses and cattle.
13. *Trichinium alopecuroideum.* Trichinium is a large genus very abundant in Western Queensland. We have not heard a particular name applied to your species, but it belongs to the amaranth family (Amarantaceæ), and is generally regarded as quite good fodder.
14. *Pterigeron odorus.* This has been accused at odd times of being poisonous to stock, but nothing definite is known about it. It is a strong-smelling herb, and we doubt if stock eat it to sufficient extent to cause trouble.
15. *Malvastrum spicatum,* a very common mallow throughout the whole of the West. We have not, however, heard a common name applied to it. It is thought that it may be associated with "staggers" or "shivers" in sheep, but this has not been proved.
16. *Abutilon otocarpum,* a native plant of the mallow family not known to be harmful in any way.
17. *Pterocaulon sphæranthoides.* We were very pleased to receive this specimen, as we had not had it previously from Queensland, although allied plants very similar to it have been received.
18. *Atriplex* sp., a saltbush. Seeds required to determine the species.
19. Specimen too fragmentary for determination.
20. *Sarcostemma australe,* the caustic vine. This plant has been accused of poisoning stock at odd times, although at other times we have heard of stock eating it freely without any ill-effects following. Feeding tests recently carried out, however, definitely prove the plant to be poisonous.

Blue Berry Ash.

T.C. (Wynnum West)—

The specimen represents *Elæocarpus obobatus,* the blue berry ash, a small tree and a native of coastal Queensland. It is very handsome when either in flower or fruit, and when in flower we have seen bees working it very assiduously.

Plants from Pialba District Identified.

J.A. (State School, Dundowran, Nikenbah, Pialba Line)—Your specimens have been determined by Mr. S. L. Everist, Assistant to Botanist, as follows:—

1. *Aristida gracilipes*, a three-pronged or three-awned spear grass. Most of the spear grasses are rejected by stock, and this seems to be no exception.
2. *Eragrostis parviflora*, weeping love grass; fairly common in the average native mixed pasture.
3. *Eragrostis elongata*, a love grass. Most of the love grasses are regarded as fair fodders.
4. *Cyperus polystachyus*, a sedge; not a true grass.
5. *Rhynchelytrum repens*, red Natal grass; an African grass now very common in coastal and sub-coastal Queensland. Stock do not seem to be particularly fond of it, though if it is chaffed up they eat it readily enough.
6. *Echinochloa crus-galli*, barnyard millet; common in Queensland as a weed of cultivation and in rather damp situations. It is a good fodder, and is closely allied to the well-known cultivated fodders Japanese millet and white panicum.
7. *Eragrostis Brownii*, love grass; common in the native mixed pasture, and usually regarded as a fair fodder.
8. *Eleusine indica*, crowsfoot grass; common in Queensland as a weed of cultivation, along roadsides, &c. Stock seem to eat it readily, and it has a high food value. However, it contains at times a prussic-acid-yielding glucoside, and if eaten in quantities by hungry stock would probably cause trouble.
9. *Paspalum dilatatum*, common paspalum. This is the chief dairying grass of Queensland. It is a native of Uruguay.
10. *Sisyrinchium micranthum*. Not a grass, but a member of the iris family, *Iridaceæ*.
11. *Cyperus* sp., a sedge; not a true grass.
12. *Digitaria* sp. The genus *Digitaria* is at present under review at the Royal Botanic Gardens, Kew. It includes a number of Queensland grasses of no particular consequence.
13. *Poa annua*, goose grass; common as a weed in shady places, particularly during the winter and early spring months. Two specimens of this were sent, and since you may not have a duplicate, one of them is returned herewith.
14. *Themeda australis*, kangaroo grass; very common in Queensland. It is quite a good fodder in its early stages, but becomes rather harsh when mature. Stocking causes it to disappear very quickly.
15. Not received.
16. *Bromus uniolcides*, prairie grass; a winter and early spring grass fairly common in Queensland. It is a native of the Mediterranean region, and is a good fodder.
17. *Entolasia marginata*, a native grass about which we have little information.
18. *Sporobolus Berteroanus*, Parramatta grass; a very common grass in Queensland. It is usually rejected by stock.
19. *Apium leptophyllum*, wild carrot; a common weed in Queensland.
20. *Sorghum verticilliflorum*, an African grass now common as a weed of cultivation in Queensland. In its young stages it contains a prussic-acid-yielding glucoside.
21. *Pennisetum clandestinum*, kikuyu grass; a native of Africa which has come into favour of recent years as a dairy grass. If it invades cultivation it can be a serious pest, but in the pasture it seems to be a desirable grass.
22. *Imperata cylindrica*, var. *Koenigii*, blady grass; very common in Queensland. In cultivation it is a very serious aggressive weed, and is difficult to eradicate. Stock generally reject it, though recently we have heard one or two good reports upon it.
23. *Panicum fulgidum*, a native grass of no particular consequence.
24. *Digitaria marginata*, summer grass; a very common weed in Queensland. Cattle seem to be fond of it.

25. *Paspalidium* sp. Most of the *Paspalidium* grasses are good fodders.

26. *Sorghum leiocladum*, a native grass about whose properties little is known.

26A. *Cyperus graciliis*, a sedge; not a true grass. Specimen is returned herewith.

27. *Axonopus compressus*, broad-leaved carpet grass. This and the narrow-leaved carpet grass (particularly the latter) are causing grave concern to some dairy farmers in coastal Queensland. For sandy coastal land they seem to have some value, but if they invade paspalum pastures they become a serious menace.

28. *Panicum fulgidum*. See No. 23.

29. Leaves only. Impossible to determine in the absence of seed-heads.

30. *Sorghum halepense*, Johnson grass; a very bad pest in cultivation, and one which is difficult to eradicate.

31. Not received.

32. A grass. Impossible to determine in the absence of seed-heads.

35. *Digitaria* sp. See remarks on No. 12.

40. *Chloris Gayana*, Rhodes grass; a native of Africa now widely grown in Queensland for dairy cattle. It is particularly valuable for scrub burns and for hilly country where ordinary paspalum will not thrive. It is sown extensively in the sub-coastal belt.

Fuchsia Bush. Berrigan.

S.H.C. (The Gums, via Dalby)—

The bush with the shorter leaves which you suspect of poisoning your sheep is the fuchsia (*Eremophila maculata*), fairly common in parts of Queensland. This plant contains a prussic-acid-yielding glucoside, and if eaten heavily by hungry sheep there is no doubt it will cause death. There is a good deal of controversy about this plant, some graziers declaring that their stock, both cattle and sheep, eat it freely without any ill-effects. There is no doubt, however, that the plant contains a poisonous glucoside and is dangerous. We have not had many tests as to the periodic occurrence of the poisonous body, but as far as we have gone it seems to be most abundant in the winter.

The other plant with longer leaves growing on the sandy country is *Eremophila longifolia*, the Berrigan, a very common shrub in some parts of Queensland and generally regarded as quite a good fodder. It is not known to possess any poisonous or harmful properties.

Palmwoods Plants Identified.

C.F.A.R. (Palmwoods)—

1. *Paspalum* sp. This is different to any we have previously received, and seems to be a new introduction. At first we thought it might be a form of No. 3, but found it is quite distinct. Could we have another specimen? We may have to send the one you forwarded to the Royal Botanic Gardens, Kew, England, for correct identification.

2. *Brachiaria miliaformis*, a native grass, and one of our best fodders. Although a native species, it seems to prefer country that has been under cultivation or broken in some way rather than the ordinary pasture. It is a species of panic grass, but we have not heard a popular name applied to it.

3. *Paspalum paniculatum*, Russell River grass. This grass is very common in parts of Northern Queensland, and, generally speaking, is not regarded very highly as a fodder—that is, compared with some grasses, such as paspalum and kikuyu. Horses are particularly fond of the seed-heads. It might be worth trying on Bribie Passage country.

4. *Gomphrena decumbens*, Gomphrena weed, a weed that is supposed to have been accidentally introduced in Townsville with fodder for circus elephants, and now widely spread throughout the coastal district. It is not a true grass, but belongs to the family Amarantaceæ. It is regarded as a good fodder.

5. There are no seed-heads, which are essential for identification. We see one you send has some nice young shoots, and we will plant this to try and produce seed-heads for identification.

Yellow Oleander.

R.F.W. (The Caves)—

The specimen represents *Thevetia nertiifolia*, a native of India sometimes known as the yellow oleander. We should say it is quite likely that the fruits caused the death of your pigs, as the tree is known to possess poisonous properties. It is often grown because it makes rather a shapely bush or tree and stands a good deal of dry weather.

Japanese Millet. Stink Grass. Caustic Creeper.

D.K.C. (Glenmorgan)—

1. *Echinochloa crus-galli*, sometimes called Japanese or barnyard millet; a palatable grass which grows in damp situations. It has a high reputation for fodder value.
2. *Eragrostis cilianensis*, stink grass. It appears to be eaten by stock only to a limited extent.
3. *Euphorbia Drummondii*, caustic creeper. This has been known to cause death to stock if eaten in large quantities. The chief symptoms are swelling of the head and neck.

Grasses from Maryborough District Identified.

R.D.W. (Tinana, *via* Maryborough)—

1. *Capillipedium parviflorum*, var. *spicigerum*, a variety of scented top grass; a native of Queensland common in forest country. In some parts of the State it is regarded as an excellent fodder.
2. *Eleusine indica*, crowsfoot grass; usually found as a weed of cultivation, on roadsides, &c. Stock like it, and it is quite nutritious. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantities by hungry cattle would probably cause trouble.
3. *Brachiaria foliosa*, a native grass sometimes called the leafy panic grass. It is a good fodder, but usually only favours damp situations.
4. *Bromus unioloides*, annual prairie grass; a native of North America now widely cultivated as a pasture grass, particularly for dairy cattle, and is quite naturalised in Queensland. When not cultivated it is usually found as a weed in home gardens or anywhere where the ground has been disturbed. It comes up during the winter months and dies off with the heat of summer.

Native Millet. Clove-strip.

G. McK. (Blackall)—

1. *Echinochloa Turneriana*, sometimes called native or western millet. It is a very robust summer-growing grass, a native of wet places in Central-West and North-Western Queensland. It is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum, and is worth encouraging.
2. *Jussiæa repens*, clove-strip or willow primrose. It is a native of the eastern States of Australia, extending through New Guinea to India. As you say, it is a rather difficult plant to get rid of, but we know of no other way than raking it on to the banks.

Carpet or Mat Grass.

E.S. (Dalrymple Heights, Eungella)—

The specimen is *Axonopus compressus*, sometimes called *Paspalum compressum*, carpet or mat grass. There has been a good deal of controversy about this grass in Queensland and the Northern Rivers district. No doubt if it gets into a paspalum pasture it is somewhat of a pest, but it has some value in second-class country. In reply to your query we say definitely that the grass is of nothing like the value to stock as ordinary paspalum.

General Notes.

Staff Changes and Appointments.

Mr. W. A. G. Haylott, Wendell street, Galloway's Hill, Norman Park, has been appointed an Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock.

Mr. C. E. Daye, Chief Attendant, Goodna Mental Hospital, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. F. A. Manning, Acting Clerk of Petty Sessions, Ayr, has been appointed an Agent of the Central Sugar Cane Prices Board and Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards during the absence on leave of Mr. A. N. Taylor.

Mr. A. Palk, Secretary of the United Fruitgrowers' Co-operative Association, Limited, Glass House Mountains, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Constable C. A. D. Loch, Kajabbi, has been appointed also an Inspector under the Slaughtering Act.

The Officer in Charge of Police at Ravenshoe has been appointed also an Acting Inspector of Stock.

Messrs. J. V. Smith and E. W. Ladewig, Inspectors of Dairies, have been transferred from Dalby to Murgon, and Murgon to Dalby, respectively.

Mr. A. W. Hay, "Palm Tree," Taroom, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Acting Sergeant T. Jenks (Silkwood), and Constables T. R. Lipp (Coomera) and J. B. Campbell (Kalbar) have been appointed also Inspectors under the Slaughtering Act.

Mr. James Turner, Finch Hatton, Mackay, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Carandotta and Wolga Holdings Road to be a Stock Route.

An Order in Council has been issued under the Diseases in Stock Acts declaring that part of the Boulia-Urandangi road within Carandotta and Wolga Holdings to be a stock route for the use of travelling stock.

Dairy Products Stabilisation Boards.

Regulations have been issued under the Dairy Products Stabilisation Act relative to the appointment of the second and subsequent Dairy Products Stabilisation Boards under such Act. The present Board consists of all the members of the Butter Board and two members of the Cheese Board with the Director of Marketing, but the personnel of the second or future Boards shall be made up of three persons nominated by the Queensland Butter Board who, at the date of such nomination, are members thereof, one person nominated by the Cheese Board who is in office as a member of such Board, and the Director of Marketing.

The Fertilisers Act.

Following on the passing, last session, of "*The Fertilisers Act of* 1935," a Proclamation has been issued bringing the Act into operation as from the 9th January, 1936, and Regulations have been approved of which will give effect to the provisions of the Act.

Toowoomba Animals and Birds Sanctuary.

An Order in Council has been issued under the Animals and Birds Acts declaring the Middle Ridge Golf Links, Toowoomba, to be a sanctuary under and for the purposes of the abovementioned Acts. It will accordingly be unlawful to take or kill any animal or bird within the boundaries of this sanctuary.

Pool Boards Extended.

Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Butter and Cheese Boards until the 31st December, 1938, and giving notice of intention to extend the duration of the Plywood and Veneer Board for the period from 3rd May, 1936, to 2nd May, 1939. A petition for a ballot as to whether or not the lastmentioned Board shall be extended, signed by 10 per cent. of the growers of plywood and veneer, may be lodged on or before 17th February, 1936.

Assistance to Wheatgrowers.

Mr. Frank W. Bulcock, Minister for Agriculture and Stock, has received advice from the Prime Minister signifying his agreement to a basis of payment to wheatgrowers whose applications have been accepted by the State authority as being in conformity with the provisions of the "Wheat Growers' Relief Act, 1935."

Mr. Bulcock mentioned that it would be recalled that under the Act an amount of £12,000 was made available by the Federal Government for distribution to wheatgrowers in Queensland who are able to satisfy the prescribed authority that they are in adverse financial circumstances, and that in the production of crops from wheat sown by them during the year 1934 they have suffered serious loss by reason of—(*a*) specially adverse seasonal conditions; or (*b*) extensive damage to those crops arising from the prevalence of pests or diseases.

The Minister stated that the necessary action had been taken in respect to the numerous applications that had been lodged, and all approved claims were in readiness to proceed to make payment to the individual growers concerned. It is the intention to engage in the distribution of the fund with promptitude, and it is anticipated that the first batch of cheques to the wheatgrowers will be posted in the course of the next day or two.

This will be the third fund that has been made available by the Commonwealth Government to the wheatgrowers planting wheat for grain during the 1934 season. The other funds which were previously distributed by the Department represented assistance that had been provided to wheatgrowers under the "Wheat Growers' Relief Act (No. 2), 1934," and the "Wheat Bounty Act, 1934."

The aggregate amount made available to this State for distribution to wheatgrowers under the Acts mentioned was approximately £100,000.

Mr. Bulcock concluded by stating, "As far as I am aware, Queensland will be first of the States to make distribution of the several funds made available to wheatgrowers by the Federal Government."

Boundaries of Tobacco Pure Seed District.

An Order in Council has been issued under the provisions of the Tobacco Industry Protection Act further altering the boundaries of the Tobacco Pure Seed District embracing Marmor and Bajool. An extenston of the boundaries to include the parish of Archer, County of Livingstone, has been made to provide further propagation plots with suitable irrigation facilities.

Disposal of Diseased Fruit.

A regulation has been approved to-day under the Diseases in Plants Acts, regarding the disposal of diseased fruit in shops in the Granite Belt Area. The regulation provides that the occupier or owner of every shop where fruit is sold shall dispose of all diseased fruit by putting it in a 24-gauge galvanised iron bin 18 inches in diameter and 24 inches deep soldered and provided with handles and a close-fitting lid, or any other bin approved by an Inspector. The diseased fruit shall be disposed of in such place as may be approved. The regulation shall apply to the Stanthorpe, Warwick, Killarney quarantine area, and has been framed with the view of effectively dealing with the disposal of waste fruit in shops and as a step in the direction of protecting the grower from the ravages of fruit fly.

Animals and Birds Sanctuary, North Queensland.

An Order in Council has been issued under the Animals and Birds Acts declaring part of the North Queensland Coast and the Atherton Tableland to be a sanctuary under the said Acts. The sanctuary comprises the area included in the Shires of Atherton, Cairns, Cardwell, Douglas, Eacham, and Johnstone, Division 4 of the Shire of Herberton, Divisions 1 to 3 of the Shire of Hinchinbrook, and Divisions 3 and 4 of the Shire of Woothakata. It will be unlawful to take or kill any animal or bird within the boundaries of the above sanctuary.

Honorary Rangers appointed for the sanctuary are:—Messrs. L. J. Duffy, G. R. Blair, E. H. Fox, J. W. Horsford, O. Nicotra, of Mourilyan; W. J. Henderson, Coorumba (Nerada Line); P. Seassola, Silkwood; H. Sumich, Mena Creek, via Innisfail; A. Bray, Nerada, via Innisfail; S. Hutchesson, Japoon; J. Astorquia, South Johnstone; J. McFadden, Japoon; A. H. Reichardt, Silkwood; W. S. Hunter, East Silkwood; H. Spanos, private mail bag, Innisfail; and W. J. Murray, Mourilyan.

Queensland Cane Growers' Council.

An Order in Council has been issued in pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1935," empowering the Queensland Cane Growers' Council, in its official name, to borrow and raise money upon such terms and conditions as the Council shall think fit for the purposes of its business, and may secure the repayment thereof by mortgages, liens, or other instruments under its official seal.

Rural Topics.

King George V. as a Farmer.

Because of his great interest in farming and stockbreeding, King George V. was held in high esteem by farmers throughout the Empire. His late Majesty was a prominent British stockbreeder, possessing studs of the leading breeds of beef and dairy cattle, of the British breeds of sheep, and of pigs. His stock won many prizes at the leading English shows, in fair and open competition with exhibits from other breeders. His interest in the progress of stockbreeding in the Empire was shown by the many exportations of stock from his studs. A large number of Autralian breeders have imported cattle, sheep, and pigs bred by the King, and importations were made by other countries, particularly Argentina.

The King thoroughly enjoyed visits to his farms, and often attended shows where his stock were exhibited. On many occasions he met buyers from other countries who visited his studs, and surprised them by his knowledge of stock and farming. He was also a breeder of thoroughbred horses.

King Edward VIII. is also a keen stockbreeder, and is the owner of a cattle ranch in Canada. His interest in farming has always been great. It is expected that with his inheritance of his late father's stud farms he will give the same encouragement to the production of the best stock.

Townspeople and Agriculture.

From my own experience I find that apart from those living in market towns and whose livelihood depends upon the purchasing power of the agricultural community, townspeople have very little idea of the difficulties that a farmer has to contend with in the course of his work.

Many people seem to labour under the delusion that a farmer is a person whose life consists of milking cows or ploughing, interspersed with spells of lamentation over the bad times with a sort of bucolic ecstasy! Little do they realise the skill necessary in managing a farm, and that a farmer to-day must combine the abilities of farmer with clerk, lawyer, vet., engineer, &c.

Another complaint is that of farmers being able to run a car when times are so bad. In this case he is at a disadvantage because whatever his reply the townsman will still criticise him. If he possesses a car then he must be prospering; should he be without one then he is accused of being out of date and failing to keep up with the times.

The great trouble in this country is that of the population regarding agriculture as an unimportant industry when compared with the iron and steel industry or textiles. Such ideas are erroneous, as the dairying branch of agriculture alone employs twice as many people as the iron and steel industry, and three or four times as many as the shipping industry.—GEORGE JARRETT, Clevedon, Somerset, in "The Farmer and Stock-breeder" (London) 11th November, 1935.

A Farrer Memorial.

Queanbeyan (New South Wales) has a memorial bust to Mr. William James Farrer, the distinguished wheat breeder. Mr. Farrer's old property, Lambrigg, where he carried out many of his experiments and where he is buried, is in the Federal Capital Territory a few miles from Queanbeyan. In unveiling the memorial the Governor-General, Lord Gowrie of Canberra, said that Farrer had been a man of vision who had seen the tremendous opportunities of wheatgrowing in Australia. It was impossible to assess the value of Mr. Farrer's work in money, but it was safe to say that it had been worth many millions of pounds. Mr. Farrer had sought no personal glory and no pecuniary reward. He had sought only the welfare of Australia and of the wheat industry.

The bust, which is by Mr. Raynor Hoff, of Sydney, is set on a sandstone plinth bearing the inscription:—"William James Farrer, Australia's world-famed wheat-breeder. Born 3rd April, 1835; died 16th April, 1906." There follow the words uttered by Mr. Farrer when he was told that he had been considered for a knighthood:—"I want only to feel, when the end comes, that my life has not been wasted."

This unassuming agricultural scientist was famous through the world as a wheat breeder. One of the varieties he bred, Federation, enriched Australia to the extent of millions of pounds, while other drought and rust-resisting types evolved by him enabled wheatgrowing to be carried on in districts which were previously not regarded as suitable for the cultivaton of that cereal. The name William James Farrer will go down in history as one of Australia's greatest benefactors.

Keep the Dairy Herd Healthy.

Most of the diseases of dairy cattle which cause extensive losses are infectious. Discussing the problem of prevention, a Departmental leaflet ("Diseases of the Udder of Dairy Cows," issued by the New South Wales Department of Agriculture) emphasises the obvious importance of seeing that no animal, unless it is known to be healthy, is placed with the herd. Usually, observes the writer, the attitude of the farmer in this connection is somewhat casual. Instead of making every effort to ascertain that a cow is not only free from disease, but also that it has not been in contact with any infected cattle, he is inclined to argue when making a purchase: "The cow looks all right—I'll take her." The animal may have had mammitis, may have aborted, may have suffered from pleuro-pneumonia, and so on, but "she looks all right," and so goes into the herd.

How is the farmer to know that a cow has not suffered from infectious disease? In reply to this the writer advises him not to buy a cow unless he can satisfy himself that it is from a herd with a clean record.

"The farmer who attends a sale and buys cattle without knowing their origin and history is weighting the scales against himself as far as disease is concerned. Many farmers taking up dairy-farming for the first time have found to their cost how easy it is to acquire unsound cattle. Further, I would advise the farmer to learn to recognise the effects of disease on stock and not to purchase any animals which show such effects. Take mammitis, for example; it almost always leaves evidence in the udder of its occurrence. The farmer who knowingly buys a cow that is a 'three-teater' or has a 'weak quarter' is buying a lot of trouble for himself."

"From the fact that he is constantly handling the udders of cows during milking operations a dairy farmer should be accustomed to the 'feel' of a healthy udder, and therefore should readily detect any change. Yet few farmers make a point of familiarising themselves with the changes that occur when mammitis attacks the cow, and they do not hesitate to buy a good-looking animal without handling the udder first. Similarly, loss of part of the tail suggests inoculation for pleuro-pneumonia, matting of tufts of hair below the vulva suggests genital infections, and so on."

Uses for Old Motor Tubes.

When the milking bails and concrete dairy are frequently washed down the concrete surface rapidly wears out the hose pipe. A simple remedy for this is supplied by the tread of an old motor tyre cut into small circular pieces in each of which is bored a hole of slightly less diameter than the hose pipe. The pieces are then threaded on to the hose and placed at intervals of a few feet, so that instead of resting on the ground the hose pipe is supported well clear. New hoses fitted in this way will last for many years.

To stop a girth from galling a horse thread the girth through an old inner tube of a motor cycle or car. This does not look unsightly, and is easily washed.

Live Stock Judges are Born—Not Made.

In judging live stock slogans may have valuable uses. For example: "No udder, now cow." Allowing the general acceptance of this maxim, the task of a judge would be rendered much easier if the absence of udder quality constituted a definite disqualification. A step further may be taken: "No constitution, no cow." And so on. But anybody who knows anything about a cow knows that the appearance of the udder, taken by itself, is not everything as an indication of productive and reproductive ability. And so, whilst slogans have definite values in directing a judge's attention to vital qualities, the determination of the degree of any disability must always remain the responsibility of the judge. What about "No foot, no horse"? Quite obviously, if a horse is hopelessly defective (constitutionally) in the feet all the good qualities above that line are useless for practical working purposes. Probably no part of a horse requires more attention—and receives less—than the foot. It may seem a long cry from the digestive organs to the feet, but not a few youngsters are ruined and rendered cripples by laminitis (fever of the feet) by being too highly fed and under-exercised to get them ready for a show. Although numerous textbooks have been written about judging live stock, every show season reveals that true judges are born, not made. The judging competitions at the shows, however, are most valuable. Having been born, the instincts of true judges have to be developed by instruction and experience.—"HIMI," in the current "New Zealand Farmer."

Dry Milking More Hygienic.

Frequently discussion arises regarding the merits or otherwise of wet milking and dry milking, but there can be no doubt that the wet method—that is the continual moistening of the hands of the milkers and the teats of the cow with milk—is a dirty one. On the other hand, dry milking is not advocated, as the friction between the hand and the dry teat is uncomfortable for both the cow and the milker. Small pieces of dry scurfy skin from teats and udder are continually dropping into the bucket. When the teats and udder are washed as they should be before milking there will be just the right amount of moisture to enable the operator to work cleanly and without friction. Cows milked by the wet system are more likely to suffer from cracked and sore teats. If washing alone does not keep the teats in a soft and sufficiently supple condition during milking, a little vaseline containing 2 or 3 per cent. of boracic acid may be used upon the hands of the milker. No information regarding bacterial counts of milk drawn by wet and dry methods is available, although it is generally recognised that a purer sample is obtained by following the methods of dry milking recommended.

Prevention of Soil Erosion.

Following research into the problem of soil erosion by field officers of the New South Wales Department of Agriculture, the senior experimentalist (Mr. E. S. Clayton) has outlined measures for prevention and reclamation which will be embodied in a campaign to be launched shortly, with the object of instructing primary producers. By this means it was hoped to prevent any repetition of fruitless effort in trying to stop erosion by such methods as haphazardly throwing brush, straw, and stones into the trenches, and by diverting the water from one gully to another.

Prevention of gullying was a much easier task than reclaiming them when formed. When the lie of the land indicated where gullying was likely, contour banks should immediately be made. Contour drainage was also a vital part of the system adopted to recover gullied areas. Broadly speaking, the principle involved was to heal the surface of the soil, particularly where the erosion was most active—at the head and along the sides of the gullies. The treated area would then be protected by planting grass, shrubs, trees, or vines.

Where the drainage area was small, the trouble could be remedied by employing what was known as "the ploughing in and seeding method." With very small gullies with no defined drainage area they might be filled with straw, cornstalks, or similar material, and then the sides ploughed in. The built-up passage should then be seeded to a grass suitable to the district and soil. In the case of deep gullies having gently stoping banks, or when the channel is shallow, ploughing should be commenced as near the bottom as possible, to throw the dirt towards the centre from both sides. The ploughing should be repeated until sufficient filling is obtained.

Conversely, when the sides are steep, ploughing should be commenced at the top of the gully banks. A long coupling chain should be connected to the furrow plough, and the wheel allowed to drop over the edge of the bank. When the first cultivation has reached down as far as possible operations should be repeated until oftentimes it will be possible to use a ditcher to distribute the soil over the sides and bottom. Suitable grasses, such as couch, and trees should then be planted, and temporary dams constructed where necessary to catch the soil, which otherwise might be washed away. On particularly steep land, where the gullies are deep and the cost of reclamation high, quick-growing trees, with interlacing, vigorous roots, known to suit the district, should be grown. They should be set in rows, following as far as possible the contour of the ground, and a dam made to hold the soil. Grass seed should be sown between the trees, and the area left unstocked.

Where it was desired to reclaim well-defined and actively eroding gullies, temporary dams built of brush, straw, timber, or woven wire might be suitable, though in the case of very large excavations a permanent dam of earth or concrete would be necessary. The purpose of the temporary dam was to check the water and cause it to deposit its load of silt so that the floor of the depression might be gradually built up. The permanent dam of earth would be made watertight, and provision for getting rid of excess water would have to be made with spillways or pipes. The wall, which should be built into a trench at the base, should be constructed with a scoop and plough, and should be 4 ft. at the top, with a protective layer of grass over it. Generally it would be advisable to commence making the barriers at the lower end of the gully, and when silting up had taken place to build another farther up. After reclamation the sides of the gully should be ploughed in to complete the work.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE CHILD WHO WON'T TAKE HIS FOOD.

Among the many mothers who attend our Clinics there are a few whom it is very difficult to help. They mean so well, and they fail so completely. For them we reproduce some advice given by a children's specialist.

"Billy didn't eat and his mother couldn't understand why. She took him to a wise doctor, who found nothing physically wrong with him."

The fact that he had tantrums, was filled with fears, petty jealousies, and hatreds did not concern her nearly so much as did his poor appetite. She had hoped that the doctor might find something wrong that could be easily corrected.

She returned home disappointed, because not only did the doctor tell her that her boy was physically well, but he had refused to give her a tonic. He had frankly told her that Billy wasn't eating because of her mistakes in handling him. He had even told her that if she stopped worrying about her child's appetite her eating problems would soon disappear.

"Why, just imagine," she said to her husband in the evening, "he told me that Billy's refusal to eat was due to the same things that made him refuse to sleep and obey."

Just what was the cause of Billy's refusal to eat, and what method should the mother use in overcoming his poor appetite? In the first place, Billy was getting too much attention from the grown-ups around

the home. It was suggested that he be kept outside as much as possible through the day, playing with children preferably his own age. If possible, one of his playmates was to join him in his meal. If he ate well, he was to paste a small silver or gold star in a little scrapbook, and this was to be shown to his father at the close of the day. His poor appetite was never to be discussed in his presence. If he failed to eat, nothing was to be said about it. If he showed the slightest tendency to take food he was to be encouraged and praised.

If after a week of this regimen his appetite was no better, the food was to be placed in front of him and left there for twenty minutes. If refused, it was to be taken away until time for the next meal, when the food was to be again offered him. Meanwhile he was to be denied any food between meals. There was to be absolutely no urging or scolding or begging him to eat. The whole problem was to be met in a cool, casual manner. Care was to be taken that those foods which he especially disliked were not on the tray during this period.

Love without Wisdom.

It does not seem that such directions should be especially difficult to follow, and yet it may take weeks to teach the mother to be unconcerned about feeding problems. This is very likely due to the fact that poor appetite is so intimately related to poor health. Her fear is a deep one, deeper in the anxious, worrying type of mother. Often after she has faithfully promised the doctor to carry out his suggestions and ignore the food refusal, she continues to urge and scold the offender.

The biggest job of the child worker is not to get the child to eat; it is to get the mother to stop worrying about his not eating. Perhaps the difficulty lies in the fact that the treatment is too simple. The mother will learn to her surprise that ignoring the child's appetite, at least in her case, is not so simple as she thought. She may finally realise, after she has properly learned to ignore her feeding problem, why it is that the mother who has so many children and hasn't time to worry about eating difficulties has so little trouble in getting them to eat. We have found after years of studying the food habits of the child, as so many others have found, that the problem in the physically healthy child who refuses to eat is not with the child—it is with the parents or nurse.

The Mother may find it too Difficult.

If the mother who cares for the child cannot change her attitude and ignore the food refusal, it is well to place the child in another home for a short time, and let someone else feed him. It may be a great deal easier for another person to start the ball rolling—to get the child into good food habits.

During the child's absence the mother will be able to relax, to study the situation more calmly, and will be better prepared to carry on the work that someone else has started.

It has been our experience that after such a vacation from home the mother will find that she can handle the child so much better, that his eating is very much improved—not because the child is a better child, but because he is better understood.

If your child won't eat, use tact. Don't urge, don't scold. If necessary, take food away. Don't feed between meals; and, above all, don't worry about it.

TOMATO TIPS.

Baked Stuffed Tomatoes.

Take 4 tomatoes, 1 small onion, 3 medium mushrooms, ½ oz. butter, ½ oz. dry breadcrumbs, ¼ lb. chicken livers, ½ teaspoonful chopped parsley, salt, pepper to taste, and a little lemon juice.

Remove a thick slice from the top of each tomato and scoop out the pulp. Heat the butter in a stewpan, stir in the chopped onion, brown it slightly, and add the chopped, stewed livers. Stir in the crumbs, chopped mushrooms, lemon juice, seasoning, and enough of the pulp to moisten the mixture slightly. Stuff the tomato cases with this. Cover them with the slices taken from the top and bake them. Serve the tomatoes on rounds of buttered toast, garnished with parsley.

Iced Stuffed Tomatoes.

Take 4 even-sized tomatoes, a few cooked green peas, 1 sprig mint, ½ teaspoonful sugar, lettuce, salt, pepper, mayonnaise sauce.

Cut off a slice from the soft end of the tomatoes, then stand on the stalk end and scoop out the centre very carefully. Mix it with some mayonnaise sauce. Fill the tomatoes with the cooked and flavoured green peas. Put into the ice chest until required. Stand each tomato on a lettuce leaf, pour over the prepared mayonnaise sauce, and serve.

Baked Tomato and Egg.

Take 1 egg, 1 firm tomato, 1 teaspoonful butter, salt, pepper to taste.

Cut a slice from the top of the tomato and scoop out some of the pulp. Break in an egg. Sprinkle with salt and pepper to taste, and add as much of the pulp as the tomato will hold, then put a piece of butter on top. Sprinkle again with salt and pepper and bake in a moderate oven for fifteen minutes.

Tomato Sausage Cakes.

Take the required number of medium-sized tomatoes, allow 1 small pork sausage per person, scrambled eggs.

Halve each tomato and skin each sausage, then shape the sausage meat into cakes the size of tomatoes, and flour very lightly. Fry on both sides in a little hot bacon fat and place one on each half tomato, covering with the other half tomato. Place on a buttered fireproof dish and bake till soft, but unbroken, in a moderate oven. Serve each on a hot plate surrounded by a ring of scrambled egg. Garnish with parsley and serve very hot.

Tomatoes and Cheese Sauce.

Take ¾ lb. tomatoes, 1 oz. butter, ¾ oz. flour, ½ pint milk, 3 oz. cheese, 1 egg-yolk, ½ teaspoonful (scant) castor sugar, salt and pepper.

Stalk and wipe the tomatoes, cut one in slices and the remainder in half, crosswise. Sprinkle with pepper and salt and castor sugar. Melt the butter in a saucepan, add the flour, and when blended, stir in the milk and bring to the boil. Boil this sauce gently for a few minutes, draw the pan aside, and add three-parts of the cheese, finely grated, also seasoning to taste, and the beaten egg-yolk. Pour a little of the sauce into a buttered fireproof dish, add the halved tomatoes, cover them with sauce, then sprinkle the remainder of the cheese on top. Bake gently till the tomatoes are tender, but do not let the sauce boil, then put the dish under the grill and brown the top. Garnish it with the slices of tomato, baked slightly.

Tomato Creams.

Take 1 tin tomatoes, ¼ pint cream, salt and pepper, 3 level tablespoonfuls cornflour.

Rub the tomatoes through a very fine sieve with a wooden spoon. Measure the puree and make up to a pint with water. Put the cornflour in a basin and mix smoothly with half a gill of cold water. Boil the tomato puree and pour on to the mixed cornflour, stirring all the time. Return to the saucepan, place it on an asbestos mat over a low gas, and stir for ten minutes to cook the cornflour. Season to taste and add the cream (using not quite the ¼ pint). Rinse four fancy pudding moulds in cold water and pour in the mixture. When quite cold and set, remove from the moulds and place on a dish. Garnish with watercress or finely-shredded lettuce. This is very good served with cold meat.

Tomato and Pineapple Jam.

Take 6 lb. tomatoes, 1 pineapple, 4½ lb. sugar, 1 scant teaspoonful tartaric acid.

Scald and peel the tomatoes, cut them into rough pieces, taking out the hard bits near the stalk. Cut a good-sized pineapple into small dice and boil with 1 lb. of the sugar for about twenty minutes. While boiling, heat the remainder of the sugar in the oven and add, very hot, to the boiling jam. Boil all quickly for three-quarters of an hour or until a little, dropped on a saucer to test it, shows signs of setting.

Tomato Pickle.

Take 1½ lb. green tomatoes, ½ pint vinegar, 1 oz. salt, a few cloves, allspice, and peppercorns, ½ oz. root ginger, ¼ lb. golden syrup, 3 level dessertspoonfuls brown sugar, ½ lb. onions, ¼ teaspoonful cayenne.

Wipe the tomatoes and cut into slices. Spread them on dishes, sprinkle them with salt, and leave until next day. Then pour off the salt liquor and put the tomatoes in a saucepan. Bruise the ginger and tie it in a piece of muslin with the other spices. Add these, also the golden syrup, sugar, vinegar, and onions (peeled and sliced). Boil the pickle very gently for about one hour and a-half, season it with cayenne, and, when cool, remove the spices and pot the pickle. Cover to make it airtight. This makes only a small quantity.

Through the Eyes of Youth—Friendship.

In a world in which there is so much strife, in which there are wars and rumours of wars, the League of Empire seeks to establish closer relations between the great Commonwealth of Britain and her dependencies. The League of Nations has as its objective the making of all men kin. The English Speaking Union strives to effect a more intimate relationship between the two great nations, Britain and America, which have a common tongue. A suggestion has been made that branches of the English Speaking Union should be established in schools. This idea of universal friendship is inculcated in the following extract from the "Firbank Log," the magazine of Firbank Church of England Girls' Grammar School, Brighton, Victoria. The extract from an account of the visit to the school of a Rotarian says:—

"Friendship is a thing which cannot be bought. Friendship is respect, esteem, and unselfishness—this last most particularly. He who says he hasn't a friend undoubtedly hasn't the qualities that make for friendship, which are affection and respect. Friendship is no one-sided affair—it must be mutual. A good description of a friend is one who knows all about you—the best and the worst—and can still like you. The best friendships are made at school, and friendship is necessary for the smooth working of every society. It is needed more and more in the world. Be friends with your school fellows, your teachers, and those at home. Friendships must spread, too, and be international. At the Rotary Convention in America, 1934, there were 10,000 men representing all the different countries of the world, and they were all friends. It is up to every one of us to do our best towards the making and keeping of friendships."—"The Australasian."

NOTICE TO SUBSCRIBERS.

If your Journal is enclosed in a yellow wrapper, it is an indication that your subscription has expired with the number so covered.

Kindly renew your subscription at once. Write your full name plainly, preferably in block letters.

Address your renewal of subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destinaion in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

During recent weeks there has been a marked increase in the banana thrips population in those districts in which this pest is well established. Growers who consider it necessary to deal with banana thrips are advised that so far nicotine dusts applied at weekly intervals have given the most promising results. The dusts may be applied by means of an inexpensive hand dust gun, or by a rotary duster to which a special flexible outlet pipe has been fitted.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green.

As blue mould is likely to cause heavy loss in coastal citrus, especially in long distance consignments, special precautions should be taken for minimising this loss. It must be remembered that the blue mould fungus will only attack bruised or wounded fruit. Hence it is necessary to be careful that no injuries are given by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit must be avoided.

The fruit must be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the

Southern markets, in order to determine what fruit has been attacked by fruit by, and also to enable bruised or injured fruit liable to blue mould to be removed prior to despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year the spray can give a mortality of 98 per cent. of the bronze bugs which are then present solely in the very young stages. This spray is also very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers will shortly have to give attention, it being considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight it is advisable to spray the plants for the control of this disease. Bordeaux mixure of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full cave and held in position by means of weighted wires.

HERD-TESTING.

To dairy farmers who really wish to improve the productiveness of their dairy herds, attention is called to the fact that the Department of Agriculture is still carrying out herd recording work.

While many thousand cows are at present under test in all parts of the State, the numbers submitted this season are considerably below those of recent years. The adverse season is, no doubt, responsible to a great extent for the falling off, but the recent rain has improved conditions in most districts, and owners should not delay in taking up the herd testing once more.

That there can be no definite improvement in any herd without herd recording has been proved beyond dispute, not only in this State, but in every dairy country in the world. The keeping of a pure-bred sire is, no doubt, a step in the right direction, but the improvement will be disappointing unless the herd is subjected to the Babcock test.

The Department is desirous of assisting dairy farmers in this matter and, as the testing is entirely free of cost, they should take full advantage of the scheme.

In comparison with other States the average production per cow in Queensland in very low, and it behoves our dairymen to face the position seriously.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1935.	Dec., 1934.		Dec.	No. of Years' Records.	Dec., 1935.	Dec., 1934.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	7·39	34	1·21	0·69	Clermont	3·88	64	1·73	0·91
Cairns	8·89	53	0·62	1·45	Gindie	2·81	36	2·97	1·85
Cardwell	8·33	63	0·53	1·35	Springsure	3·26	66	3·23	5·50
Cooktown	6·74	59	0·12	1·03					
Herberton	5·79	49	2·58	1·94					
Ingham	7·05	43	1·04	0·77					
Innisfail	11·98	54	1·36	0·39					
Mossman Mill ..	10·75	22	0·70	0·17	*Darling Downs.*				
Townsville	5·56	64	0·50	0·80					
					Dalby	3·31	65	5·01	8·43
Central Coast.					Emu Vale	3·54	39	2·40	5·37
					Hermitage	2·94	29	3·18	3·50
Ayr	4·02	48	0·28	0·13	Jimbour	3·29	47	2·92	7·88
Bowen	4·43	64	0·37	1·50	Miles	3·17	50	2·56	8·37
Charters Towers ..	3·32	53	1·34	0·22	Stanthorpe	3·59	62	3·34	6·47
Mackay	7·18	64	1·48	2·07	Toowoomba ..	4·46	63	2·66	7·38
Proserpine	7·93	32	3·12	2·29	Warwick	3·42	70	3·55	5·07
St. Lawrence ..	4·82	64	1·69	5·41					
South Coast.									
Biggenden	4·72	36	4·58	9·04	*Maranoa.*				
Bundaberg	5·07	52	9·32	5·21					
Brisbane	4·95	83	3·63	9·82	Roma	2·54	61	2·08	4·70
Caboolture	5·33	48	4·47	7·16					
Childers	5·67	40	6·93	4·99					
Crohamhurst	7·30	42	8·30	6·18					
Esk	4·75	48	4·60	6·71					
Gayndah	4·19	64	6·19	6·84					
Gympie	6·07	65	6·57	8·11	*State Farms, &c.*				
Kilkivan	4·58	56	6·45	8·40					
Maryborough ..	5·12	64	5·51	6·96	Bungeworgoral ..	3·01	21	..	4·95
Nambour	6·98	39	4·97	7·65	Gatton College ..	3·71	36	5·29	5·62
Nanango	3·86	53	2·91	5·45	Kairi	6·30	21	..	1·80
Rockhampton ..	4·83	64	5·85	3·55	Mackay Sugar Experiment Station	8·24	38	1·66	1·82
Woodford	5·66	48	4·88	4·00					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·81	91	72	101	14, 23	61	15	12	1
Herberton	..	89	63	96	12, 13, 23	53	14	258	7
Rockhampton	29·87	92	71	103	21	65	1, 2	585	10
Brisbane	29·92	85	68	97	21	61	15	363	9
Darling Downs.									
Dalby	29·87	89	65	97	11, 20, 24	52	22	501	8
Stanthorpe	..	82	57	91	20	40	22	334	11
Toowoomba	..	83	61	95	25	47	22	266	8
Mid-Interior.									
Georgetown	29·81	100	76	105	21	60	14	77	6
Longreach	29·79	102	71	115	20	61	23, 4	36	3
Mitchell	29·83	95	65	108	11, 20	53	5, 23	56	3
Western									
Burketown	29·80	98	77	107	13	68	16	130	4
Boulia	29·81	102	73	114	10, 20	64	23	15	1
Thargomindah	29·83	96	70	116	19	60	5	119	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February. 1936.		March. 1936.		Feb. 1936.	Mar., 1936.
	Rises.	Sets.	Rises.	Sets.	MOONRISE.	
					p.m.	p.m.
1	5·25	6·47	5·46	6·24	1·34	1·27
2	5·25	6·47	5·46	6·23	2·34	2·20
3	5·26	6·46	5·47	6·23	3·33	3·9
4	5·26	6·45	5·47	6·22	4·25	3·49
5	5·27	6·45	5·48	6·21	5·10	4·26
6	5·28	6·44	5·48	6·21	5·51	5·0
7	5·28	6·44	5·49	6·20	6·27	5·30
8	5·29	6·43	5·49	6·19	6·59	6·0
9	5·30	6·42	5·50	6·18	7·28	6·29
10	5·31	6·42	5·50	6·16	7·58	7·0
11	5·32	6·41	5·51	6·15	8·27	7·32
12	5·32	6·40	5·51	6·14	8·58	8·8
13	5·33	6·39	5·52	6·12	9·30	8·45
14	5·34	6·38	5·52	6·11	10·8	9·29
15	5·35	6·37	5·53	6·10	10·47	10·19
16	5·36	6·36	5·54	6·8	11·35	11·14
17	5·36	6·36	5·54	6·7	a.m.	a.m.
18	5·37	6·35	5·55	6·6	12·27	12·11
19	5·38	6·34	5·55	6·5	1·25	1·15
20	5·38	6·33	5·56	6·4	2·27	2·18
21	5·39	6·32	5·56	6·3	3·34	3·24
22	5·40	6·31	5·57	6·2	4·41	4·31
23	5·40	6·30	5·57	6·1	5·50	5·39
24	5·41	6·29	5·58	6·0	6·56	6·47
25	5·42	6·28	5·59	5·59	8·3	7·57
26	5·43	6·27	5·59	5·57	9·10	9·8
27	5·43	6·26	6·0	5·56	10·18	10·15
28	5·44	6·25	6·0	5·54	11·24	11·18
					p.m.	
29	5·45	6·24	6·1	5·53	12·28	12·15
30			6·1	5·51		11·6
31			6·2	5·50		1·51

Phases of the Moon, Occultations, &c.

7 Feb.	○	Full Moon	9 19 p.m.
16 ,,	☽	Last Quarter	1 45 a.m.
23 ,,	●	New Moon	4 42 a.m.
29 ,,	☾	First Quarter	7 28 p.m.

Apogee, 12th February, at 4.6 a.m.
Perigee, 24th February, at 8.24 a.m.

About 3 hours after setting, about 4.40 p.m., Venus will become occulted by the Moon to observers situated in the Northern Hemisphere, north of parallel 49 degrees.

Mercury will reach its greatest elongation, 27 degrees west of the Sun on the 26th. It will then rise 1 hour 55 minutes before it, affording a good opportunity to be seen by early risers. Venus and Mercury will then be apparently in Capricornus, about 3 degrees (half length of Cross) apart.

Mercury will set only 5 minutes before the Sun on the 1st: on the 14th it will rise at 3.54 a.m., 1 hour 40 minutes before the Sun.

Venus rises at 2.39 a.m., 2 hours 46 minutes before the Sun, on the 1st, and at 2.57 a.m., 2 hours 37 minutes before it on the 14th.

Mars sets at 8.32 p.m. on the 1st and at 8.8 p.m. on the 14th.

Jupiter rises at 1.28 a.m. on the 1st and at 12.45 a.m. on the 14th.

Saturn sets at 8.22 p.m. on the 1st and at 7.34 p.m. on the 14th.

It will be noticed that Mars and Saturn will be apparently nearer to one another on the western horizon on the 1st, when Mars will set only 10 minutes after Saturn, but on the 14th it will be 34 minutes later.

The path of the Moon in February, commencing at 8 p.m. on the 1st will be:— In Taurus, just above the Pleiades, that beautiful group of six small stars in the left shoulder of the Bull, so modest and so easily deciphered, which may be seen as seven or even twelve stars by persons with very keen sight. The number, however, reaches a hundred in moderately powerful telescopes. The Moon will reach Gemini on the 3rd and Cancer on the 6th, passing above Castor and Pollux. Reaching Leo on the 7th it passes above Regulus on the 8th, crossing the border of Virgo on the 11th, and passing above Spica at 10 a.m. on the 13th. It will reach Libra on the 14th, Scorpio on the 16th, and will be in Orphincus till the 18th, in Sagittarius till the 21st, in Capricornus till the 22nd, in Aquarius till the 24th, and pass below Saturn near midnight on the 23rd. It will be in Piscus till the 27th, in Aries till the 28th, and again in Taurus until the end of the month.

The Southern Cross does not come into view till after 7 p.m. on 1st February but will appear an hour earlier on the 16th. It will be visable all night during this month.

8 Mar.,	○	Full Moon	3 13 p.m.
16 ,,	☽	Last Quarter	6 35 p.m.
23 ,,	●	New Moon	2 13 p.m.
30 ,,	☾	First Quarter	7 22 a.m.

Apogee, 10th March, at 2.18 p.m.
Perigee, 23rd March, at 7.24 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.