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. L 1 SEPTEMBER, 1938 Part 3

Event and Comment

The Brisbane Show.

AS a centralised aggregation of decentralised effort and enterprise, the Brisbane Exhibition always presents an impressive spectacle; and this year it outshone all previous shows. Judging by its representation of the extraordinary range of rural production and diversity of country interests in Queensland, it is difficult to imagine a limit on any estimation of future advancement. The attainment of high standards under the stimulus of healthy competitive effort was exemplified in every farm exhibit and in every animal paraded. No more convincing evidence of the State's immense agricultural and pastoral capacity could be presented.

At the opening ceremony, his Excellency the Governor, Sir Leslie Wilson, said that the people of Queensland had every reason to be grateful to the Royal National Agricultural and Industrial Association. "I congratulate you," he added, "on the progress you have made, and I am confident from what I have seen that yours is no idle boast when you say that this is the finest Show yet put before the citizens of Queensland."

Continuing, his Excellency said that great men with great pioneering spirit had passed away in recent years, and particularly this year. He would add, also, the names of some women who, in their way, really gave just as great services to the State. The work of these great-hearted men and women should be put on record for all time. Possibly some of those who realised how much they owed to the pioneers would help towards this end in the establishment of a historical museum.

He had a great belief in the future of Queensland. This Show demonstrated the State's great assets, but without the beneficent generosity of Divine Providence they could have availed nothing.

The Show was an advertisement of the best that Queensland could produce. The exhibits were a record in number and, he believed, in quality, for Queensland and the exhibitors had done all in their power—often at a great financial sacrifice.

It was right they should look back with gratitude to the early pioneers, but they should also look forward to the future, so that they might leave to those who came after a State whose foundations had been well and truly laid. It was his fervent hope that the spirit of their work would be an example to everyone who had at heart—as every Queenslander should—the welfare of his country. They should do all in their power to utilise the gifts with which they had been blessed to the greatest benefit of the greatest number of citizens.

The Show was worthy indeed of a great State, and demonstrated that Queensland not only could but intended to produce the best. The Show must send into the hearts of all who saw it a message of encouragement and hope for the future.

Conservation of the State's Rural Resources.

SPEAKING at another official function later in the day, his Excellency remarked that the Brisbane Exhibition could not have been staged if it had not been for the work of district shows, and he wished to pay tribute to their wonderful contribution to the State's progress. Optimism was sometimes a danger, because it meant they were a little self-satisfied and complacent. They could not afford to be that, but must strive for even better things. He was such an ardent advocate for better water supply that he felt he could talk about it until "the cows came home." Water was a priceless gift to Queensland, but geologists stated that it had been misused and neglected in the past. Only a fortnight before he had seen artesian bores which had gone dry and had become sub-artesian.

The felling of scrub, ringbarking, and the denudation of timbers were other examples of the tendency to draw too heavily on Nature without helping it to replenish the supply.

It was gratifying that water conservation and irrigation would play an important part in the Government's programme of development outlined to Parliament recently.

He realised they must proceed slowly, but they should go ahead with surveys and research, and use every means in their power to ensure a plentiful water supply for the future.

The Royal National Association was doing great work, and nobody realised it more fully than he.

National Development a Vital Principle.

ACKNOWLEDGING the toast of Parliament at the same function, the Premier, Hon. W. Forgan Smith, said Parliament had greater significance to-day than at any other time in history. In electing Parliament the people gave certain men or women power of attorney to implement a policy in the interests of the community. Parliament at one time was regarded as an organisation that should interfere as little as possible with industry, trade, and individuals. That sounded very nice in theory, but other people were clamouring for it to legislate for their welfare. It was an inevitable development that Parliament should enter more and more into the affairs of life, and control industry on behalf of the whole people and not of a section, continued the Premier. Whether they liked it or not, people were living to-day in the social state, and Parliament was expected to give a lead. This meant that it had an increased responsibility. Though parliamentarians might differ on matters of fundamental policy, as men of sound character they could not differ on vital principles, the first and most vital of which was to develop this country.

"Queenslanders must enter manfully into possession of their great natural heritage and use it effectively, not alone for their generation, but for the future of a great Commonwealth," said Mr. Smith. "They should stand, also, for the vital principles that all men and women shall be free; that every child shall have the right to be born clean and healthy, to be loved and cared for, and educated and trained as a good citizen."

If any institution became corrupt or effete it would be replaced by one nearer to the hearts, minds, and souls of the people. Therefore, Parliament as they understood it to-day could be strengthened only by the intelligent support of the people who elected it. In carrying out their duty for the greater good of the people, governments might have to do things that were unpopular at the moment. But time would demonstrate their soundness.

The Show an Inspiration.

SPEAKING of the work of the Royal National Agricultural and Industrial Association, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that few people appreciated the amount of work the leaders of the Association gave willingly to the State in pursuit of an ideal. The Show crystallised the activity and thought of the previous twelve months, and he congratulated those who had made this possible. Nations whose feet were planted firmly in the soil of their country ultimately found themselves on the highest plane, and for that reason the Exhibition was not only a fruitful display but an inspiration for future performance.

One of the problems facing Queensland was how to promote the quality of agricultural products, and how to attain a level at least equal to that maintained by competitors in, say, the markets of the United Kingdom, continued Mr. Bulcock. Cultural problems sank to comparative insignificance when confronted with that. It was because the outstanding performance of to-day became the commonplace of to-morrow that the Royal National Association, concentrating the State's best in its Annual Show, was an inspiration rather than an institution.

Codling Moth Control Experiments, 1937-38.

KEIGHLEY M. WARD, M.Agr.Sc., Research Officer, and A. A. ROSS, Assistant to Research Officer.

IN seeking methods by which an improvement in the control of codling moth might be achieved, two main aspects of the problem must be investigated. In the first place, any alternative spray schedule should compare favourably in efficiency with lead arsenate and at the same time obviate the accumulation of arsenical residues on mature fruit; the cost of such a schedule should not be disproportionate to that of the lead arsenate schedule. In the second place, if the most effective results are to be obtained from a minimum number of sprayings, the practicability of timing spray applications according to the activity of the moth must be determined.

In the Stanthorpe district, the various spray schedules in use rely to a considerable extent on lead arsenate for the control of codling moth. To minimise arsenical residues, some growers employ white oil for the later cover sprays. Whatever cover spray is adopted, times of application frequently bear little or no relation to moth activity. As the moths usually appear in a series of waves during the season, and egg-laying is therefore more active at some periods than at others, the correct timing of cover sprays is particularly desirable.

The 1937-38 programme of work was designed to ascertain the relative efficiency of certain spray schedules and to record the activity of adult moths under orchard conditions with a view to devising a practicable method of timing spray applications.

EXPERIMENTAL METHODS.

In designing the orchard spraying trial, two important sources of variation which occur in any orchard were taken into account. These are (i.) the variation in infestation between different trees; in this experiment, for example, the amount of infested fruit on individual unsprayed trees ranged from 13 per cent. to 64 per cent.; and (ii.) the variation in the number of fruits produced on different trees; in the present case, the number of apples borne by individual trees varied from 66 to 1,355. In the absence of information on the probable variation in infestation, a randomised block layout was employed in which seven treatments, including controls, were replicated six times on plots of four trees each, arranged in a square. The experiment was laid down on 168 Granny Smith apple trees. Since this variety matures late, the fruit was subject to codling moth attack for practically the whole of the season. The trees were eighteen years of age.

The experimental results were analysed after an examination of the whole crop from each tree. The fruit, when harvested, was sorted into three groups, namely, uninfested, infested—calyx entrance, and infested —side entrance. An apple was classed as "infested" only when a larva had actually entered the fruit or caused a definite injury; so-called "stings"—*i.e.*, fruit with slight surface injury but not entered by larvæ—were classed as uninfested fruit. Wind-fallen fruit, collected at intervals through the season, was similarly classified, and the figures

were included in the total yield per tree for analytical purposes. A total of 101,888 apples, approximately 680 cases, was harvested from the experimental trees.

Adult moth activity was studied with the aid of lure traps which consisted of vinegar or molasses solutions. The traps were maintained throughout the season in the experimental orchard at The Summit, and also at another orchard about 5 miles away at Applethorpe. Forty traps were employed and the number of moths caught was recorded twice weekly. The lure was renewed fortnightly.

The cocooning behaviour of the larvæ was observed by means of bands or shelter traps made from plain corrugated cardboard strips, 3 inches wide, placed on the trunks of twenty-four apple trees. The bands were removed twice weekly and the numbers of larvæ trapped were recorded. Temperature and humidity records were kept for the period of the observations.

Codling moth life history studies were carried out at the Stanthorpe laboratory and general observations were made in several orchards.

TREATMENTS.

The spray schedules tested in the 1937-38 season are set out below:—

1. White oil—nicotine sulphate (1½ gallons—1 pint—80 gallons) applied in both calyx and cover sprays.
2. Nicotine sulphate with a white oil spreader (1 pint—1 quart—80 gals.) applied in both calyx and cover sprays.
3. Lead arsenate (2½ lb.—80 gals.) applied in both calyx and cover sprays.
4. Lead arsenate (2½ lb.—80 gals.) as a calyx spray followed by white oil (1½ gals.—80 gals.) as cover sprays.
5. Potash soft soap (10 lb.—80 gals.) applied in both calyx and cover sprays.
6. Colloidal sulphur—nicotine sulphate (2½ lb.—1 pint—80 gals.) applied in both calyx and cover sprays.
7. Controls—untreated.

Sprays were applied four times during the season on the following dates:—calyx spray—13th October; cover sprays—4th November, 23rd December, 14th February. The greater part of the fruit was harvested between 19th February and 10th March.

RESULTS.

The results of this experiment are summarised in Table I. where a comparison is made between the six different spray schedules. Each of these figures is based on the crop yielded by twenty-four trees receiving similar treatment.

In examining the results it is essential to bear in mind that *only differences of 9·24 or over in the percentage control given by different treatments can be taken as reliable or "significant."*

The first four schedules have all exercised a controlling effect over the moth, as is shown by a comparison with unsprayed trees. They do not differ significantly from each other and therefore must be classed,

in this experiment, as equally effective. Whilst none gave better control than Schedule 3 in which lead arsenate alone was used, three of the Schedules (1, 2, and 4) embodying non-arsenical cover sprays, were equally efficient.

The mixture of 1 pint of nicotine sulphate plus 1 quart of white oil (Schedule 2) controlled the moth as well as 1 pint. of nicotine sulphate plus 1½ gals. of white oil (Schedule 1). Of these two sprays, the second is, of course, more expensive than the first.

TABLE I.—SHOWING RELATIVE EFFICIENCY OF VARIOUS SPRAY SCHEDULES IN 1937–38 EXPERIMENTS.

Schedule.	% Uninfested Fruit.	Significantly Exceeds.	Number Apples Examined.
1. White oil-nicotine sulphate calyx and cover sprays	**78.98**	5, 7	11,772
2. Nicotine sulphate-white oil spreader calyx and cover sprays	**79.70**	5, 6, 7	15,071
3. Lead arsenate calyx and cover sprays ..	**79.42**	5, 6, 7	15,559
4. Lead arsenate calyx followed by white oil cover sprays	**82.18**	5, 6, 7	16,308
5. Potash soft soap calyx and cover sprays..	**59.78**	..	15,211
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	**70.15**	5	12,982
7. Control—Unsprayed trees	**63.42**	..	14,985
Total	..	..	101,888

Standard error = 3·2

Significant difference = 9·24

F for treatments = 7·81 which is highly significant (P. < ·01).

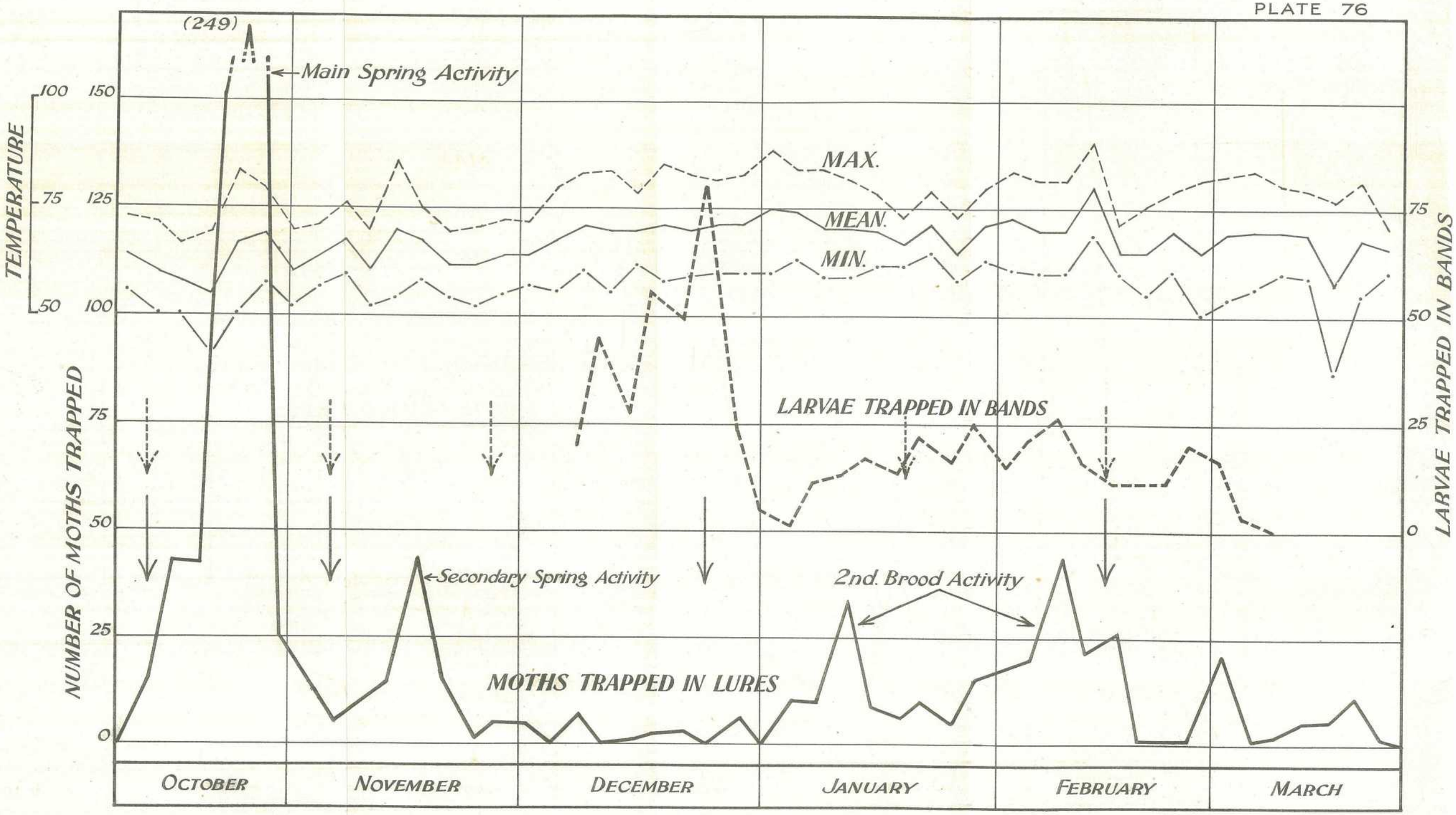
The percentage of uninfested fruit obtained from trees sprayed with potash soft soap (Schedule 5) was not significantly different from that obtained from the unsprayed trees, *i.e.*, potash soap has failed in this experiment to control the insect. This observation was supported by a laboratory test in which codling moth eggs were treated with the same spray. The results were as follows:—

	No. eggs treated.	Per cent. eggs not hatching.	Per cent. eggs killed by treatment.
Potash soap	150	31·3	24·2
Untreated	150	9·3	..

Since only 24·2 of the eggs was killed by the spray, potash soft soap cannot be considered an effective ovicide.

Colloidal sulphur plus nicotine sulphate (Schedule 6), though somewhat more effective than potash soft soap, has also given disappointing results. As this mixture was less effective than Schedules 1 and 2 containing nicotine sulphate plus white oil sprays, it seems that white oil may have an activating effect on the nicotine sulphate, which is not exerted by the colloidal sulphur.

The four best treatments gave approximately 80 per cent. sound fruit, which can scarcely be considered adequate control, although it is



CODLING MOTH ACTIVITY AT STANTHORPE, 1937-38.

probably as good, if not better, than that obtained in many orchards. Better control might have been procured if lead arsenate calyx sprays had been employed in all schedules and if cover sprays had been applied shortly after the November and January peaks of moth activity (see Plate 76). The December spray could probably have been dispensed with. In view of the fact that the season was favourable for codling moth infestation and that only four sprays were applied, the control given by the better spray schedules is reasonably good. The relatively inadequate degree of commercial control does not, however, prevent contrasts being made between the several spray schedules, nor does it lessen the reliability of the results.

Effect of Sprays on Calyx Entrances.

The whole of the infested fruit was examined to determine the position of larval entry. The results are summarised in Table II.

TABLE II.—THE EFFECT OF VARIOUS SPRAY SCHEDULES ON THE AMOUNT OF CALYX INFESTATION.

Schedule.	% Calyx Entrances in Infested Fruit.	Significantly Exceeds.	Number of Apples Examined.
1. White oil-nicotine sulphate calyx and cover sprays	**27.50**	3, 4	2,130
2. Nicotine sulphate-white oil spreader calyx and cover sprays	**25.67**	3, 4	2,965
3. Lead arsenate calyx and cover sprays ..	**10.36**	..	3,073
4. Lead arsenate calyx followed by white oil cover sprays	**9.36**	..	2,812
5. Potash soft soap calyx and cover sprays..	**42.13**	1, 2, 3, 4, 6	5,821
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	**29.43**	3, 4	3,606
7. Control	**37.25**	1, 2, 3, 4, 6	5,448
Total	..	..	25,855

Standard error = 2·53 Significant difference = 7·31.

F for treatments = 24·03 which is highly significant (P. < ·01).

Those schedules which included a calyx spray of lead arsenate (Schedules 3 and 4) have, by a wide margin, produced the smallest amount of calyx-infested fruit. Every other treatment is significantly inferior to these two in this respect. This indicates that the arsenical calyx spray provides a much greater degree of protection against infestation through the calyx than the other treatments, and should not therefore be dispensed with in the codling moth spray programme.

It is also evident that Schedules 1, 2, and 6 have exercised some control over the number of larvae gaining entrance through the calyx, though markedly less than that given by Schedules 3 and 4, which included a lead arsenate calyx spray. This fact indicates that if a lead arsenate calyx spray had been employed in Schedules 1, 2, and 6, better results would have been obtained. The evidence suggests, therefore, that nicotine sulphate plus white oil may be more effective as a cover spray than either lead arsenate or white oil used alone.

Wind-fallen Fruit.

The amount of codling moth infestation in the wind-fallen fruit, as recorded to January 11, is shown in Table III.

These figures reflect the relative efficiency of the various spray treatments up to January 11. The greatest number of fallen fruit occurred on those plots in which infestation was highest, but an average of only 32 per cent. of the wind-fallen fruit was infested.

Foliage Injury Due to Arsenical Sprays.

Scorching of the foliage occurred on a number of the experimental plots, and there can be no doubt that this was due, directly or indirectly, to the lead arsenate sprays, for leaf injury appeared only on trees receiving such treatment. The injury must interfere with the efficiency of the foliage, and doubtless has a harmful influence on the vigour of the trees.

OBSERVATIONS ON CODLING MOTH ACTIVITY 1937-38 SEASON.

The activity of the moth, and the cocooning of larvæ, are shown in Plate 76, which is based on bi-weekly records from forty lure traps and twenty-four bands, and on daily temperature records. The records of moths trapped in lures demonstrate that the total period of activity

TABLE III.—CODLING MOTH INFESTATION IN WINDFALLEN FRUIT.

Schedule.	Uninfested Fruit.	Infested Fruit.			Total Fruit.
		Calyx.	Side.	Total.	
	%	%	%	%	
1. White oil-nicotine sulphate calyx and cover sprays	81	4	15	19	676
2. Nicotine sulphate-white oil spreader calyx and cover sprays	75	8	17	25	753
3. Lead arsenate calyx and cover sprays	86	1	13	14	1,033
4. Lead arsenate calyx followed by white oil cover sprays	82	1	17	18	901
5. Potash soft soap calyx and cover sprays	42	26	32	58	1,372
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	62	9	29	38	793
7. Control	55	19	26	45	1,479

S.E. for calyx entrances only = 2·5 Significant difference 7·2.

extended over almost six months, from 9th October, 1937, to 25th March, 1938. The moths appeared in a series of four or five waves indicated by peaks during this period. These waves were associated with two broods of the insect, a numerous spring brood, which appeared in two waves in October and November and a summer brood which appeared in two and a doubtful third wave in January, February, and early March. Very few moths were trapped in the intervening eight weeks between these two broods. The main appearance of the spring brood extended from 13th October to 20th November, a period of five weeks, whereas the second brood appeared from 11th January to 18th March, a period of approximately nine weeks.

The temperature graph (Plate 76) indicates some correlation between the first two peaks of activity and rises in temperature, but in subsequent emergencies there was apparently little or no relation between temperature conditions and moth activity.

Larvæ descended the trunk of the trees for cocooning from early December to the close of the season. The larval progeny of the spring brood were full grown by the second week of December and descended to the bands during the remainder of that month. The great majority of these larvæ completed their development later in the season and gave rise to the peaks of moth activity shown in January and February. A few remained in the larval stage for over-wintering.

THE TIMING OF SPRAY APPLICATIONS.

As adult moths appear in a series of relatively well-defined waves during the season, egg-laying probably takes place more actively at some periods than at others. Spraying should therefore follow shortly after an observed peak of moth activity if cover sprays are to give the best results. In the experimental orchard where these observations were made, spray treatments were obviously necessary at certain times in October and November. From the first week in December to about mid-January, spray applications could perhaps have been omitted owing to the inactivity of the moth. Further sprays were required about mid-January and mid-February to minimise infestation of the fruit by the offspring of moths that emerged during these two months.

In actual practice the timing of sprays according to moth activity would necessarily be based on the consideration of several factors. Careful and regular observations must be made on the numbers of moths caught in the traps. The lures must not be allowed to lose their attractiveness through failure to renew the materials regularly. Efficient attractants must be employed. Vinegar and molasses were used in this year's work, but other lure materials such as unfermented apple juice, apple cider, golden syrup, and wine are utilized elsewhere with better results (Anon., 1938). During the 1937-38 season a molasses solution (1 in 12) and vinegar (at the same strength) in separate but attached jars caught almost three times as many moths as either of these two materials employed separately in spaced traps. A minimum number of 15 lure traps should be satisfactory for obtaining data on moth activity in any one orchard. The containers should hold about 1½ pints of liquid, should be deep rather than shallow and preferably with straight sides. Two-pound glass jars or fruit preserving cans are suitable. They should be hung in a shady position to minimise evaporation and must be examined twice weekly, e.g., Mondays and Thursdays, to record the number of codling moths caught. All moths should be removed from the traps at each routine examination.

When the number of moths caught indicates the existence of a peak in codling moth activity, consideration must be given to early spraying. When moths emerge, a period of about two to five days elapses before egg-laying begins, and a further period of from six to twelve days elapses before the eggs hatch. These periods vary according to the time of the season and with weather conditions; they are generally longer in spring than in summer, and longer also under cool than warm weather conditions. Furthermore, egg-laying is retarded and possibly suspended in cold, wet, or windy weather when the temperature is about 60 degrees

F. or below. Under normal conditions cover sprays applied during a period extending from about the fifth day to about the twelfth day after a recorded peak of moth activity in the orchard should therefore be more effective than sprays timed by any other consideration.

Because they are primarily ovicides, non-arsenical cover sprays, such as white oil and white oil plus nicotine sulphate, especially require more accurate timing. Even with lead arsenate, a stomach poison, the same timing procedure should give the maximum protection at a time when newly-hatched larvæ are seeking access into the fruit.

The maintenance of an adequate number of lure traps in the orchard and the proper recording of the insects caught should assist apple and pear growers in their codling moth control programme. Sprays applied in conformity with the data obtained should prove very effective, and unnecessary sprays can be omitted from the schedule without prejudice to the crop and with a saving in costs.

GENERAL DISCUSSION.

A lead arsenate calyx spray followed by white oil-nicotine sulphate cover sprays has previously (Jarvis, 1937) given very good control of codling moth. In 1937-38, a schedule comprising white oil-nicotine sulphate in all sprays gave control equal to that obtained from a wholly lead arsenate schedule. An analysis of the data further showed that lead arsenate is more effective in preventing calyx entrances than any other spray used in the experiment. There can therefore be no doubt that a schedule in which lead arsenate is applied as a calyx spray and white oil-nicotine sulphate in the several cover sprays will give at least equal, and probably better, results than a wholly lead arsenate schedule in the Stanthorpe district.

Although this cover spray (1⅓ gallons white oil; 1 pint nicotine sulphate; 80 gallons water) is admittedly expensive compared with lead arsenate, the results obtained with Schedule 2 (1 quart white oil; 1 pint nicotine sulphate; 80 gallons water in all sprays) indicate that the amount of white oil in the former might be reduced considerably without any proportional loss of efficiency. This possibility will be further investigated in the coming season.

A cover spray which contains white oil and nicotine sulphate should prove of considerable incidental value in controlling apple leafhoppers, red mites, scale insects, woolly aphis, and possibly fruit fly.

A schedule in which a lead arsenate calyx spray was followed by cover sprays of white oil alone proved as effective for the control of codling moth as a wholly lead arsenate schedule. This result is in line with investigations in Southern States, and such a schedule should give good results in the Stanthorpe district.

Both white oil-nicotine sulphate and white oil cover sprays should obviate any arsenical residues on the mature fruit. Both possess ovicidal properties. Nicotine sulphate is also known to be toxic to moths present in the trees.

The lure trap records indicate that codling moth infestation is associated with peaks of activity of the moth. The occurrence of well-marked peaks of activity in the spring of 1937, followed by a period of inactivity, suggests that the correct timing of cover spray applications should give the most satisfactory results and eliminate unnecessary applications when the pest is inactive. The activity of the moth may

vary from season to season, and the period of eight weeks' inactivity in 1937-38 may be unusually long, as peaks of moth activity are determined by climatic and other factors during any one year. The times of spray application in one season might therefore be quite different from those in any other season.

Recommendations.

The available information warrants the following recommendations to apple and pear growers for the control of codling moth. A calyx spray consisting of 2½ lb. of lead arsenate powder (or 5 lb. paste) in 80 gallons of water (plus spreader) is essential. This spray should be aplied after petal fall and at a stage when most of the calyces have begun to close. It is designed to prevent the entry of the newly-hatched larvæ through the calyx, and, properly applied, should be efficacious in this respect for the greater part of the season.

The calyx spray should be followed at appropriate times by one or other of the cover sprays shown to be efficient in the experimental programme, viz.:—

1. White oil 1⅓ gallons, plus nicotine sulphate 1 pint, in 80 gallons of water.
2. White oil 1 gallon in 60 gallons of water.

Alternatively, lead arsenate could be used for both the calyx and the first cover sprays, one or other of the above non-arsenical cover sprays being used subsequently.

The effective use of any of the cover sprays depends primarily on the correct timing of spray applications. Orchardists will find the timing problem simplified if they maintain a series of lure traps in the orchard. Provided that conditions were favourable for egg-laying during a peak of moth activity, cover sprays should be applied not earlier than the fifth day, and seldom later than the twelfth day after the recorded peak. Growers should consult the nearest officer of the Department of Agriculture and Stock if they are in doubt as to the timing of any particular spray.

SUMMARY.

1. The 1937-38 programme of work on codling moth was designed to ascertain the relative efficiency of certain spray schedules which may obviate the accumulation of arsenical residues on mature fruit, and to investigate methods of timing sprays most effectively.

2. The experimental methods are described.

3. An orchard spraying trial showed that three spray schedules were just as effective as a lead arsenate schedule in controlling the moth. Two of these schedules embodied a white oil and nicotine sulphate spray both in calyx and cover sprays, and in the third a lead arsenate calyx spray was followed by white oil cover sprays. A combined spray of colloidal sulphur plus nicotine sulphate and also a potash soft soap spray did not significantly reduce the amount of infested fruit.

4. Schedules in which sprays other than lead arsenate were applied as the calyx sprays resulted in a marked increase in calyx penetration by codling moth larvæ. It is thus inadvisable to omit a lead arsenate calyx spray from any schedule or to substitute a contact insecticide for a stomach poison in the calyx spray. While less effective than lead

arsenate as a calyx spray, nicotine sulphate plus white oil may be more effective as a cover spray than either lead arsenate or white oil alone.

5. Observations on adult moth activity, as shown by lure traps, indicated that during a period of six months, extending from 9th October to 25th March, the moths appeared in a series of four or five waves. Spring brood activity was very marked in October and November, and was followed by an inactive period of about eight weeks. Second brood activity occurred during January, February, and March.

6. The fact that the moths appear in waves indicates that there are some periods when egg-laying is greater than at others. Cover sprays may therefore be employed more effectively if applied in accordance with moth activity. The factors on which the timing of sprays is based are discussed.

7. As a result of the season's work, alternative spray schedules for codling moth control in the Stanthorpe district are suggested. A lead arsenate calyx spray forms an essential part of the spray programme, but cover sprays consisting of white oil, with or without nicotine sulphate, are suggested as alternatives to lead arsenate.

Acknowledgments.

The statistical analyses given in this report were carried out by Miss Barbara Shield, M.A., Assistant to Research Officer. Mr. R. B. Middleton, The Summit, made available the experimental trees and provided the necessary facilities for spraying, &c. The Deciduous Sectional Group Committee of the Committee of Direction of Fruit Marketing bore portion of the loss due to codling moth infestation on the control trees required for experimental purposes. Mr. J. L. Groom, Assistant to Research Officer, gave considerable assistance in the field during the harvesting of the fruit.

The collaboration and interest of the foregoing have been particularly helpful.

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The Control of Banana Rust Thrips.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

(*Continued from p. 163, Part 2, Vol. L.—Aug.*, 1938.)

VI. DISTRIBUTION.

(1) Distribution of the Pest in Queensland.

A KNOWLEDGE of the distribution of the banana rust thrips within the State is relevant to local quarantine measures controlling the movement of planting material. For quarantine and other purposes the banana-growing region south of Rockhampton is divided into a number of loosely defined districts, the boundaries of which are altered from time to time to suit changing conditions. Each district is in charge of an Agent of the Banana Industry Protection Board, who, of course, becomes thoroughly acquainted with every plantation under his supervision. An exact detailed survey of pest incidence was not an essential part of the present investigations, and the distribution of the pest will, therefore, only be sketched on fairly broad lines.

Most of the banana-growing localities in the coastal area north of Gympie (Plate 77) are infested with thrips. In 1935 infestations were observed at Cairns, Rollingstone, Magnetic Island, Ayr, Bowen, and Rockhampton. Just north and south of Cairns are areas known for many years to be amongst the worst affected in the State. The pest is known to occur on the Atherton Tableland (Smith, 1935), though no commercial rust has resulted. In several of the somewhat scattered banana-growing localities between Townsville and Rockhampton the insect has attained pest proportions, e.g. Mackay (1916-17). South of Rockhampton to Gympie are numerous small centres of banana production. Some have suffered severe damage from rust, e.g., Takura-Pialba (1916-1917), reported by Tryon (1925), while in others *S. signipennis* is known to occur but in insufficient numbers to cause appreciable commerical damage. In the remainder there seems to be good reason for supposing that the pest species may not occur. Two such areas, each with only a small acreage, are situated at Biggenden and Gayndah, both of which are out of the recognised banana-growing belt. In the coastal region, however, it is reported (Hancock, 1936) that sundry localities are free from rust.

The bulk of the crop sold outside Queensland is grown south of Gympie, and a knowledge of the exact distribution of the banana rust thrips is particularly important as a guide to the Banana Industry Protection Board in determining its policy concerning the movement of planting material.

The Gympie district itself was the centre of the first outbreak of thrips in southern Queensland and, as far as is known, the whole district is affected.

South of Gympie (Plate 78) the distribution of the pest is practically continuous through Traveston, Cooran, and Pomona to Cooroy, though some isolated localities have suffered very little loss. Along the Mary Valley line, Gympie to Brooloo, rust has often been severe.

In the Eumundi-Yandina district, thrips have been present for some time in sundry localities but so far no serious developments have taken place.

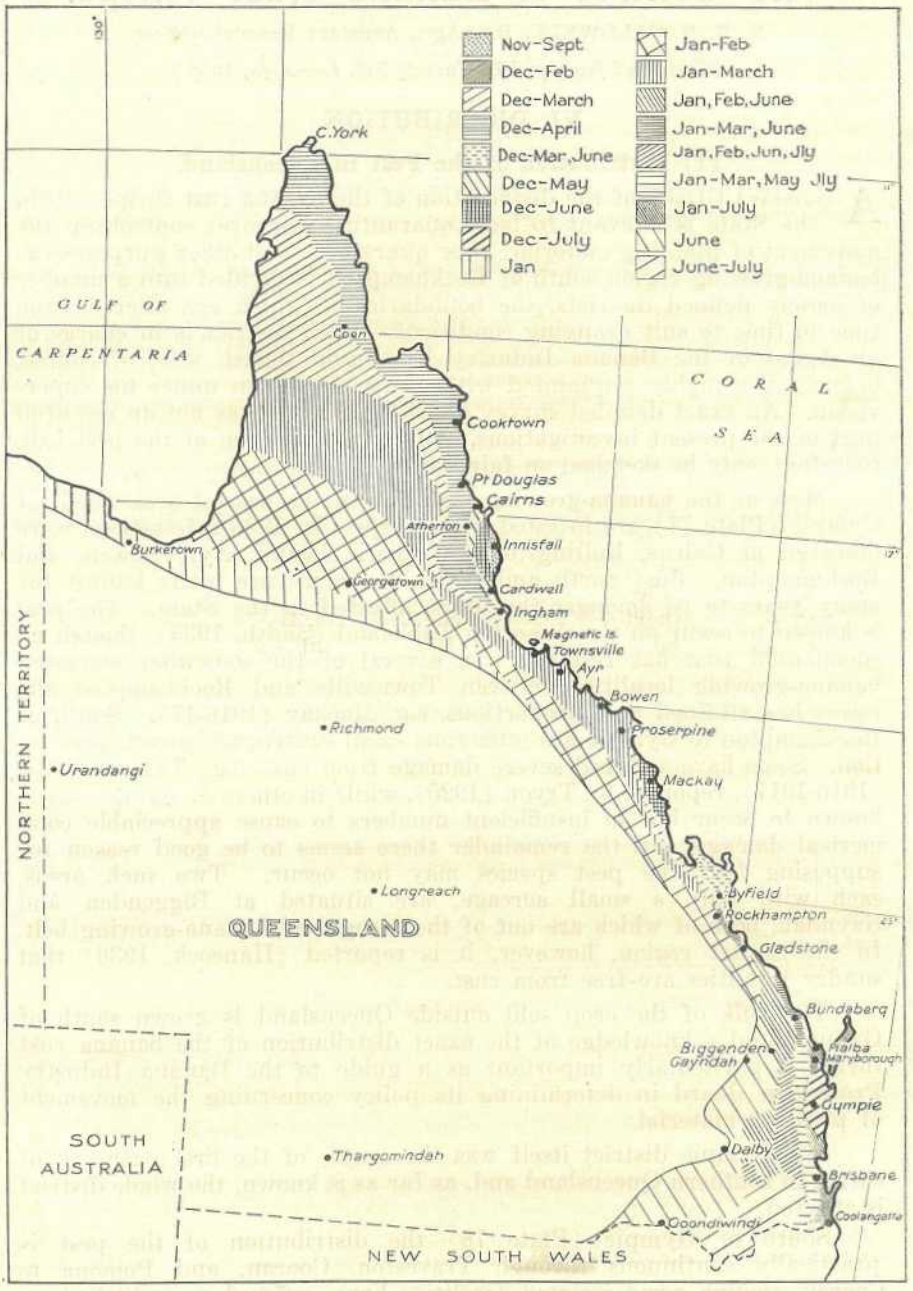


Plate 77.

Queensland, showing areas in which rainfall exceeds evaporation for stated periods as determined by the saturation deficit. Bananas require adequate moisture and thrive best when rainfall exceeds evaporation for the greater part of the year.

(After Davidson.)

From Nambour to Caboolture has always been considered a clean belt, but the recent discovery of *S. signipennis* on citrus at Nambour and on both citrus and bananas at Palmwoods renders suspect a portion of this area. On grapefruit at Palmwoods a fairly large population built up during the 1935-36 summer and seriously blemished the fruit. Commercial rust in bananas, if it did occur, must have been rare for no official reports have been made on the subject by officers closely associated with this area.

In the Upper Caboolture district a slight amount of commercial damage was recorded in the 1933-34 summer but only on isolated plantations. Slightly blemished fruit has been observed from localities between Caboolture and Woodford (on the Kilcoy line) but the insect could not be found on the plantations.

The banana rust thrips is of little or no importance in the Brisbane and near-Brisbane districts. Thrips are not known in the Dayboro' district. A very light infestation was detected at Brookfield but no commercial damage has resulted. Wynnum-Manly-Cleveland-Redland Bay areas are probably free from the pest.

South of Brisbane to the New South Wales border is a region of irregular distribution.

Beenleigh is a centre of severe, though restricted infestation. One plantation has suffered fairly acute commercial damage in recent years, while the insect has been detected on sundry other plantations at Cedar Pocket and Mount Cotton. In the 1936-37 seasons, commercial rust developed on isolated plantations at Ormeau and Upper Coomera. Nerang, near Southport, is another centre of infestation, and severe damage occurred several years ago on some plantations at Mount Nathan and Callagraba. The pest is known to occur in certain other localities, e.g., Upper Mudgeeraba.

In the 1936-37 summer a fairly severe infestation was located on one plantation in the Tallebudgera Valley, previously regarded as a clean area. Other plantations in the valley are probably harbouring the pest. In the Currumbin Valley, one plantation developed sufficient commercial rust in 1933-34 to cause some concern for the future but rust incidence has since declined in severity. Thrips have been located in several other plantations in the valley.

Tryon (1925) recorded *S. signipennis* from the Tweed Valley in 1920 and 1924. It is not clear to what portion of Queensland territory this record applies but in sundry small areas between the Currumbin Valley and the border the presence of either thrips or rust has not been observed in recent years.

The ever-changing importance of the main centres of production and the fluctuations of the insect population constantly modify the significance of the different foci of infestation. For instance, in 1930-32, owing to severe infestation at Callagraba, Nerang, and Mount Nathan, thrips were a serious menace in the Southport district. Since then practically all the affected plantations have been eradicated, new outbreaks have not occurred, and rust is not at present of any importance in the district. Similarly, in 1933-34, the situation on one plantation in the Currumbin Valley was potentially serious but the thrips population has since declined to comparatively small numbers. Although the plantation is still extant and bananas are grown extensively in the

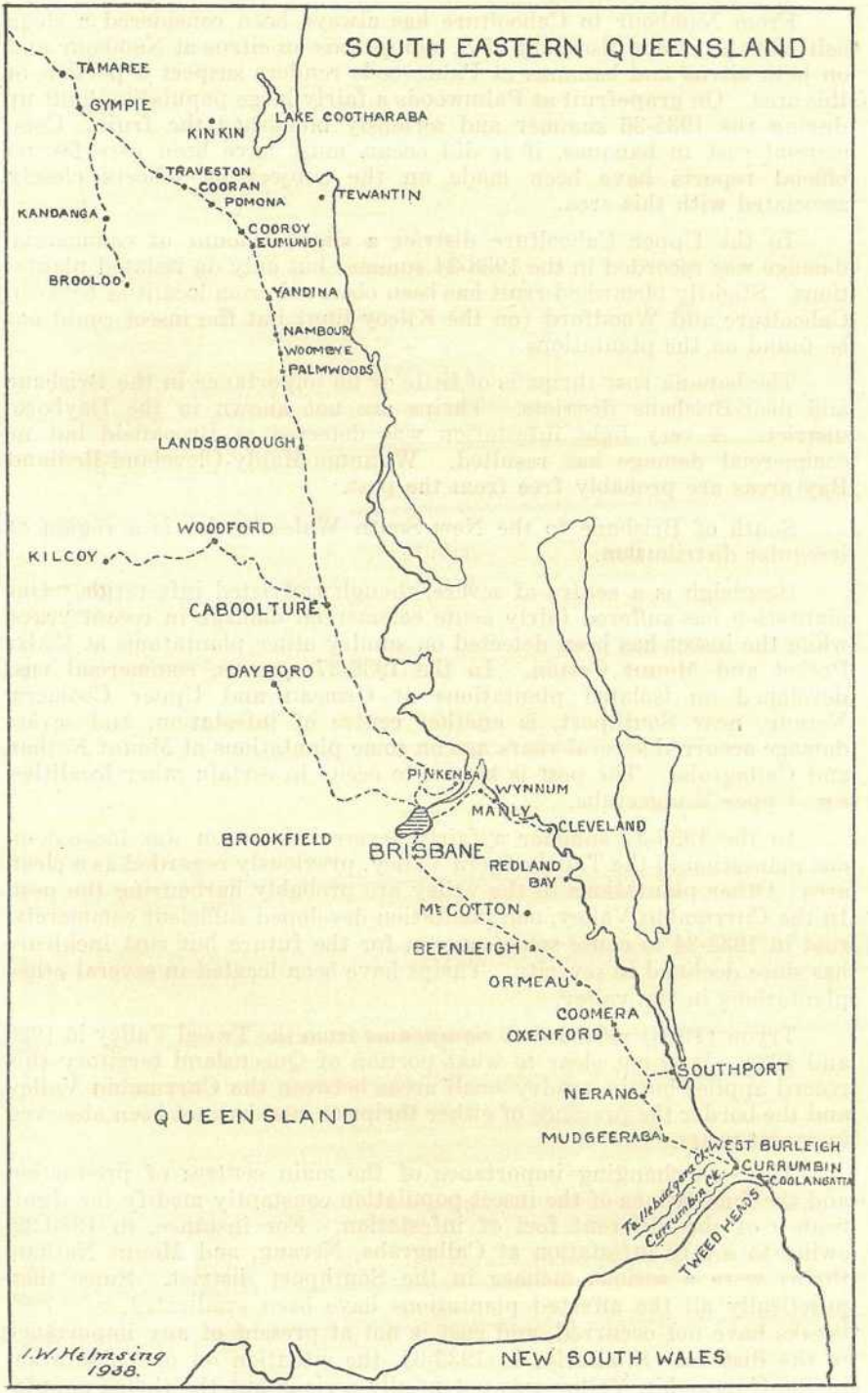


Plate 78.

South-Eastern Queensland, showing towns and localities mentioned in the text.

vicinity, rust is not at present viewed seriously. In 1933-35 a number of control experiments were carried out at Cootharaba, near Pomona. Banana growing has now practically ceased in this locality. The position may, of course, be completely changed in all these, and other districts, in the next few years.

(2) Factors Governing Distribution.

As the foregoing survey shows, the pest is literally distributed from one end of Queensland to the other along the agriculturally-developed areas of the coastal belt. In this range of 1,000 miles or so, climatic conditions vary considerably (Plates 77 and 79), and it will be seen that the banana rust thrips is distributed throughout wet to fairly dry tropical and sub-tropical environments. Even in the far north, however, there are definite seasons, a hot wet summer alternating with a marked winter period characterised by relatively low temperatures and rainfall. It must be concluded, therefore, that climatic conditions prevailing in coastal Queensland nowhere preclude the establishment of the pest in banana plantations.

The influence, if any, of other factors on thrips distribution is similarly ill-defined. Soil factors appear to be unimportant. The soils of the Queensland coastal belt present an almost infinite variety of types and bananas are cultivated, more or less successfully, on practically every one of them. Severe thrips infestation has been observed on almost every type of soil on which the crop is grown. Topographic features are undoubtedly important in determining the intensity of infestation but their influence on thrips distribution in an absolute sense either directly or indirectly by affecting local climatic conditions, is problematical. The physical characteristics of the banana plant, though modified to a considerable degree by the environment, have no apparent effect on the distribution of *S. signipennis*.

VII. POPULATION STUDIES.

(1) General.

Although *S. signipennis* has been recognised as a pest for practically the whole of the present century, very little attention has previously been paid to the question of population density and fluctuation. The following discussion is based on observations in southern Queensland over a period of four years—1933-37—and in the north during one short visit at the end of 1935. The value of these observations is lessened somewhat by the fact that during this period the thrips epidemic was on the wane, after a peak apparently attained during the summers of 1931-32 and 1932-33. Deductions from them are therefore tentative, particularly as, in the absence of exact population counts, subjective impressions had to be relied upon to a great extent.

In this discussion of climatic factors only the general conditions for the district can be considered. Population studies aiming at defining the probable climatic limits of distribution of the pest, either absolutely or as a pest, were not attempted. They would be of little value in Queensland where the pest is known to be potentially dangerous throughout the whole banana-growing area of the State. Similarly, detailed ecological studies designed to facilitate the prediction of rust incidence were not undertaken. They would have been of little practical importance, for the increase of the pest population in each season is a gradual

process taking place in each plantation. It can therefore be kept under observation by the grower and the point at which control measures must be initiated can be quite easily determined. The position is thus very different from that in which a pest invades an area in plague form (Evans, 1932; Bailey, 1933, &c.).

(2) Population Density and the Normal Seasonal Fluctuation.

The thrips population fluctuates between a low level in the winter and a peak in the summer, the density of the population at the peak largely determining the incidence of commercial rust. There are other predisposing factors but, unless the summer population attains a certain high level, commercial rust will not result. The winter population often becomes very small, so small, in fact, that, during a winter separating two summers of fairly severe rust incidence, it is sometimes difficult to locate any insects at all. On the other hand, the thrips sometimes persist through the winter in quite appreciable numbers, especially on small suckers and low down on larger pseudostems. Plantations with a large over-wintering population during the decline of an epidemic do not necessarily suffer from severe rust in the following summer. The winter surviving population cannot, therefore, be the only factor determining the incidence of the insect in pest proportions, though it is probably a contributory one.

Peculiarly enough, the pest population in the far north of the State fluctuates from summer to winter to about the same degree as in the south. Smith (1935) states that in the winter the population in the north becomes very small though the level attained may not be as low as in the south. In a normal summer the insects are probably more numerous than in the south for, at the end of November, 1935, the population was far larger than ever experienced in the south at the same season. The severity of rust development is apparently greater in the north. Since the time taken by the fruit to reach maturity, and thus the time during which it is exposed to the attack of the insects, is appreciably less under tropical than subtropical conditions, this greater rust development must be due to a proportionately greater insect population. Therefore, assuming a somewhat higher winter population level in the tropics, the amplitude of the normal seasonal fluctuation in pest numbers appears to be about the same in all parts of the State.

The severity of rust incidence in any season must depend largely on the rate at which pest proportions are attained. Rust is a cumulative effect of thrips activity which reaches a peak in mid-summer and declines with the advent of cool weather. Therefore, the greater the rate of population growth in the spring the earlier will the insect reach pest proportions. Because a large proportion of the bunches in any one year are thrown in spring and early summer, most bunches will be subjected to attack during the whole period of growth and suffer the maximum amount of injury. In epidemic years, the population apparently reaches a high level early in the season as well as a high ultimate peak.

The date at which the pest becomes important in the plantation varies from season to season. In the 1932-33 summer, as far as could be gathered from growers affected, there was considerable development of commercial rust on some plantations by the end of November. In 1933-34 little commercial rust was present before the middle of December and control experiments initiated at the end of October were, for the first month at least, wasted effort. In 1934-35 infestation was such that

control experiments could not profitably be undertaken before January. In 1935-36 it was difficult to select plantations at the end of January in which thrips incidence warranted their use as experimental plots. In 1936-37 it was the end of January before a decision could be made as to whether experimental work on control was justified.

In each season, severe commercial rust developed on some plantations. Though undoubtedly less than would be experienced during the peak of an epidemic, the decreased importance of the pest in each plantation was, in great part, due to the smaller amount of fruit affected with the maximum amount of injury.

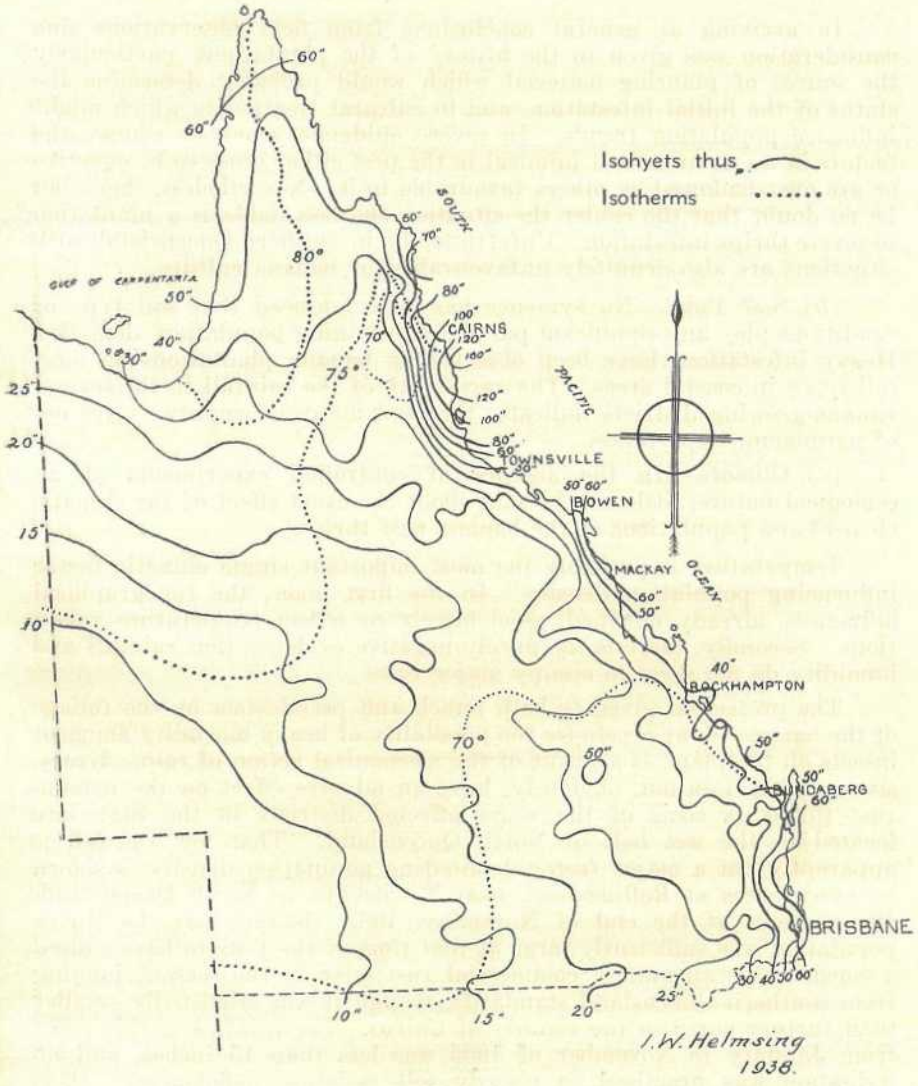


Plate 79.

Queensland, showing isohyets and isotherms. Note that the intensity of the rainfall is greatest along the coastline though a relatively dry belt occurs south of Townsville.

(3) Factors Influencing Population Density and Fluctuation.

(*a*) *Topography.*—As survey work proceeded it became evident that, at least under the conditions pertaining to 1933-37, the banana rust thrips never attained serious proportions in certain environments. Such environments were all classed as "cold" from the cultural point of view and were of three main types, viz., (i.) southerly slopes, (ii.) situations other than southerly slopes unduly exposed to cold winds, and (iii.) situations approaching or at frost level in the winter. Observations on thrips population and rust incidence for an extended period on several plantations showed distinct differences between plantations of the above types and others preferable for purely cultural reasons.

In arriving at general conclusions from field observations due consideration was given to the history of the plantations, particularly the source of planting material which would probably determine the status of the initial infestation, and to cultural treatments which might influence population trends. In severe epidemic years, of course, the factors in an environment inimical to the pest either cease to be effective or are overshadowed by others favourable to it. Nevertheless, there can be no doubt that the colder the situation the less liable is a plantation to severe thrips infestation. Unfortunately, in southern Queensland, such situations are also definitely unfavourable for banana culture.

(*b*) *Soil Type.*—No evidence has been adduced that soil type or conditions play any significant part in determining population densities. Heavy infestations have been observed in banana plantations on most soil types in coastal areas. The variability of the rainfall in the several banana-growing districts indicates that soil moisture conditions are not of paramount importance.

(*c*) *Climate.*—In the absence of controlled experiments of an ecological nature, little can be said about the exact effect of the climatic elements on populations of the banana rust thrips.

Temperature is probably the most important single climatic factor influencing population density. In the first place, the topographical influences, already outlined, seem merely to reflect temperature variations. Secondly, there is the purely negative evidence that rainfall and humidity do not seem to occupy major roles.

The protection given to both bunch and pseudostem by the foliage of the banana plant precludes the possibility of heavy mortality amongst insects on the plant as a result of the mechanical action of rain. Excessive rainfall does not, obviously, have an adverse effect on the banana rust thrips as some of the worst affected districts in the State are located in the wet belt of North Queensland. That low rainfall is apparently not a major factor dominating population density is shown by experiences at Rollingstone, near Townsville, in North Queensland. Observations at the end of November, 1935, showed that the thrips population was sufficiently large at that time of the year to have caused a considerable amount of commercial rust later in the season, judging from southern Queensland standards, though it was admittedly smaller than further north in the vicinity of Cairns. The rainfall at this point from January to November of 1935 was less than 15 inches, and no irrigation was practised to remedy soil moisture deficiencies. It is improbable that, in a plant like the banana, the water balance would be upset sufficiently, even under drought conditions, to affect eggs embedded in the tissue.

Similarly, humidity seems to be of little importance in regulating population density.

(*d*) *Age of the Plantation.*—It is a widely-held belief in all parts of the State that rust incidence decreases with increasing age of the plantation and that fruit of the first cut* is the worst affected. Observations during the last four years have tended to confirm the accuracy of this belief without in any way revealing the reason for the phenomenon.

Two examples, subject to close observation over an extended period, will illustrate the normal position during the period 1933-37.

Example 1.—A plantation, very uniform in natural environmental characters and in cultural treatment, consisted of three sections from which, during the 1933-34 summer, the first, second, and third cuts respectively were taken. The planting material for the second and third sections was taken from the existing areas. During the 1932-33 season the two older patches had been severely affected with rust though the growers had not observed any difference between the two sections. In the 1933-34 season the youngest section, then on its first cut, suffered considerably from rust but on the other two sections there was little loss. Subsequently thrips infestation was comparatively light, and it was not possible to gauge any significant difference between the various sections.

Example 2.—Two plantations in one locality occupied very similar situations about three-quarters of a mile apart. In the 1932-33 season the older one, then on the first cut, was very severely affected with rust. In 1933-34 the rust was fairly bad, but, in the 1934-35 summer, by which time the cultural requirements of the plantation were seriously neglected, there was practically no commercial damage. The younger plantation was on the first cut in 1933-34 and the fruit was very severely rusted. In 1934-35, when this area also had been neglected, rust development was again very severe, though rather less than in the previous year.

In this instance, the severe rust during the 1934-35 season in the second plantation indicates that the comparatively light rust incidence on the first plantation must have been due to conditions peculiar to that plantation and not to any factor operating over the whole district. The possibility of a differential effect of cultural measures was negligible as both areas were in a similiar state of neglect during the summer of 1934-35.

No old plantation, i.e., on the third or subsequent cuts observed during the course of the investigations suffered so severely from rust as the average bad plantation during the same season. At that time the oldest plantations in localities of severe rust incidence were on the fourth cut.

Older plants, normally less vigorous in growth, tend to throw small bunches which on account of their more open character, are morphologically less favourable for rust development. At the same time, the passage of such bunches through the throat of the plant is normally less rapid, and a proportionately larger initial thrips population could well be acquired.

* "Cut" is a term used by growers to denote the various harvests of fruit. Thus the "first cut" comprises the bunches produced by the plant crop; the "second cut," those produced by the first suckers allowed to reach maturity, i.e., the first ratoon bunches constitute the "second cut," and so on.

As far as could be ascertained the phenomenon of declining rust incidence in older plants is due to a diminished thrips population and not to any variation in the host plant's reaction. In no case has the amount of rust development been incompatible with the observed population density.

It might be anticipated that the absolute population density for a fixed area would increase with increasing plantation age. The normal practice in banana culture, at least in the rust susceptible areas, is to increase the number of plants per stool from year to year. Thus, for example, in the first cut there will be one bunch per stool, in the second cut two or three, and in the third cut three or four. With increasing age there is thus a corresponding increase in the extent of the presumably favourable environment for the insect within the plantation. There is no apparent reason why the over-wintering population should not increase proportionately and keep pace with the extension of breeding area, thus maintaining the same population density per plant.

In the absence of parasites or predators of any kind, which would act directly on the insect population, it must be assumed that variations in the population within a plantation must be determined by the condition of the plant itself or by the environmental modifications produced by the plant. It has been suggested that the increased number of plants in an old plantation would alter the environment by the additional shading. This, however does not seem very plausible for (1) any temperature changes would only be very slight, (2) closely-planted, luxuriant plantations do develop severe rust on their first cut, (3) plantations subjected to a rigorous suckering programme fail to develop rust more severely than those in which free sucker growth is permitted, and (4) since growth during second and subsequent years, under present systems of culture, is usually less vigorous than in the first year, the increased shading may not be pronounced. Alternatively, it may be postulated that, on account of some structural or physiological modification, the plants in old stools provide a less favourable environment for the insect and thus keep the population per plant at a relatively low level. This hypothesis has not yet been investigated.

The foregoing discussion indicates that the effect of the age of the plantation on the banana rust thrips population still requires an adequate explanation. At present it must not be implied that (1) old plantations will not be affected with severe rust, or (2) young areas will always be worse affected than older ones in the same locality. Various other important factors, such as topography, source of planting material, phase of the epidemic, &c., must obviously have a considerable effect which may quite obscure the influence of age. The only definite statement which can be made is that, during the declining phase of an epidemic, the greater the age of the plantation, the less the tendency to develop severe rust.

(*e*) *Plantation Management.*—The type and normal treatment of the planting material used in establishing a plantation must be considered under this heading. Suckers* comprise the bulk of the planting material used in southern Queensland at the present time. In preparing suckers for planting about 6 in. to 1 ft. of the pseudostem usually remains after removing the top. Such suckers, when taken from a thrips-infested plantation, can harbour a considerable number of insects. More severe sucker treatment, entailing the reduction of the pseudostem to 3 in. or

* "Suckers" are offshoots from the corm of a parent plant.

less in length and the complete removal of the outside layers of leaf-sheaths, must considerably reduce the thrips population of the newly-established plantation. The use of "butts"* and "bits,"† provided they have been carefully cleaned of all adhering soil, must still further reduce the initial population. In fact, this type of planting material appears to offer the best chance of obtaining clean, or reasonably clean, plants from an infested plantation.

In the established plantation, cultural conditions could quite conceivably have an effect on the insect population, chiefly because the pupal stage is passed in the ground. It is a common belief that severe rust is never experienced on a neglected plantation which is overgrown with weeds. Such plantations will be at least on the second cut, for most growers will suppress weed growth to a reasonable extent at least until the first thrown bunches are harvested. Many of the plantations on which the thrips population has declined during recent years have been more or less neglected. However, one of the 1934-35 experimental plots demonstrated that neglect is not necessarily followed by a diminution in rust incidence. In the previous summer this plantation, then on the first cut, developed very severe rust. From the middle of 1934 onwards the bananas were completely neglected by the grower, with the result that, throughout the 1934-35 rust season, the whole area was covered by dense weed growth of mixed character up to 5 feet high in parts. In this season severe rust was again in evidence, perhaps rather less than in the preceding year but still representative of an epidemic peak.

Weed growth could influence the pest position by its effect on the general environment, particularly the soil, and by diverting part of the insect population to such of the weeds as could act as alternate hosts to one or more feeding stages. The possible influence of alternate hosts seems to be discounted by the fact that, as previously stated, none of those plants which normally comprise the greater part of the weed growth in banana plantations in southern Queensland have been found to harbour the pest.

As regards the soil, weed growth would be expected to reduce materially both soil erosion and compaction, two factors usually found to cause a high mortality amongst pupæ and emerging adults of many species of Thysanoptera (*cf.* Bailey, 1933; Harris, Drake and Tate, 1936). This effect would operate particularly during the periods of heavy rainfall characteristic of Queensland summers. In normal seasons, weed growth should not seriously deplete soil moisture, which, in any case, is probably of little importance in regulating thrips populations. In providing additional shade weed growth must influence soil temperatures. The effect of this on the insect population is not clear, though the prevention of excessive temperatures in soil not otherwise shaded by bananas should scarcely be harmful to the soil-frequenting stages of the insect.

The available evidence suggests that the incidence of rust was influenced more by the wane of the epidemic and the age of the plantation that by the weed growth incidental to neglect.

Another State-wide belief is that suppression of weed growth by arsenical sprays, in preference to hoe chipping, tends to decrease rust

* "Butts" are the underground corms of the mature plants.

† "Bits" are sections of a "butt" containing one or more eyes.

incidence, presumably by reducing the insect population. Limited opportunities were afforded for making observations on this point and controlled experiments were not possible. Sundry plantations, on which weed spraying was the normal practice and on which severe rust had never developed, have been examined, but in all cases it was quite clear that other factors, such as location, could have been responsible for the phenomenon. As evidence in favour of weed spraying for the control of rust, the examples were valueless. Other plantations, on which a certain amount of spraying had been done, developed severe rust, but it must be admitted that the number of sprayings may have been too few to produce results. The arsenical sprays would probably act, if at all, through their effect on the pupal stage in the ground, and considering the details of the insect's life history, it is highly improbable that the number of sprays usually given would materially reduce the population. Nevertheless, the question must still be considered an open one.

The subject discussed in the preceding paragraphs is important in view of the probable development of cover cropping in the banana lands of coastal Queensland and will require consideration when cover crop possibilities are being investigated. At present the probable effect of any cover crop on thrips activity cannot be indicated.

The fairly common practice of trashing may influence population density. This operation involves the removal of all dead and dying leaves. Dying leaves are usually severed at their junction with the pseudostem, while the sheaths of dead leaves are more often stripped right down the pseudostem and cut off towards the base of the plant. Trashing is usually carried out in the autumn, though it may with advantage be done in midsummer as a measure of control against fungous diseases of both leaves and fruit. Pseudostem colonies may be disturbed to a certain extent by the operation. Also the removal of the dead leaves, which are normally draped around the pseudostem and over any small suckers, may increase the exposure of overwintering thrips to the rigours of the cold weather. However, no evidence has been obtained to show that trashing has any significant effect on the thrips population.

The cutting up of the pseudostems after the removal of the mature bunch, as advocated for banana weevil borer control, may have a slight adverse effect on the thrips population in the plantation, though insufficient to have any practical value in controlling the pest.

Similarly, the removal of the "flower" bud below the bottom hand of fruit after the bunch has fully opened, a practice not generally followed in Queensland, may result in the destruction of a few insects. However, as the number of banana rust thrips in this part of the plant is very small, especially during the early stages of bunch development, there can be no significant effect on the pest population.

VIII. EPIDEMICS.

(1) The History of Epidemics in Queensland.

Little can be said of serious outbreaks of the banana rust thrips prior to the last fifteen years, except that they did not occur in the southern part of the State. There are numerous references to the pest, but the information gives no indication of the relative severity of rust

incidence from year to year (Tryon, 1912, &c.). Since 1924, owing to the sometimes severe losses in the more important banana-growing areas, the pest has received greater attention.

There were serious outbreaks in southern Queensland in 1923-25 and 1930-33. The latter was the more extensive and, in this case, some plantations as far south as Southport were severely affected. The extension of the infested area in the later outbreak was almost certainly due to the considerable development of banana growing south of Brisbane at the end of the decade 1920-30. Between 1925 and 1930, the pest was less numerous and, in 1927, experimental work on control was not possible on account of light infestations. Since the 1932-33 season the losses have steadily diminished in southern Queensland. While a few plantations have suffered severe damage in each season the amount of rust in many localities previously heavily infested has been of little or no commercial importance.

In the far north, it appears that the periodic fluctuations are not so marked. Admittedly there have been periods in the last fifteen years when the economic importance of the pest, and hence the amount of attention attracted to it, have been greater than at others, but these periods probably coincided with the settlement of rain forest areas in which bananas can be a profitable clearing crop. The position in the far north seems to be that infestation is great enough each year to cause fairly general commercial rust, though in some years the severity of rust incidence is greatly accentuated.

The position in the areas between Townsville and Rockhampton has not been investigated. From Rockhampton to Gympie the periodic fluctuations of the south seem to prevail.

(2) Factors Governing Epidemics.

Little can be said about the factors governing epidemics of the banana rust thrips. Nevertheless, general considerations of Thysanopterous pest outbreaks (Evans, 1932; Bailey, 1933) prompted an examination of meteorological data, especially temperature. Rainfall and mean monthly temperature records for Gympie were examined in an attempt to discover climatic factors associated with the epidemic seasons, 1922-23 to 1924-25 and 1930-31 to 1932-33.

The first series of epidemic years was characterised by mean maximum monthly temperatures up to 5 deg. higher than the average. During the second series the mean maximum summer temperatures were up to 6 deg. above the average, while for the remainder of the year they were more or less normal. The mean minimum monthly temperatures were not correspondingly high in either series of years, but at the same time they did not fall below the average in any of the epidemic seasons.

Examination of the temperature data for shorter periods within the year, such as winter, winter and spring, spring, &c., did not reveal any significant differences between epidemic and normal years.

That an epidemic may be the result of the cumulative effect of favourable temperature conditions over a long period is suggested by the fact that, though for the calendar year 1926 temperatures were considerably above the average, there is no record of severe thrips incidence in that year, or, in fact, until 1930. It is noted that the calendar years 1925 and 1927 were considerably colder than the average.

The rainfall figures showed no correlation with the intensity of thrips infestation.

IX. INJURY TO THE BANANA PLANT.

(1) Injury to Vegetative Parts.

Under plantation conditions no injury to the vegetative parts of the banana plant can be directly attributed to the banana rust thrips. The feeding of colonies on pseudostem and bunch stalk probably accentuates the characteristic reddish discolouration irregularly distributed on these parts of all Cavendish plants, irrespective of thrips distribution. It is probably the normal reaction of the plant to exposure to the sun. In any case, injury to banana tissues, no matter how slight, tends to produce a reddish discolouration.

Injury to the leaf tissues occurs only when large colonies of adults and larvæ have fed, for a more or less extended period, on young leaves, during and immediately after unfurling. This effect has been observed only under severe drought conditions and is almost certainly associated with retarded growth of the plant. Mixed colonies become established on the leaf only if ovipositing females find suitable shelter for a considerable time in the funnel leaf, the unfurled leaf not being a favoured oviposition site. In normal seasons the rate at which leaves unfold is too rapid for colony establishment to take place.

The damaged tissue of the leaf blade presents a somewhat blistered appearance, with a more or less reddish-brown discolouration. The degree of discolouration appears to depend to a certain extent on the amount of exposure to the sun, for it has been observed that the portions of the leaf first to unfold are the most intensely discoloured. On the upper surface of the leaves, discolouration tends to be more pronounced along the veins, which, in all cases examined, were much more prominent than normal, a common symptom of drought conditions. The midrib on both surfaces is usually more reddish in colour than the blade, especially in the central depression on the upper and the two lateral furrows on the lower side.

Withering and ultimate desiccation of portions of the leaf blade have been observed, but in no case has the damage been of commercial significance.

(2) Injury to the Fruit—Rust.

(*a*) *The Nature of Rust.*—The nature of banana thrips rust has been briefly defined by Girault (1925) and discussed at some length by Smith (1934). Rust is the name popularly applied to the disfiguration of the skin of the banana fruit caused by the feeding activities of *S. signipennis*. Oviposition, which takes place in the same tissue as that fed upon by the insects, apparently plays no part in producing this disfiguration (*cf.* Bailey, 1933).

On very young fruits the first trace of insect damage, which is usually due solely to adult feeding, has a water-soaked appearance and is slightly reddish-brown in colour. This is followed by a dark discolouration of slight intensity to which the term "smokiness" has been applied, after which the red colour of the typical rust makes its appearance. At first, owing to the admixture with black, the red colour is dull and confused, but it gradually replaces the former and becomes a definite full colour with a more or less glossy surface. True redness

may appear very early in the life of the bunch, but usually there is a distinct interval during which smokiness is the predominant colour. In bunches which remain attached to the plant for a considerable length of time an ochraceous or brownish colour is often found. Rust of this type is more common on bunches thrown late in the summer for, owing to the slow rate of development during the cold weather, they hang for a much longer period than the earlier-thrown fruit.

The colour change from smokiness to red is apparently due partly to the reaction of the fruit to continued feeding by the insects and partly to its advancing maturity. Thus smokiness alone is usually found only on very young bunches, except in very slight infestations when the total injury may be thus described. However, even in these cases there is usually some gradation into red. If the thrips are numerous the red colouration may make its appearance before the bracts have withered. During the summer months, rust on mature bunches will usually be entirely of the red type, though at times there may be a smoky margin to the reddened areas. Later in the season, smokiness is slightly more pronounced on mature bunches, though never plentiful, for, if very slight, it practically disappears after thrips activity has ceased and, if more intense, turns reddish as the bunch matures. The ochraceous colour is found on bunches only when rusting has been severe.

In addition to the discolouration, disruption or cracking of the skin may also occur. The cracks normally run more or less longitudinally, are irregular in spacing and may be of varying length. In the first instance, only the epidermis proper is ruptured. Later the cracks become deeper and may ultimately result in the splitting of the skin from end to end, exposing the flesh beneath.

The cracking of fruit affected with rust must be distinguished from another type of skin rupture associated with a reddening of the surface of the fruit. In this case, the cracking takes place more or less regularly in both longitudinal and transverse directions with the result that the damaged portion is divided into definite and fairly regular rectangular areas. The final appearance is thus quite distinct from thrips rust. The position of this blemish on the top side of the fruit also serves to distinguish it from true rust. The cause of this condition is unknown and, though possessing little importance, it has sometimes been confused with rust.

Cracking and splitting as a phase of rust development are the result of the injured skin being unable to keep pace with the normal growth of the fruit. The first cracks may appear, in severe rust years, when the fruit is only half mature. Cracking is usually only associated with fully developed redness, but in the case of some bunches attacked in the autumn, slight cracking may be found in conjunction with marked red and black colouration. Splitting occurs only in mature fruit and, if due solely to rust, only in association with severe blemishes.

Rust of any degree detracts from the appearance of the fruit, though moderate blemishes do not impair its eating qualities. Severe rust, however, even without splitting, may spoil the flavour, while split fruit has no market value. Commercial rust, a term used freely in the foregoing pages, is merely discolouration with or without cracking and splitting of sufficient extent and intensity to cause depreciation in the market prices of the fruit or to prevent sale.

(*b*) *Distribution on the Fruit.*—An account of the sequence of events involved in the throwing of a bunch will facilitate an understanding of the distribution of rust on the individual fruits, as well as on the bunch as a whole.

The emerging bunch while still in the vertical position is tightly compressed. The two whorls of fruit in each hand and the individual fruits in each whorl are packed closely together. The long axes of the fruits lie more or less parallel to the bunch stalk. The whole hand is held against the base of the next hand by a close-fitting bract. As the bunch is inverted, the hands open out, until the fingers are more or less at right angles to the bunch stalk. The two whorls of fruit in each hand move apart so that the fingers of one are separated from the fingers of the other; the adjacent fingers in each whorl separate, the bracts dry out and later become detached at their base, often falling from the bunch. These changes take place simultaneously within about one to four weeks from the first appearance of the bunch, depending on the time of the year and the seasonal conditions. Thus the fruits are separated long before they begin to fill out and assume a rounded shape. There appears to be a slight difference between the conditions in various parts of Queensland for Smith (1934) working in the north mentions ". . . . . the appearance of the rounded contour which initiates the separation of the individual fingers. . . . ." In the south, as the fruits increase in size and become rounded in outline, they tend to fill up the interspaces and become once more closely appressed to each other (though not along their whole length) until in the mature bunch the fruit is very tightly packed. Thus, normally, from the point of view of the thrips population, environmental conditions on the bunch are at first excellent. Then follows a short period when the habitat may be less congenial, after which conditions for the pest steadily improve.

As previously explained the insects are chiefly confined to sheltered situations which, in the case of the banana bunch, are, for the most part, the contact surfaces between fruits; the word "contact" is used to imply close proximity as well as actual physical contact. (*Cf.* Smith, 1934). In the early stages, the bracts are appressed to the top surface of the uppermost whorl of fruit in each hand, and afford excellent shelter for the pest. Under normal circumstances in southern Queensland, the bracts do not persist long enough to allow extensive injury to the surface of adjacent fruits, and when they wither and fall, the insects move to other vantage points, usually leaving areas of merely incipient rust on the top surface of the hand.

Rust thus normally occurs on the sides of fruits which are touching or in close proximity to their neighbours. The extent of the blemishes both longitudinally and circumferentially is dependent on several factors. In mild cases the rust will be confined to a small area on the sides of the fruit near the stalk end where contact is maintained for the greatest length of time. In very severe cases practically the whole fruit may be damaged, though this is rather rare in southern Queensland even during severe epidemics. It would appear to be more common in the north.

An examination of a very rusty bunch shows that the area blemished on any fruit usually extends a considerable distance from contact or closely placed surfaces. In severe infestations, the insects spread beyond the actual shelter afforded by adjoining fingers, especially in the direction of the underside of each whorl of fruit where there is a considerable

amount of shading. The larvæ, often found out in exposed situations, also extend the area over which feeding takes place, though sometimes their numbers in these parts of the fruit are insufficient to produce more than a moderate degree of smokiness. Obviously, however, the amount of discolouration demarcates the surface area over which the insects have fed and, in severe outbreaks, this bears little relation to the area of the contact surfaces. The common impression that the insects operate only at or near contact surfaces overlooks this point. On the other hand, a great deal of injury is caused while the fruit is young and, as the damaged tissue grows to some extent with the rest of the fruit, the presumed increase in the area of actual thrips pasturage may not be very great.

In the normal opening bunch, pairs of fruits sometimes stick closely together along their whole length for a period while the rest of the fingers are well separated. The reason for this is not clear. If these fruits are parted by hand they do not return to their original positions but remain apart. These fruits provide a specially favourable environment for thrips. The young angular fruits fit very closely together and rust development on them is often both extensive and severe. This phenomenon may also explain the occurrence of severe rust on odd fruits of bunches which have been kept generally clean by the application of control measures, for insects between such fruits would be well protected from lethal agents such as dusts.

The effect of slight abnormalities in the bunch may be mentioned here. It is not unusual for some of the bracts to remain caught up in the bunch after drying, either resting on top of the hands or hanging over the distal extremities of the fruits. These provide shelter for the insects and the associated rust is often sufficiently severe to induce cracking later.

The large bract subtending the bunch may often, when dry, overlie the bunch and afford shelter for the insects. Rust may then develop away from contact surfaces between fruits. Similarly, one or more leaves may be so placed as to have the same effect. Any malformation of the bunch affecting the normal disposition of the fruits may also widen the range of suitable habitats for the insects. Generally, these aberrations are of no great importance under plantation conditions in southern Queensland.

On any one fruit all the rust development is not necessarily of the same intensity. Normally, the focus of development is that area where contact between adjacent fruit has been maintained for the longest time. Cracking will first start here and splitting will almost invariably pass through this point. The whole of the rusty zone may be comparable with this focal area but more commonly the disfiguration grades off in intensity towards the margins.

(*c*) *Distribution on the Bunch.*—It has been shown that the basal hands of the emerging bunch—which become the top hands of the inverted bunch—are the first to become infested with the banana rust thrips. They also eventually acquire the greatest population. Since rust distribution on the bunch is largely a reflection of population density, these top hands are normally the most severely affected. The fruit is seldom badly rusted right down to the bottom hand. More frequently there is a more or less regular decrease in intensity from top to bottom of the bunch. Sometimes the bottom hands may be

free of commercial rust while the top hands have reached the stage of severe cracking and even splitting.

This more or less regular gradation may be upset to a slight extent by the minor abnormalities discussed in connection with rust distribution on the individual fruits. Colonies originating from the advent of flying adults, which presumably alight by chance on any part of the bunch, may cause a discontinuous distribution of rust throughout the bunch. This type of infestation may explain the not uncommon occurrence of severely rusted patches, often involving only a few fruit, on the lower hands when the normal gradation from top to bottom would provide for comparative freedom from commercial rust in this region.

(*d*) *Development in Relation to Age of Fruit.*—The greatest development of rust undoubtedly takes place during the early stages of the life of the bunch. For the first few days, when the population is predominantly adult, little damage is done, but as soon as larvæ appear in sufficient numbers to create definite colonies, rust development proceeds apace. The tender skin of the young fruit is naturally highly susceptible to injury. Furthermore, the injury to the skin of the young fruit is accentuated by the growth and expansion which takes place during development until cracking and splitting, as previously explained, occur.

Nevertheless, there is no cessation of insect activity as the bunch matures, though the population usually decreases somewhat towards the end of the life of the bunch, presumably owing to the fact that the establishment of new colonies on the bunch does not keep pace with the depopulation due to natural causes. The insects definitely avoid those parts of the fruits which have been already severely damaged, especially when extensive callousing has taken place. Thus, their feeding activities in the later stages of the life of the bunch produce an extension of the area affected.

Severe damage to the young fruit results in the development of a callous-like appearance, usually rather dull red or even ochraceous in colour, with fairly deep cracking. On the other hand, rust acquired by fruit in the later stages of maturity is much more superficial. The colour is usually bright red and there is little callousing. Cracking, if any, is usually only slight, except perhaps in the colder months. It is improbable that this type of rust would ever result in splitting, i.e., exposure of the flesh. Splitting of full fruit is a common phenomenon at certain periods of the year, particularly in the autumn, and care must be taken to differentiate between that due to rust and that which would occur even in the absence of rust. The extent and intensity of discolouration and surface cracking will indicate the true cause of the splitting.

As rust may occur at any time during the development of the bunch, any control measures must be effective over the whole period of development. This point was illustrated by experimental bunches which were kept commercially clean for twelve weeks by the application of certain control measures. In the absence of any further treatment during the ensuing four to six weeks before harvesting, maturity being retarded by a dry season, a certain amount of commercial rust developed.

(*e*) *Incidence in Relation to Thrips Population and Time of Year.*—As the incidence of rust is dependent on the thrips population, environmental or other factors which influence the insect are reflected in the

amount of damaged fruit. Unless the insect population reaches a certain level, rust of commercial importance will not eventuate. Thus the effect of topography, age of plantation and cultural measures such as spraying, chipping, &c., on the thrips population is directly reflected in rust incidence.

The normal seasonal fluctuation in insect numbers naturally determines the seasonal incidence of rust. There is, of course, a lag between the time of actual injury and the harvesting of rusty fruit, due to the developmental period of the bunch. Rust may appear on young bunches as early as the end of October in southern Queensland, but commercially rusty fruit is seldom cut before the end of December. Thus, bunches thrown before October usually escape commercial rust provided a normal rate of development is maintained, the fruit maturing in slightly more than three months during the warmer period of the year.

The stage at which commercial rust appears on bunches thrown during the last quarter of the calendar year depends on the rate of thrips population increase but, if the insects are abundant, all these bunches will become rusted to a greater or lesser extent. If the summer thrips population is late in reaching its peak the onset of commercial rust will, of course, be delayed. Thus, on one plantation during the 1935-36 season commercial rust was not noted on mature and submature bunches until the end of February. Had seasonal conditions been normal, the bunches thrown during October and early November may have been free from severe blemish. Actually the early summer was abnormally dry and the fruit matured very slowly. Bunches had to be left hanging in the plantation much longer than usual and became rusty during the later stages of development.

Rust is usually worst on bunches thrown in January, February, and March. Later it becomes progressively less important until the end of April, and bunches thrown after that date are usually free from commercial blemish. The danger period may be slightly prolonged if an abnormally mild autumn follows a summer of severe thrips infestation. Thus, in 1936, a season of this kind, slight rust was observed on bunches thrown as late as the last week in May. There is some evidence to suggest that the decrease in rust development in the autumn may be due in part to diminished feeding activities by the insects, as there seems to be a definite time lag between the cessation of severe injury and the marked decrease in thrips population.

Bunches thrown in the late summer and autumn mature slowly and hang in the plantation throughout the winter. Thus, while bunches thrown in January and February will probably be cut in rather more than three months, autumn bunches require a much longer period to mature and rusty fruit may even be found on bunches cut as late as October. From January to August, however, is the period during which the bulk of the severely damaged fruit is harvested. Because of this time lag many growers are inclined to overlook the fact that the damage to the fruit is mainly caused from December to March and that that is the period when control measures must be applied.

(*f*) *Rust Development in Relation to Factors other than Insect Population.*—Smith (1934) has discussed at some length the relation of rust incidence to plant growth and bunch type. He points out that any slowing down of plant growth at the time of bunching, due to climatic or other conditions, results in a predisposition of the bunch to severe

rust incidence. Such a growth check may not prevent the production of a normal bunch. On the other hand it may be conducive to two abnormalities recognised by Smith and termed by him "non-inversion" and "delayed inversion."

In the case of non-inversion the bunch never attains a pendant position, remaining practically erect in the plant throat. This condition is due to an almost complete check in plant growth at a critical period of bunch development. "Later on growth may be resumed, but in the meantime the structure of the various parts of the plant associated with the bunch have become much less plastic, and, instead of a simple resumption of growth, a type of plant cretinism is observed in which the bunch stalk is twisted within the pseudostem . . . ." This type of abnormality is of little commercial importance in southern Queensland. Bunches of this type are usually associated with acute plant debility and would be of little value even if properly thrown.

The phenomenon of "delayed inversion," which can perhaps better be described as "incomplete inversion," is, on the other hand, of considerable importance. Incomplete inversion is due to less acute forms of the causes responsible for non-inversion. Affected bunches are commonly described as "choked," as are also non-inverted bunches. The bunch, instead of being fully pendant, stands out at an angle from the plant. The stalk from plant throat to top hand is comparatively short and the top hand or hands are thus compressed at or near the top of the pseudostem. The fruits are held in this position throughout the life of the bunch and usually remain fairly straight instead of developing the normal curvature. Gross distortions of individual fruits may at times occur. At the same time the length of the internodes between hands is subnormal and the fingers do not separate as readily as usual. Thus the whole bunch may be of a compact nature.

The two bunch types just described are, of course, merely examples of a more or less regular series at one end of which only the top hand is constricted, while at the other the bunch has scarcely emerged from the throat of the plant.

The susceptibility to rust of such bunches is readily understood from a consideration of two points. In the first place, the longer the period between the first appearance of the bunch in the plant throat—at which time or shortly afterwards thrips are able to enter beneath the bracts—and the completion of inversion, the greater will be the initially-acquired adult thrips population. This *a priori* implies a greater final insect population and, other things being equal, more severe rust incidence. In the second place, as the rate of bunch inversion is slow, the hands remain compressed and the bracts are retained for a relatively long period. Thus, such bunches provide optimum conditions of shelter for an unusually long time. In addition, owing to their compacted state, the area of the contact surfaces between fruits is greater than normal. As a result the rusted area on individual fruits usually shows a pronounced increase.

The economic loss sustained through choked bunches can be readily appreciated on examination of rust-affected plantations. Choked bunches are always the most severely blemished, while the injury is often accentuated by the undue exposure of the top hands to the sun. Further, the top hands, which are usually a total loss in choked bunches, normally contain the largest and best quality fruit.

In southern Queensland choked bunches may be caused by three factors. First, and most important, is soil moisture deficiency. The banana plant, indigenous to tropical regions with copious rainfall, is adversely affected by dry conditions which, in the south, usually occur in the spring and early summer. If the dry spell coincides with a certain stage in bunch development choked bunches will result. An excellent example of the influence of dry weather was observed in the 1935-36 summer when the end of 1935 was rather dry and January and February of 1936 disastrously so. A year-old plantation of splendidly grown plants bunched in January to March. The bunches contained more than the normal number of fruit, a character which was largely due to favourable growing conditions prior to emergence, but, as a direct result of the dry weather, the majority of the bunches were choked to such an extent that one or more hands were badly compressed.

The second factor influencing the production of choked bunches is low temperature. In southern Queensland, growth is checked to a considerable extent during the winter and choked bunches may be thrown on almost any plantation. Fortunately, thrips activity is then at a minimum.

Thirdly, general plant debility, particularly during the second and subsequent years after planting, may be a cause of choked bunches. Plant deterioration of this type is reflected chiefly in the size and quality of the bunch, but the bunches are also often imperfectly thrown and the effect of adverse climatic conditions, such as deficient rainfall, are particularly severe.

The above discussion indicates quite definitely that no small part in rust control may be played by a programme of plantation management which aims at the elimination of bunch types susceptible to rust development and unsuitable for the efficient application of control measures.

In the south, the normal bunch type of the Cavendish variety varies with the season. Thus, bunches thrown in September and October are large and well-shaped with good quality fruit, being probably the best bunches of the year. These are followed by the November "dump" type which are small bunches of irregular conformation with short fruit. December bunches are very big but the fruit is small. From January onwards the bunches remain big and the fruit gradually improves in size from the December type. With the onset of the cooler weather bunches tend towards the choked type, the fruit of which is rather straight, i.e., without the natural curvature. The normal types of bunch produced during the period of maximum thrips activity are thrown well out from the plant with hands well spaced on the bunch stalk, and are thus least favourable for rust development and most favourable for rust control measures. The abnormalities described above due to retarded plant growth may, of course, be superimposed upon any of the normal seasonal bunch types, and the vigour of the plant is thus of more importance than the seasonal bunch type.

The amount of shading given to the bunch by the plant foliage may also influence the incidence of rust. In the average plantation some bunches may be almost completely sheltered from the direct rays of the sun, the majority will be shaded for a portion of the day, while a few, exposed bunches at the ends of rows, may be exposed to direct sunlight for practically the whole day. Undue exposure to sunlight does seem

to accentuate rust development, for exposed bunches are invariably amongst the worst affected. The top hands of choked bunches, for instance, are usually abnormally exposed, though, of course, in this case other factors contribute towards severe rust development. Whether this accentuation is due to intensified thrips activity or to an acute reaction of the plant is not clear.

This question again emphasises the need for sound cultural practices in order to maintain the plantation in good growing condition. Unhealthy plants tend to produce erect leaves, which provide much less shelter for the bunches than that afforded by the spreading leaves characteristic of healthy plants.

(*g*) *Incidence in Relation to Variety of Banana.*—The Cavendish is the most extensively grown variety of banana in Queensland, the acreage being many times greater than that of all other varieties together. In the thrips infested areas, the other varieties are represented by small scattered patches growing either alone or adjacent to Cavendish patches. The greatest acreage of other varieties is probably in the Brisbane and near-Brisbane areas, which are, for the most part, free from thrips.

Whenever possible, the amount of rust development on Lady Fingers, Sugars, Mons Maries and Gros Michels, (Queensland Gros Michels may not be true to type) has been investigated. When any of these varieties have been growing adjacent, or in close proximity to Cavendish plants, rust development on the bunches has been comparable.

Any apparent differences between the common varieties would probably be associated with the taller habit of growth or with variations in bunch type. In southern Queensland these differences are usually insufficient to influence thrips activity or rust incidence. However, in north Queensland, the Gros Michel, and perhaps the Lady Finger, may produce a particularly open type of bunch which is less susceptible to rust development.

[TO BE CONTINUED.]

SHEEP LAND FOR SELECTION.

A resumption from Welltown Holding has been surveyed as portion 2, parish of Taraba, and will be open for Grazing Homestead Selection at the Land Office, Goondiwindi, on Tuesday, 11th October, 1938.

The portion is situated about 6 miles south from Bungunyah railway station on the Goondiwindi railway.

The portion has an area of 10,517 acres and the term of lease will be for twenty-eight years at an annual rental of 6½d. per acre for the first seven years.

A condition will be that the selection must be stocked to its reasonable carrying capacity with the applicant's own sheep during the first three years.

The portion is watered by the McIntyre River and by two earth tanks, and the country is described as black, reddish, and chocolate soils, lightly timbered and grassed with Mitchell, Flinders, Coolibah, and various other good sheep grasses and herbage. It is excellent wool growing and breeding country.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Goondiwindi, and the Queensland Tourist Bureaux at Sydney and Melbourne.

Dressed Poultry Marketing.

P. RUMBALL, Poultry Expert.

THE marketing of dressed poultry can be made profitable, especially when direct contact with the consumer is practicable. It should appeal to many poultry farmers in places in which little effort has been made to supply a bird ready for the oven; and as these centres are distant from the larger markets, freight costs and other charges could be saved. The greatest difficulty to be encountered in marketing dressed poultry is the maintenance of supplies. It is possible, however, especially when the purchase of supplementary supplies from neighbouring farms is practicable, although such a practice is not generally recommended, as there is always the risk of introducing some infection or pest into one's own flock. In one's own experience, many cases of infestation with fowl tick have been actually traced to the introduction of fowls from other flocks. Farmers who propose to enter the dressed poultry business, therefore, should plan for a continuity of supply. In general farming practice cockerels should be available from August to February. Obviously, early in that period some birds would be exceptionally young, while those sold in February would be full grown. To keep cockerels after this period would mean added costs and lowered quality because of age. Culled hens, however, would be available from the beginning of this period, or even earlier, and until May. Old hens in good condition are usually in fair demand and, provided the consumer knows what class of bird is purchased in order that the proper cooking process be followed, this demand could be increased, with better values resulting.

There is then a gap that has to be bridged—the period after the old hens have been cleared and before cockerels are available. The only method by which a continuity of supplies is possible is by hatching out of season, the use of females still in production, or by caponizing some of the later cockerels. Hatching out of season is not recommended. The use of some laying hens has a lot to commend it; and it means a severer culling of the laying flock. Some of the best flocks in the State are those of poultry raisers who have developed this business, and their flocks have only been brought to this condition by heavy culling.

Production of Capons.

The question whether caponizing is profitable or otherwise is best left to the individual producer to decide, because of the varying features governing the commercial side of the proposition—that is, cost of feeding and ultimate sale.

The capon, however, has advantage over the uncaponized bird in weight, quality of flesh, and cost of maintenance. The opinion frequently expressed that capons grow to a greater size than cockerels is wrong. When the reproductive organs are removed cockerels lose their fighting instinct and lead a lazy, inactive life, thereby putting on more weight or flesh, but not size. It is possible, also, to retain capons until they are fully developed, and to market them as desired. This is not so with

cockerels, as they become troublesome and lose the quality of flesh. The inactive life a capon leads naturally reduces food consumption, and so it is kept at a greatly reduced cost, which materially assists a producer in regularity of supply. To the farmer engaged in diversified production, however, capons should appeal most, inasmuch as they can be allowed to range with the farm flock. There is no necessity for segregating sex, and because of sterility the quality of eggs is in no way affected.

Appearance of a Capon.

The comb and wattles of a capon do not develop, and the head remains small and colourless. The pointed feathers of the neck and those in front of the tail and large sickle tail feathers grow profusely, and in countries where capons are appraised at their true value as table birds these feathers are left on the bird in dressing and serve as a trade mark.

Marketing.

At present the caponizer should cater for regular customers, but if supply exceeds demand the surplus should be sold when young birds of quality are scarce, which happens every year from March onwards until early cockerels are on the market—say, September. Cockerels of any breed may be caponized, but breeds of the light or small varieties, such as Leghorns, are not as suitable as larger varieties, such as Orpingtons, although in this article leghorns have been used for the purpose of illustration.

The age at which the operation should be done naturally varies with different breeds and the development of the subject, but generally the correct period is between eight and twelve weeks, when the chickens are about 2 lb. in weight. The next point which the caponizer must keep in mind is light. A good light (sunlight) is essential, especially to the inexperienced operator. With practice he may operate under other conditions, but, for a start, the position of the various organs must be thoroughly understood. The third requirement is to refrain from feeding and watering the bird for at least twenty-four hours—thirty-six hours would be better. Under such treatment the intestines become empty and will fall away from the side where the incision is made, and, as well as lessening the chance of injury, permit of the reproductive organs being seen much easier.

The Operation.

In addition to knife, spreader, probe, and forceps, a table and two pieces of soft cord with a running noose at one end and two half-bricks attached to the other, and a basin containing a weak antiseptic solution, are necessary. The table may be a packing case or barrel, or the operator may prefer to make a more elaborate and, possibly, more convenient bench. The bird is fastened down with the cord and bricks, one noose being placed around its legs and the other around its wings close to the body, and the bricks allowed to hang down on either side. The correct position is illustrated in Plate 81.

The next move is to pluck a few feathers from the seat of operation,

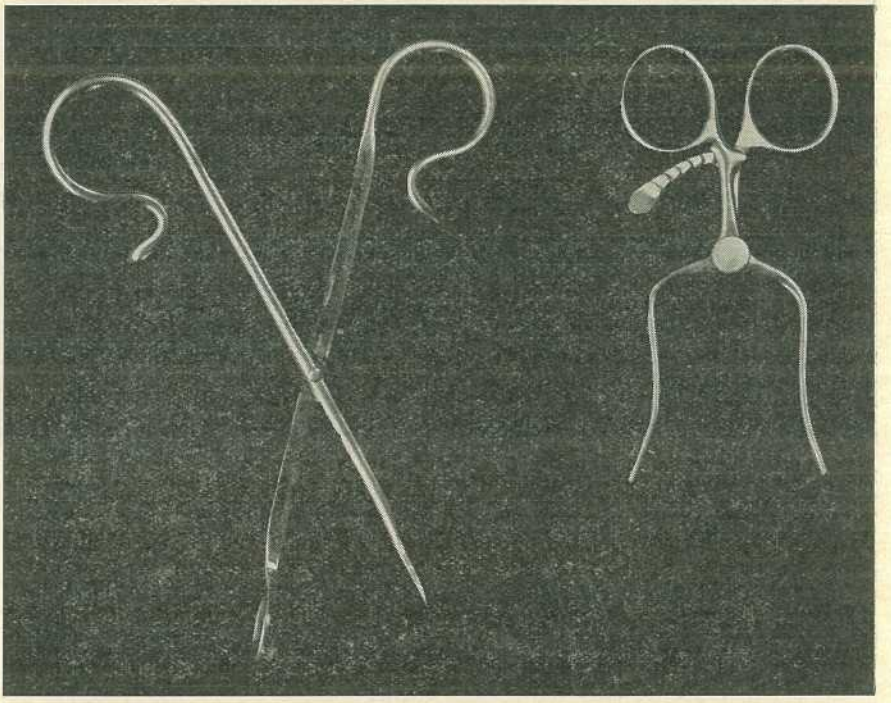


Plate 80.
The spreaders and extractors recommended for general use.

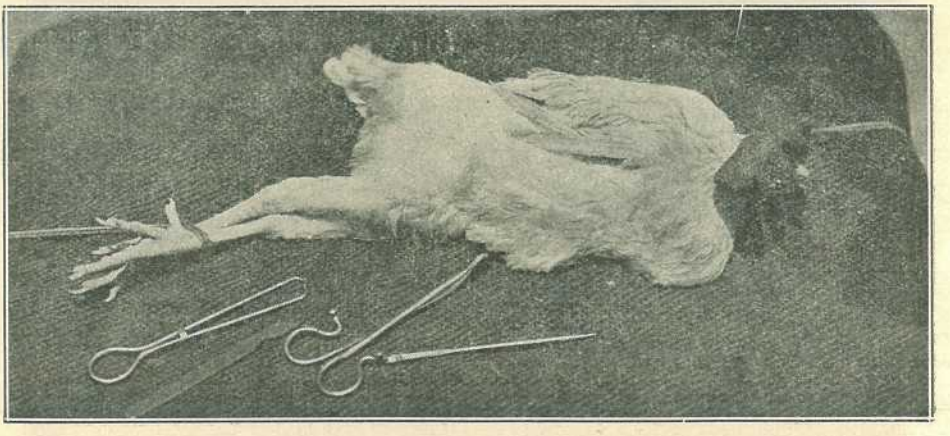


Plate 81.
Bird in position for caponizing. It can be turned over without unfastening, which facilitates the operation.

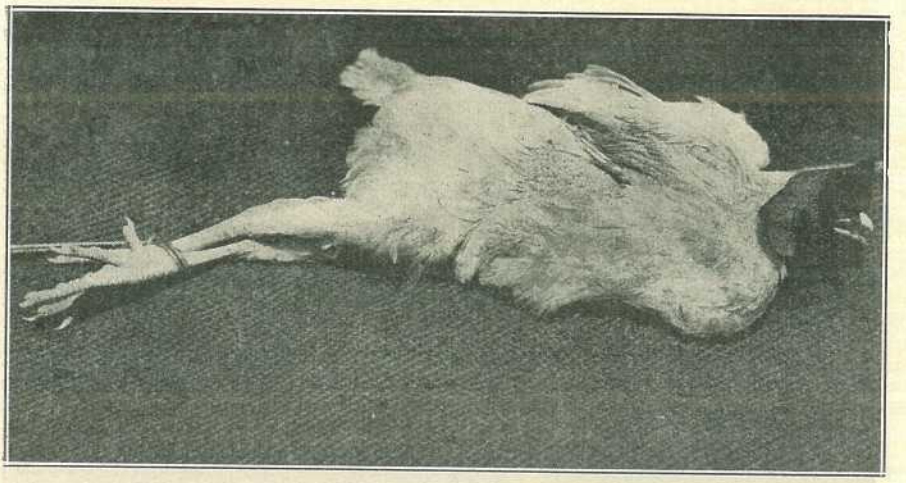


Plate 82.
Clearing the feathers in front of hip joint and holding others back by damping.

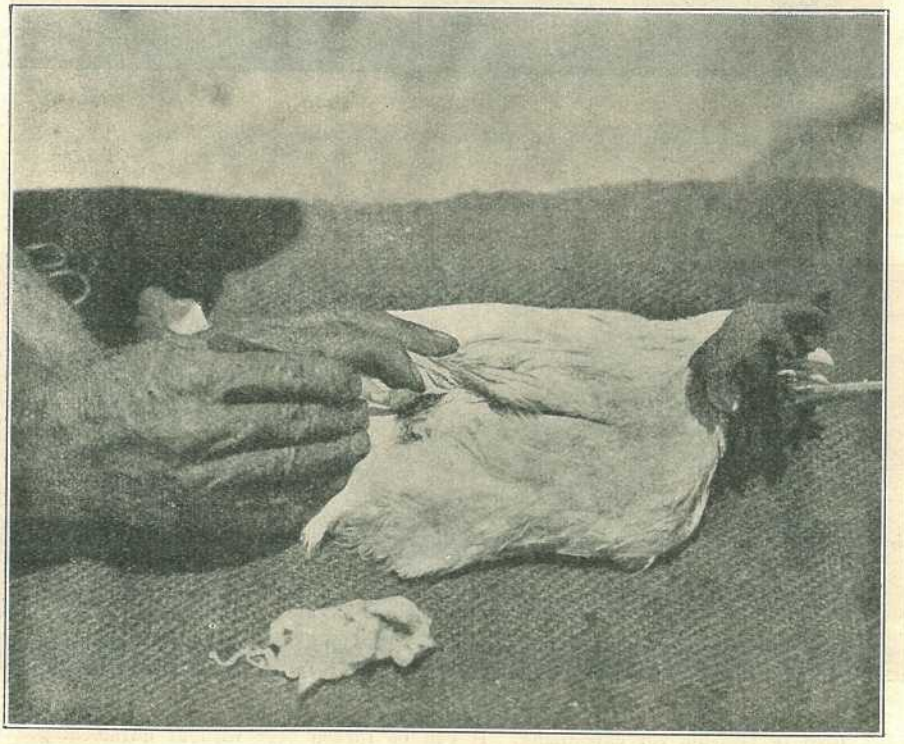


Plate 83.
Drawing skin back with forefinger and making incision between last two ribs.

which is just in front of the hip joint. In a bird of the correct age very few feathers will need removing, and those that are lying in the way can easily be held aside by damping them with an antiseptic solution, which should always be used to cleanse the site of the incision. The clear space obtained by doing this is illustrated in Plate 82. Having done this, the correct position to make the incision must be ascertained. This is best done by placing the thumb on the hip joint, gradually moving the forefinger along the body until the last rib is felt. It is between the last two ribs that the incision has to be made, but before doing that draw the skin as far back as possible with the forefinger as shown (Plate 83) so that when the operation is completed and the skin goes back to its natural position the wound in the skin and abdominal cavity are not directly opposite. Having made the cut, insert the spreaders, enlarge the opening to about 1½ inches, and gently spread the ribs as shown in Plate 84.

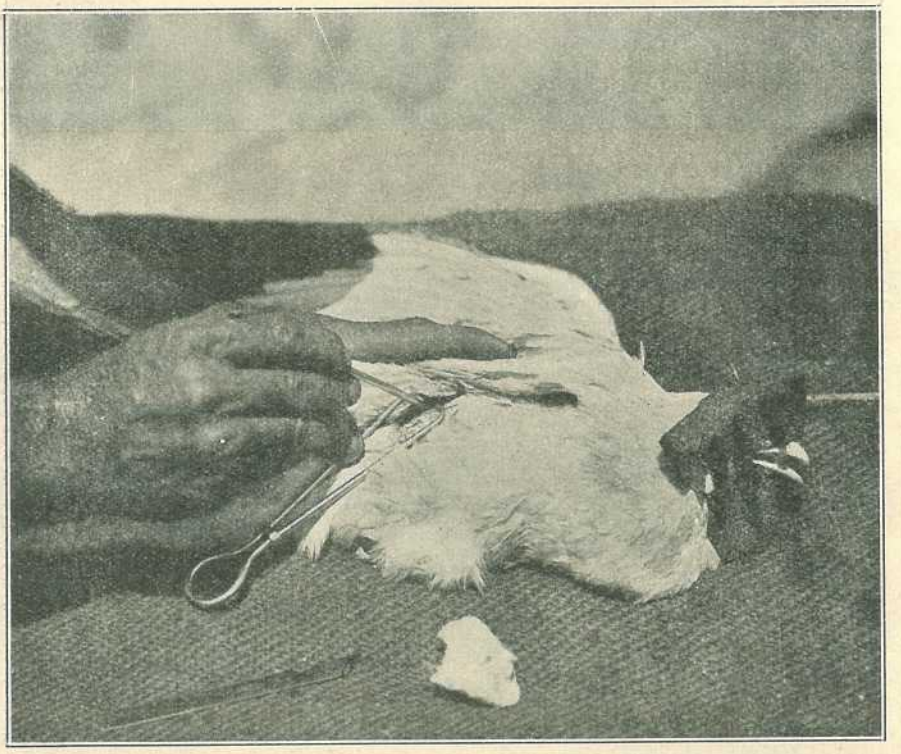


Plate 84.

Insert spreader, enlarge opening, and tear membrane which covers intestines.

When this is completed a thin membrane will be noticed covering the intestines. This has to be torn apart before the testicle can be seen. The testicle is easily noticed if the bird has been properly starved. It is yellowish white in colour, runs parallel to the backbone, and in birds of correct age about ¾ in. long and a little thicker than a plump grain

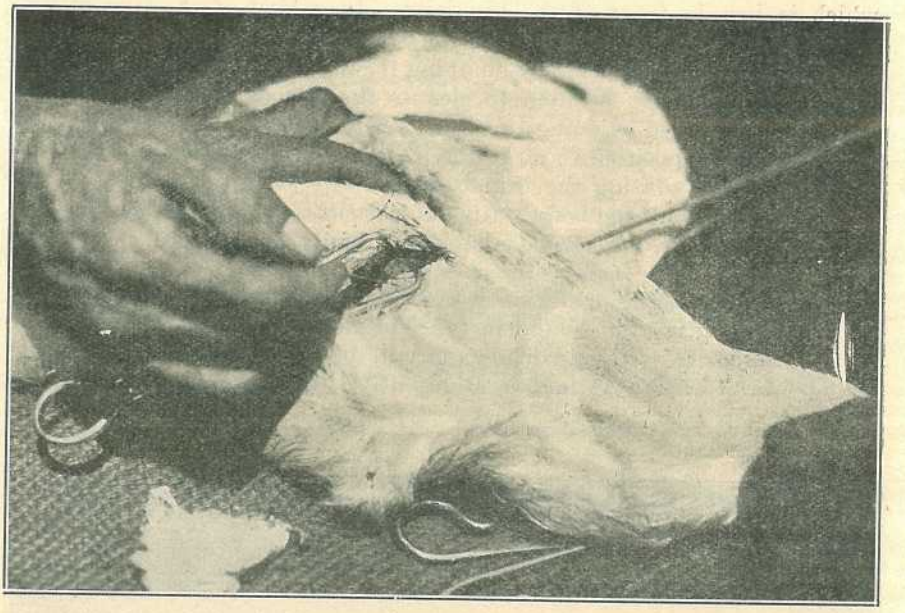


Plate 85.
Close-up view showing position of testicle.

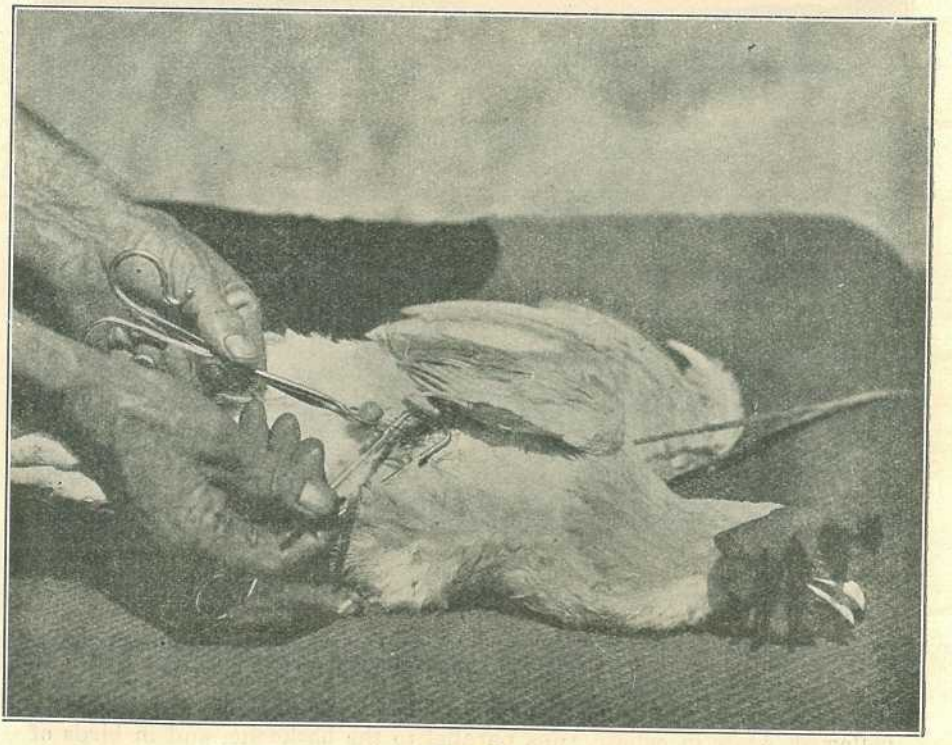


Plate 86.
Severing appendages after removal of testicle.

of wheat. The position of this is shown in Plate 85, although somewhat enlarged because of the advanced age of the bird operated on. With the forceps take hold of the testicle, being careful not to grasp the large artery which runs parallel with and close to it. Withdraw the instrument as shown in Plate 86, with testicle attached, with a twisting motion, and after appendages have been twisted up and pulled out cut them about 1½ to 2 inches from testicle to make certain that no portion of the organ remains.

When the operation is completed on the one side, turn the bird and repeat the process. Some operate from the one side only, but this method carries more risk, and the saving in time is doubtful.

In about a week it is a very difficult matter to find where the incision had been made—a few wind puffs may sometimes be observed, but it is merely necessary to prick them.

After the operation of caponizing turn the bird loose. If the operation has been correctly performed the skin covers the wound, and no dressing of any description is required. It is as well, however, to keep the capons in clean quarters and away from other fowls for a few days; but beyond this further treatment is unnecessary.

Fattening.

If poultry have to be sent long distances for sale special fattening treatment is not recommended, for the weight increase that may be obtained by two to three weeks' special attention may be lost in transit and in the sale room. It is a practice of many poultry auctioneers to hold poultry temporarily in the hope of obtaining greater values for the farmer. The birds are fed and watered, but it will be realised that the practice is not such as to be conducive to the retention of the condition gained on the farm by special feeding.

General Health.

Poultry raisers should aim at keeping growing stock and laying hens in good condition by good feeding. If that is done, culled hens and unwanted male birds will always be in a fit condition for market. Fowls that are not so conditioned are probably weak constitutionally and unlikely to respond to treatment. Sometimes, however, worms may be the cause of a poorly fleshed condition. In such cases fattening may be justified, but before commencing this treatment rid the birds of worms. Dr. F. H. S. Roberts, Veterinary Parasitologist of the Department of Agriculture and Stock, recommends the following treatment:—

Flock Treatment.—Flock treatment can be applied with success only when the birds are kept under intensive or semi-intensive conditions. The procedure is to mix nicotine sulphate with the mash at the rate of ·5 c.c. of nicotine sulphate for every 1 lb. of dry mash. The amount of nicotine sulphate required is incorporated with just sufficient water so that when mixed the mash is flakey. The mixing should be thorough, so that no lumps remain. This treated mash is mixed fresh daily and fed continuously for four days.

Period of Fattening.

Confinement is necessary for any special fattening process. This restricts exercise, with the result that the maximum quantity of food consumed by the bird is used for building up flesh and body condition.

Lack of exercise, however, soon results in a loss of appetite. Some birds may only feed well for ten days; others, again, may be kept going for three weeks. The most important thing to remember is that birds may only be kept in close confinement for a short period without losing appetite, and when that is observed a halt must be made. These remarks apply particularly to the system of crate fattening.

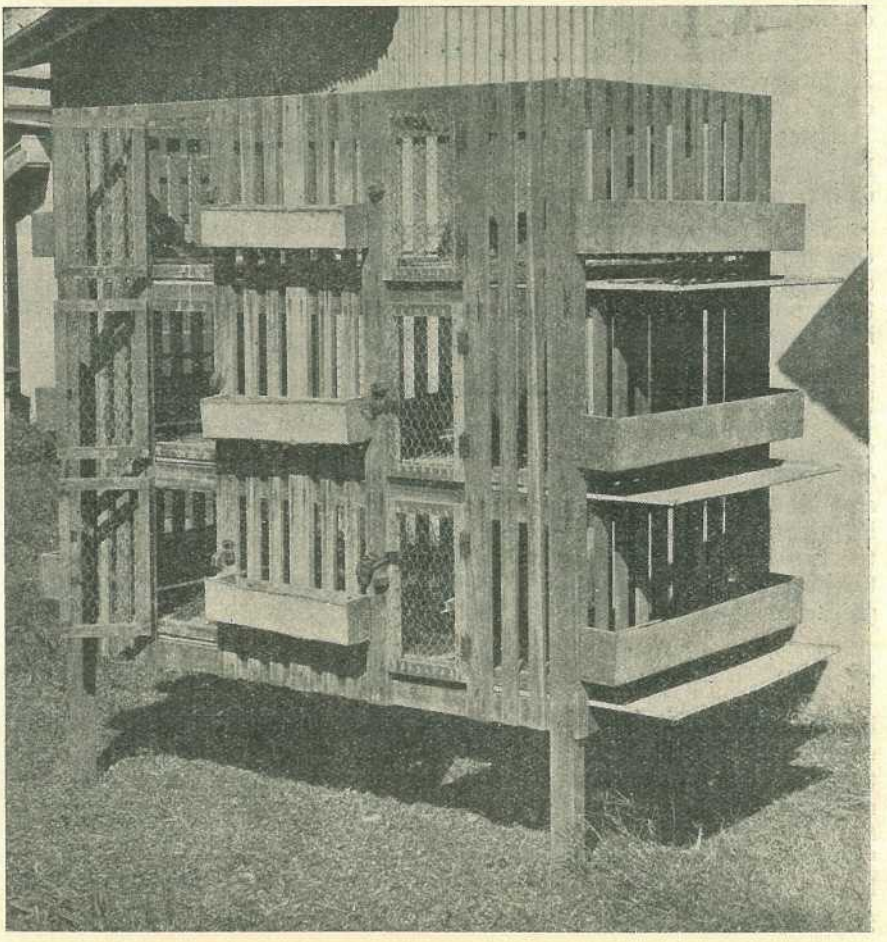


Plate 87.
A compact battery suitable for the fattening of poultry.

Pen Fattening.

Cockerels present a problem, particularly all light breed varieties, because of early development of sexual activities. The earlier they are taken away from pullets the better. Cockerels have to be kept growing, and should be fed the same as pullets until placed on special fattening ration. When large enough for the trade they should be graded according to size.

In pen fattening, both hens or cockerels, as the case may be, should be placed in small pens and in groups of about twenty, allowing 2 sq. ft.

of floor space for each bird. Under these conditions there is naturally some crowding, and it is essential to protect the food and water from soiling. This is best done by having the feeding receptacle outside the house, the bird gaining access to it through a grid.

Crate Fattening.

Crate fattening is only desirable when adult birds or well-grown cockerels are to be fattened, and then only for assured markets. This method requires more attention and so adds to the work of the farm, hence the necessity of obtaining returns commensurate with the cost of labour and material used. A crate 2 ft. long, 18 in. deep, and 18 in. high is simple of construction. This crate will hold three to four birds, according to their size. A long crate of similar dimensions divided into 2-ft. sections, and raised on legs to facilitate the work, may be built. The sanitation of the crate should, of course, receive strict attention; dirty crates soon lead to sickness and poor results. A V-shaped food trough to hold porridge or gruel, if the fowls are so fed, and receptacles for grit and charcoal are all the furnishings required.

Crates should be set in a well-ventilated shed. Good light is essential to encourage feeding, but after feeding it is desirable to darken the shed to induce rest.

Feeding.

Feeding from the commencement is most important if good results are to be obtained. A keen appetite is necessary, and is best obtained by giving the birds a dose of salts with their first feed at the rate of 1 oz. to each twenty full-grown birds; and then, if food is still in their crop at any subsequent feeding, it is wise to miss a feed. For the first two or three days, and until the birds settle down in their new quarters, feed sparingly. After this they may be fed three times a day and given all they will pick up quickly, but it is desirable to feed so that the birds could eat a little more, especially as they are being fed three times daily. The troughs should then be cleaned. Grit should be available at all times, or put out in the troughs at least three times a week.

The feed used should be easily digestible and palatable. Having this in mind, ground grain or meals should be used, and not whole grain. To make the food palatable ½ per cent.—say, a pinch or two—of salt should always be incorporated in the mixture. Another food which increases palatability is molasses. This could be used to the extent of from 3 per cent. to 5 per cent. Where possible, skim milk, butter milk, semi-solid milk, or milk powder should be incorporated in any mixture. With any milk product an equal quantity of any three of the following—wheat meal, maize meal, barley meal, ground sorghum, or pollard—would give excellent results. In any mixture, however, it is desirable to incorporate maize meal, as the condition put on when this food is used is not lost to the same extent in transit as in the case with some other foods. In the utilisation of semi-solid buttermilk, 20 per cent. may be added to any ration, and with buttermilk powder 10 per cent. Sufficient liquid is necessary to mix the ground grains to a consistency that will enable it to pour freely into a pan or bucket.

Potatoes, both English and sweet, either raw or cooked, in conjunction with ground grains, also are useful as a fattening ration, and may be used to the extent of one-third of the bulk, the mixture to be made to a porridge consistency.

Milk is credited with the placing of fat in the muscular tissue of poultry and materially improving the flavour, but in countries where it is used extensively it is also claimed that there is a greater shrinkage with milk-fed birds than with any other system; consequently, the shorter the distance from market the better.

Poultry raisers who have not home supplies of skim milk may be forced to use meat meals in lieu of milk products. To them it is suggested that 10 per cent. should be incorporated in any mixture, such mixture to be mixed with water.

Dressing Poultry.

Killing.—Before slaughter the birds should be fasted for twenty-four hours, in order to facilitate drawing. Water, however, should be supplied. For local trade, killing may be done by removing the head with an axe, or by dislocating the neck. The latter method is very satisfactory and much cleaner, and is probably in more general use.

Dislocation of the neck is done by holding the legs and end of the wings in the left hand and grasping the head of the bird with the right hand, the thumb being behind the head and the second finger under the beak close to the throat. Next bend the head back almost at right angles and give a sharp pull with the right hand. This causes a dislocation of the neck where it joins the head, and severs the blood vessels. Stretch the neck slightly to create a cavity for the collection of the blood and hang the bird up until bleeding has finished, which will be indicated by an enlargement of the neck. Dislocating the neck of a bird at first may appear difficult, but by stretching the bird over the right hip one will soon acquire proficiency in the method.

For the export trade birds are generally killed by severing the jugular and debraining, as it is claimed that this method gives the best bleeding and that debraining facilitates the removal of the feathers when the birds are to be dry plucked.

Plucking.—There are four methods of plucking—dry plucking, scald, semi-scald, and wax plucking. Unless a person is very proficient, the dry method of plucking is laborious and slow, and for local trade is not essential; while for the wax method a fairly elaborate equipment is necessary.

Scald Method.—The water should be held at a temperature of 180 degrees Fahr. With this method it is essential to guard against the partial cooking of the skin, which causes the bird to discolour rapidly and the skin to tear easily when the feathers are being removed. In scalding, the birds should be held by the head and feet and drawn through the water with the feathers and not against them in order to prevent the water penetrating to the skin. By this process the steam will reach the base of the feathers, and the length of time of scalding required judged by pulling a few of the thigh feathers.

After scalding, first pull the main tail and wing feathers and then start on the breast, then the small body feathers, taking care to avoid tearing the skin of the breast. When a bird has been properly scalded the feathers may almost be rubbed off. With a blunt knife any pin feathers left may be removed easily by grasping them between the thumb and the knife.

Semi-scald.—This is a method that has come into use in recent years, and it is claimed that the process has not the discolouring effect when the birds are kept in storage for any time, and that the finished bird is in appearance equal to that of the dry-plucked bird.

The temperature of the water used for the method is between 125 deg. and 130 deg. Fahr. The birds are immersed in this water from a quarter to half a minute. Picking the bird after being submitted to the semi-scald method is quicker than the dry picking method, and the pin feathers are easy to remove. The same plan of plucking is followed in this method as any other—i.e., the tail, wings, breast, &c.

After plucking, a considerable number of fine hairs will be left, which, for appearance sake, it is desirable to remove. Many dressers do this by singeing with lighted paper. This invariably causes an objectionable darkening of the skin, therefore it is better to pass the bird over a flame of a methylated spirit lamp.

Cooling.—To cool the carcase, do not lose sight of the keeping quality. Cooling as rapidly as possible is desirable, but if the birds are to be kept for any length of time they should be placed on racks in a store at a temperature of from 30 to 40 deg. Fahr.; whereas if they are to go into immediate consumption cold or iced water may be used.

Dressing.—Lay the bird on its breast and with a knife cut the skin at the back of the neck from the body to the head. Loosen the neck, gullet, windpipe, and crop from the skin. Then remove the neck by cutting it close up to the body. The crop and windpipe can then be pulled out and the neck skin then severed from the head. Then insert the index finger or a knife and break away all connective tissue.

Turn the bird around and make an incision between the vent and the tail, then with the index finger pick up through this opening a loop of the intestines and draw out. When out sufficiently, cut around the intestine and remove the vent. Remove the intestines, then gizzard, liver, heart, and lungs, all through this opening.

With aged birds it is sometimes desirable to remove the sinews of the leg. This is easily done by cutting the skin around the shank about ½ in. from the hock; then break the leg of the bird close to the cut by bringing the leg sharply down on the edge of the table. The lower part of the shank and foot will then hang only by the sinews. The foot of the bird is then placed in a grip or hook, and by grasping the thigh in the hand, and giving a sharp pull, the sinews are torn out.

Trussing.—Draw the skin of the neck on to the back, locking it down by folding the wing tips under on to the shoulder. This closes effectively the cavity in the front of the bird and gives it a nice finished appearance. The "drum-sticks" may be tied down with string or skewers. Many, however, make a point of just holding them in place by drawing the skin of the abdomen, where cut, over the ends.

Milk Grading Tests.

(*Continued from page* 179, *August issue.*)

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

The Sediment Test.

THE receiver of liquid milk from a number of different sources will find the Sediment Test of great assistance in convincing the careless dairy farmer of the impurity of his supply. This simple test shows the nature and amount of visible dirt extracted from a measured quantity of the milk by forcing the milk through a standard cotton disc of definite size. The test can be made in the presence of the farmer on the receiving platform if necessary, and he can immediately examine the disc and compare the result with those given by previous tests.

Advantages of Sediment Test.

1. The Sediment Test is useful in improving the purity of liquid milk supplies by demonstrating the actual foreign matter present.

2. It is simple, cheap, and calls for no technical knowledge.

3. It is very rapid, being completed in a few minutes, so that if required results can be reported to the farmer immediately.

4. Sediment discs can be dried and mounted and marks awarded for cleanliness.

5. If tests are carried out regularly, an interesting record can be kept showing each supplier's improvement. Alternatively, discs can be mounted on separate cards, dated, and returned to the farmer with grading comments and the marks gained.

Carrying out the Test.

Sampling for the Sediment Test is important, for, obviously, foreign matter will tend to settle out to the bottom of the can, and thorough mixing is essential. One pint is the usual amount taken but a larger amount may be used—less than this tends to be not a representative sample—and a test is made from each can sent in. The can of milk is well mixed with a stirrer and one pint removed at once by means of a measure or dipper into the tester. This consists of a metal cylinder tapered at the lower end with a screw-on cap into which fits a cotton disc, kept in place by a wire gauze; the top of the cylinder is closed by a cover, to the centre of which is attached a hand-pump. (*See* Plate 88.) This enables the milk to be forced through rapidly, and an even distribution of sediment is obtained on the cotton disc. The milk is returned to the bulk. The disc is then removed and allowed to dry on a square of blotting paper, numbered or bearing the farmer's name, in a dust-free place, and a fresh disc placed in the tester, which is then ready for the next sample.

Care should be taken by the operator to handle used discs as little as possible, preferably using a pair of forceps for the purpose. Fresh discs should not be removed from the box in which they are supplied until require, and dust of any sort should be guarded against throughout this test.

Interpreting Results.

The milk grader will, after very little experience with the Sediment Test, be able to discover the suppliers of inferior milk. A maximum of 10 or 100 marks should be decided upon for milk showing complete freedom from sediment, and by continual comparison a standard for awarding points can be arrived at. It is advisable to prepare a standard set of discs as a guide, for no human judgment can be relied upon to be absolutely accurate where appearances are concerned, and the farmer must be able to compare and contrast his tests from week to week for the best results. One test each week, of the whole supply

Plate 88.
APPARATUS FOR THE SEDIMENT TEST.

from each farmer, made not always on the same day, will be sufficient to start with—later, once a fortnight or once a month may be quite satisfactory.

The Sediment Test will show clearly which milk contains the largest quantity of visible dirt. It will not, however, show without some additional test which milk is the purest. It must be remembered that by thorough straining into clean cans on the farm and no subsequent opening of them, the farmer may succeed in removing all visible dirt, but this does not necessarily mean that his milk is really pure, for straining cannot remove the invisible impurities and obnoxious bacteria may still be present in large numbers.

Taken in conjunction with careful grading by taste and smell this test is useful in the early stages of improving supplies. When it has achieved its object—that of making farmers aware of visible dirt, and encouraging proper straining as soon as possible after milking—it can be dropped in favour of a more stringent test, such as the Methylene Blue Test which has already been described in this Journal.

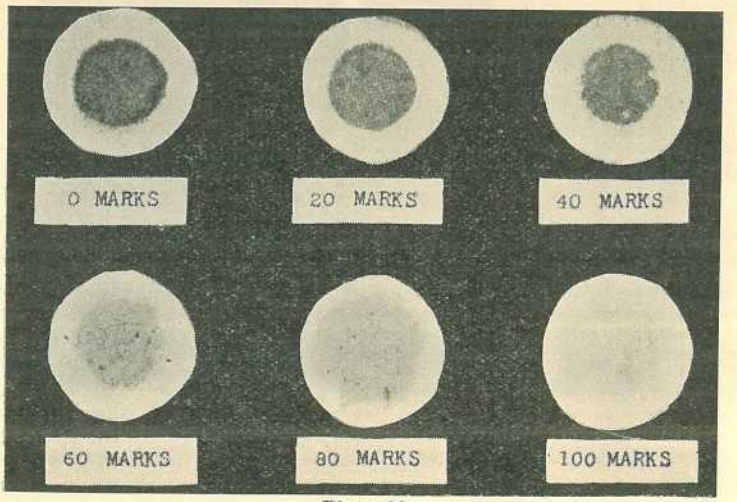


Plate 89.
A SET OF USED DISCS SHOWING METHOD OF SCORING.

Brisbane Exhibition, 1938.

Plate 90.

His Excellency the Governor, the Right Hon. Sir Leslie Orme Wilson, opening the 1938 Brisbane Exhibition. On the dais in the foreground on the right is the Premier of Queensland, the Hon. W. Forgan Smith.

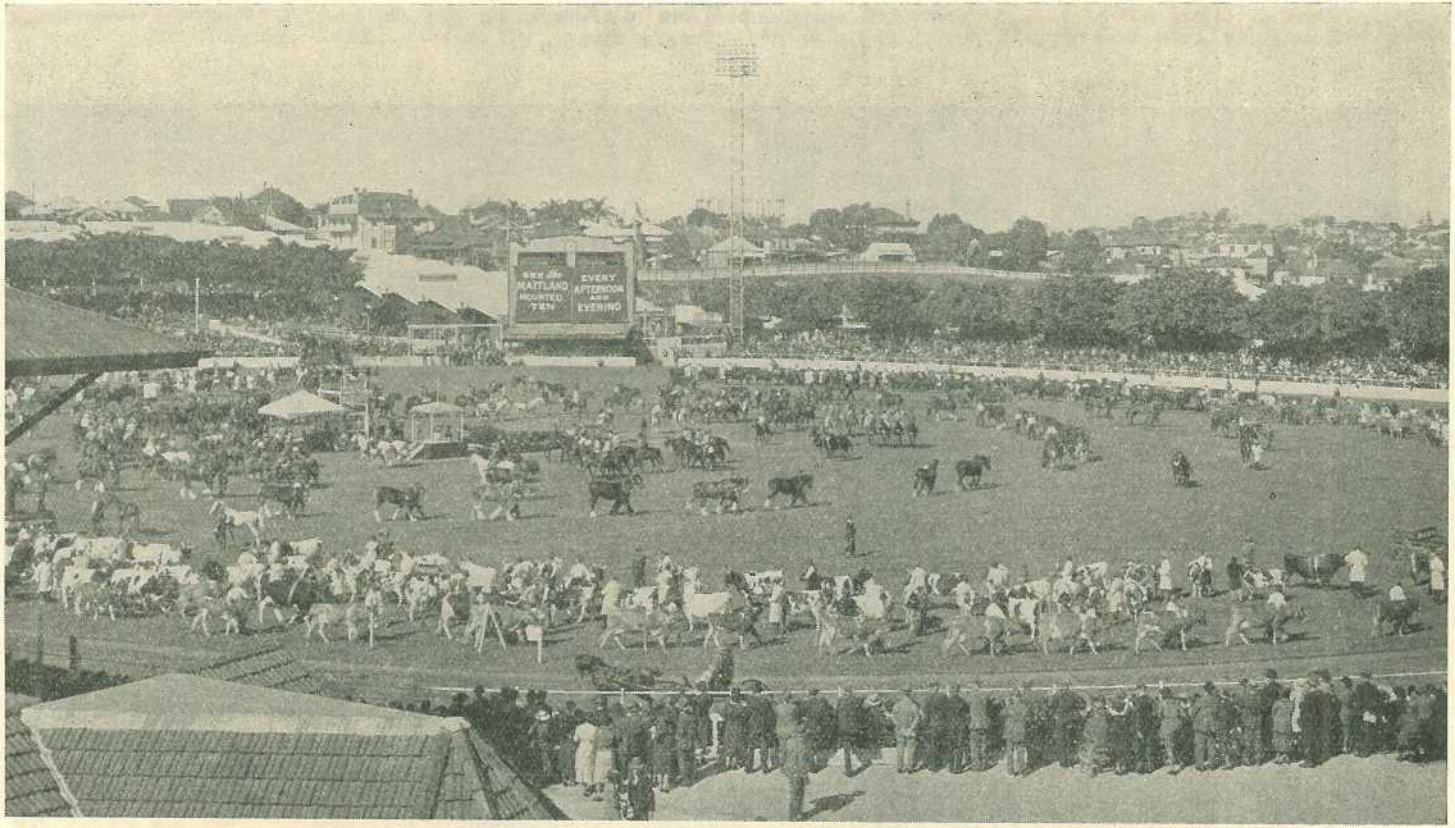


Plate 91.

THE RING AT THE 1938 BRISBANE EXHIBITION.—The daily parade illustrated admirably the high standards attained by Queensland stockbreeders. With the dairy cattle particularly, show-ring shapeliness and cream-can value were happily blended. The plough teams, hacks and hunters, and a Light Horse troop also added to a great stock Show.

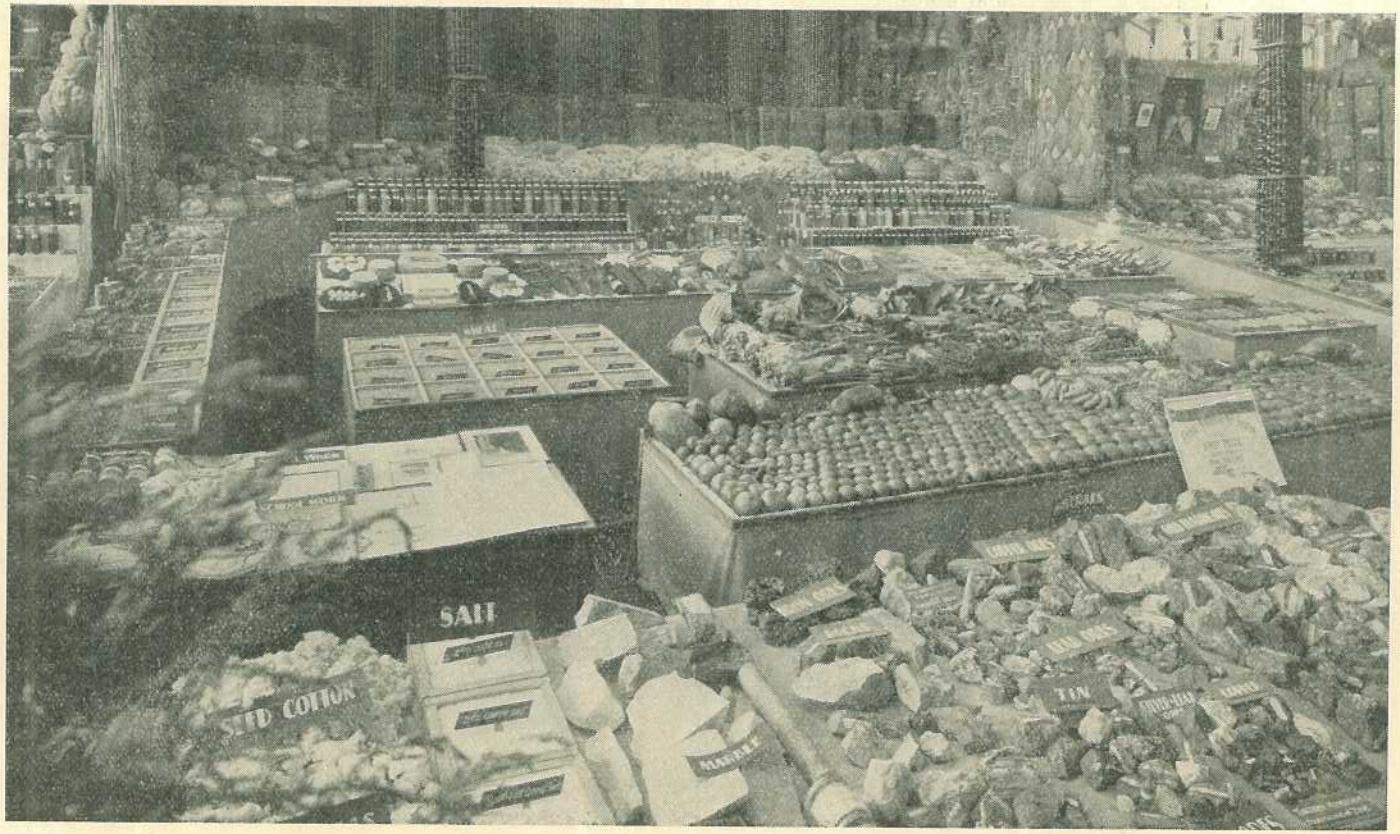


Plate 92.

WEST MORETON WAS THE WINNING "A" GRADE EXHIBIT.—This display of mineral, pastoral, agricultural, and factory products demonstrated the richness of the resources of the country below the Range.

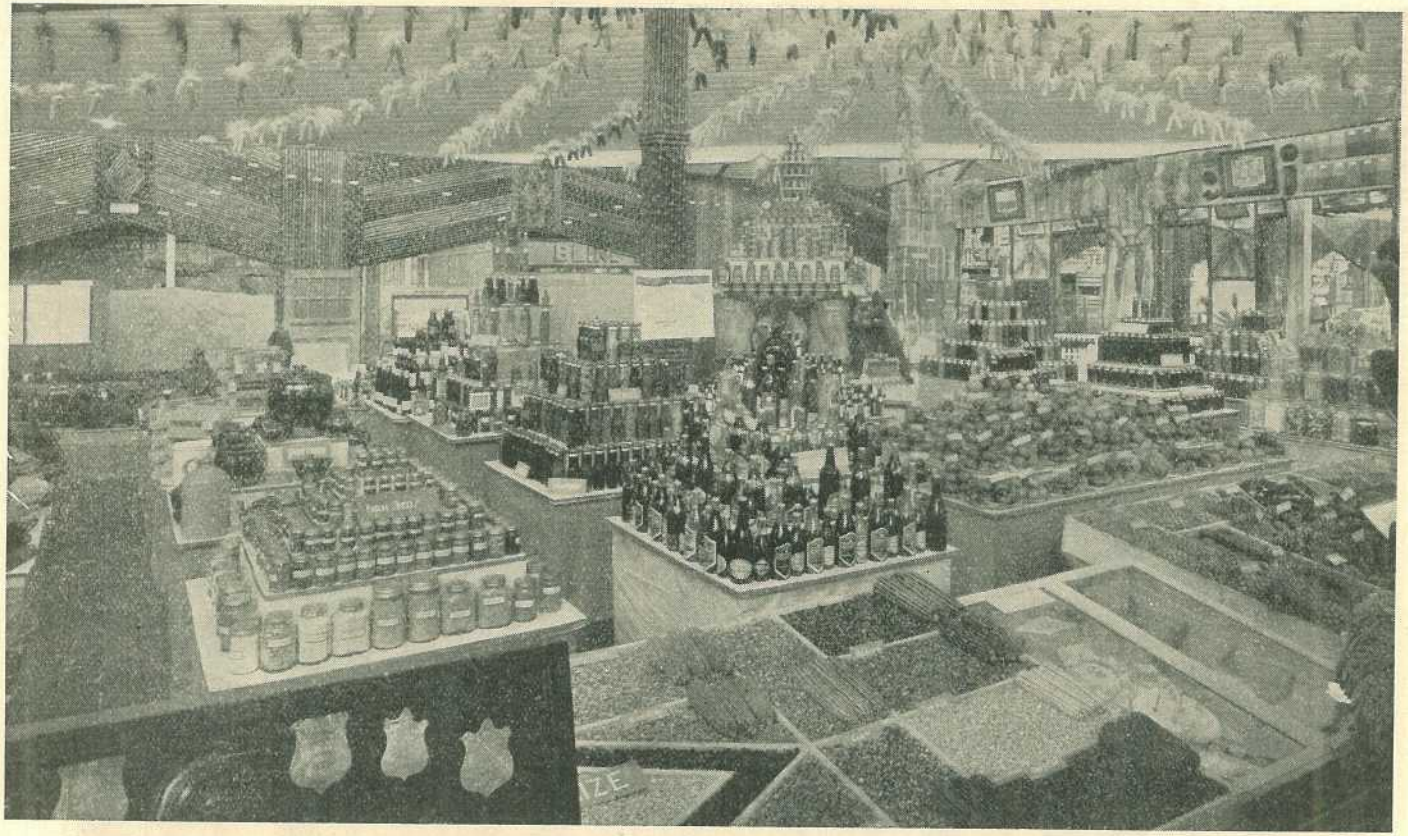


Plate 93.

THE MACKAY-CHARTERS TOWERS COURT.—This was the winning "B" Grade exhibit and illustrated impressively the remarkable diversity and quality of production in North Queensland.

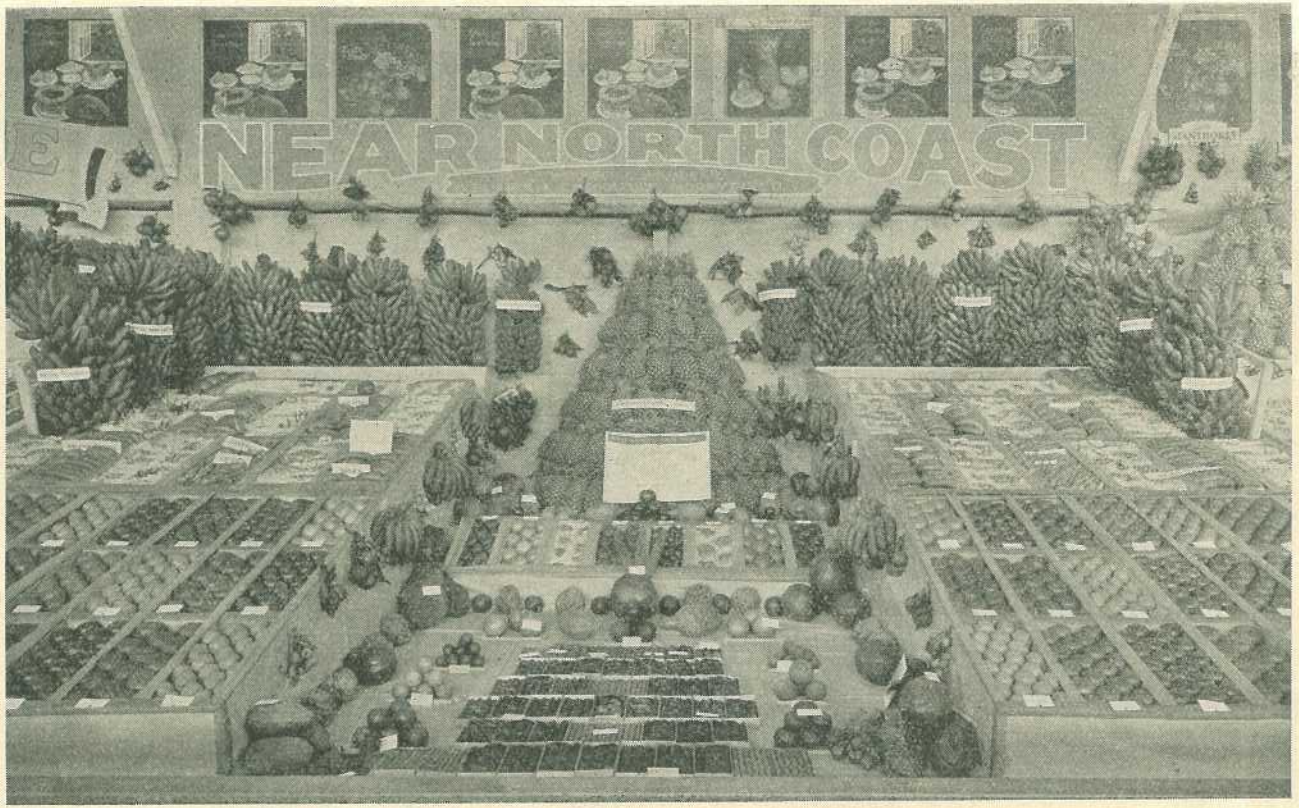


Plate 94.
The Winning District Fruit Exhibit.

Plate 95.

IN THE FRUIT PAVILION.—Pyramids of pineapples, bananas in bunch and pack, oranges and lemons, apples arranged in geometrical patterns, and a wealth of rare tropical products made up one of the most colourful displays of fruit ever seen in Brisbane.

Plate 96.
A striking exposition in green and gold and russet red of the wealth and health of the Stanthorpe apple lands.

Plate 97.
Pylons of ripening pineapples in attractive array in the general display in the fruit pavilion.

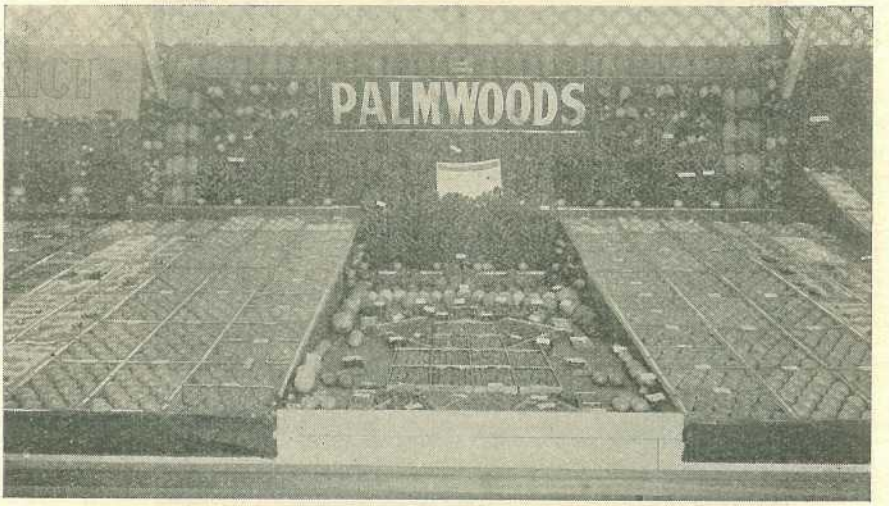


Plate 98.
The Second Prize-winning Exhibit in the District Fruit Competition.

Plate 99.
The Third Award went to Woombye.

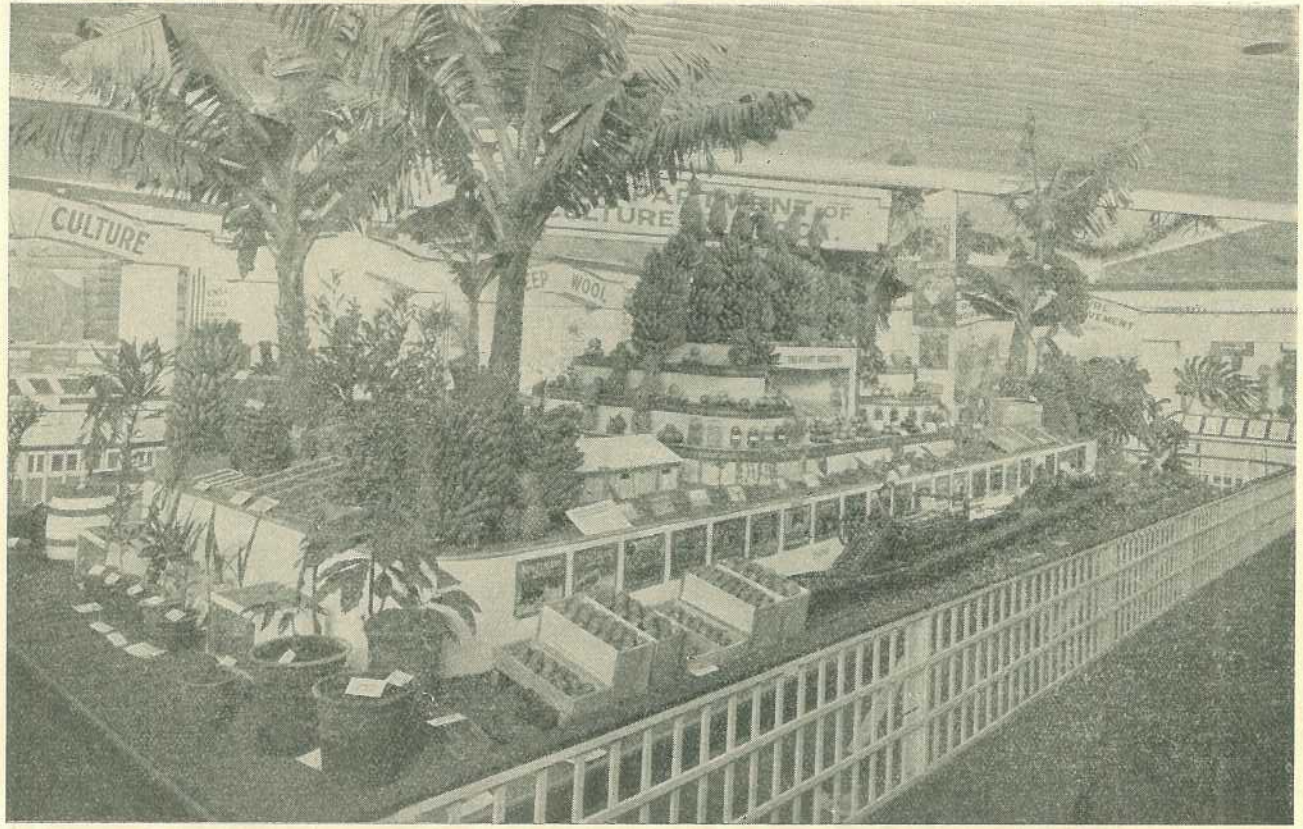


Plate 100.
This year tropical and temperate fruits in extraordinary variety formed the central feature of the Court of the Department of Agriculture and Stock.

Plate 101.

The importance of entomology and vegetable pathology in rural economy was illustrated impressively in this educational display in the Court of the Department of Agriculture and Stock.

Plate 102.

How cattle may be fattened on coastal pastures was the pictorial story in this popular bay in the Court of Agriculture. Many specimens of indigenous and introduced grasses were exhibited. The renovation of established swards was the main theme of the display.

Plate 103.

Modern methods of control and treatment of stock diseases were illustrated in diagram, text, and specimen in this corner of the Departmental Court.

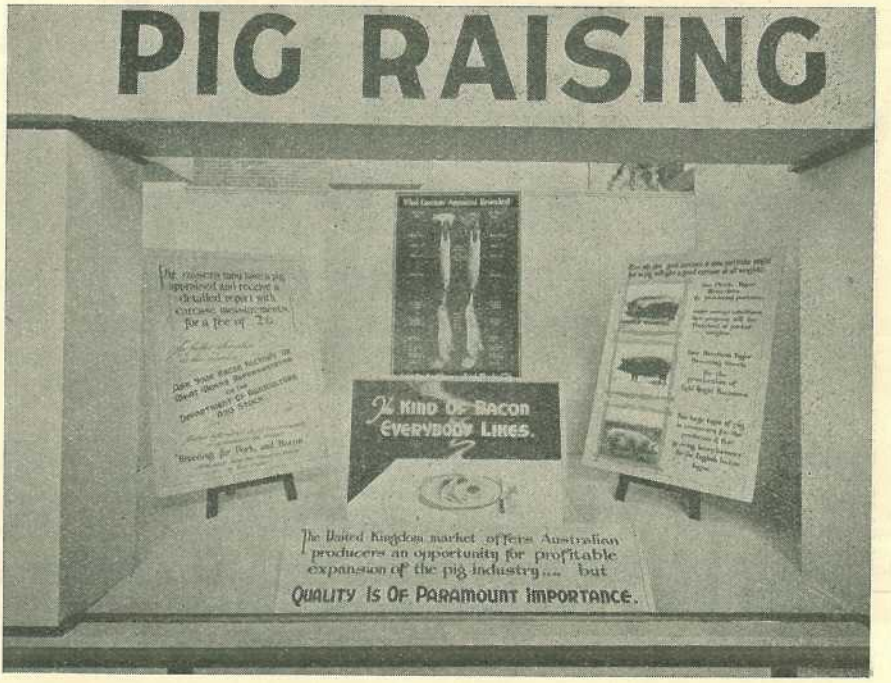


Plate 104.

Points for Pig Raisers.

Plate 105.

This exhibit was arranged in such a way that the fundamentals of fodder conservation could be understood and appreciated at a glance. Scale models of silos—tower, trench, and pit—and samples of silage made with maize, wheat, sorghum, and barley were the chief features of a very fine display. The lesson conveyed was that "a silo contains more good things pointing to greater profits than any other building on a farm."

Plate 106.

This collection of farm crop samples—especially of wheat and maize—was an outstanding feature of the Departmental Court.

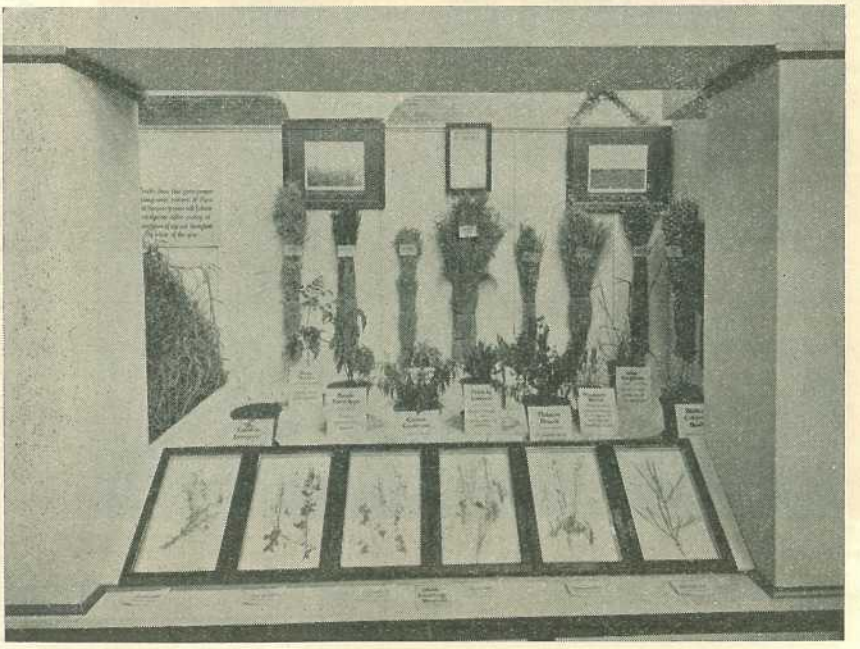


Plate 107.

A PANEL IN THE PASTURE SECTION.—In the foreground were specimens of plants poisonous to stock, which enhanced the educative value of the exhibit.

Plate 108.

"Do's" and "Don'ts" in dairy practice and cream-can contrasts were illustrated well and demonstrated very effectively in this outstanding contribution to dairy education in the Court of the Department of Agriculture and Stock.

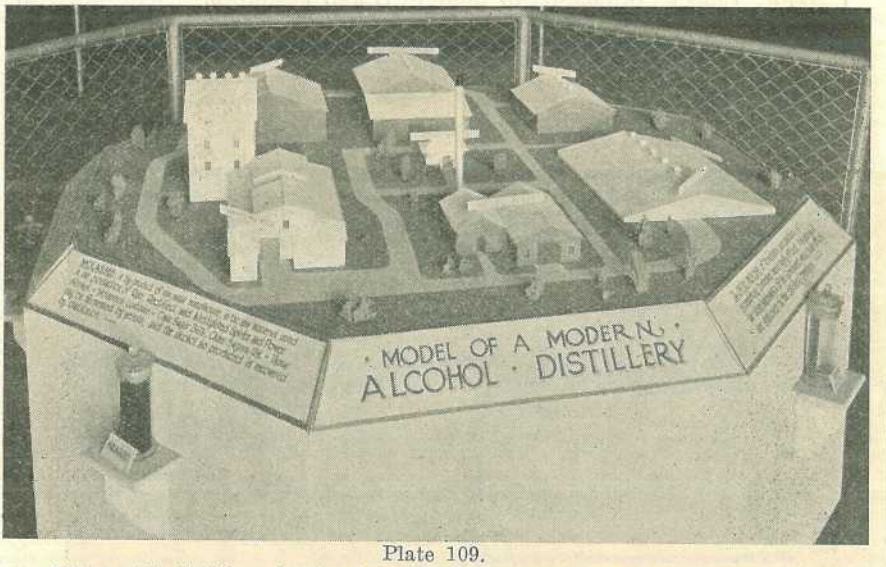


Plate 109.

This model distillery in the Sugar Hall illustrated the development of power alcohol production in Queensland. It showed how a modern distillery is designed to produce alcohol for all purposes. Successive steps in the fermentation and distilling processes were described in detail, and samples of spirit in its various forms at intermediate stages were shown.

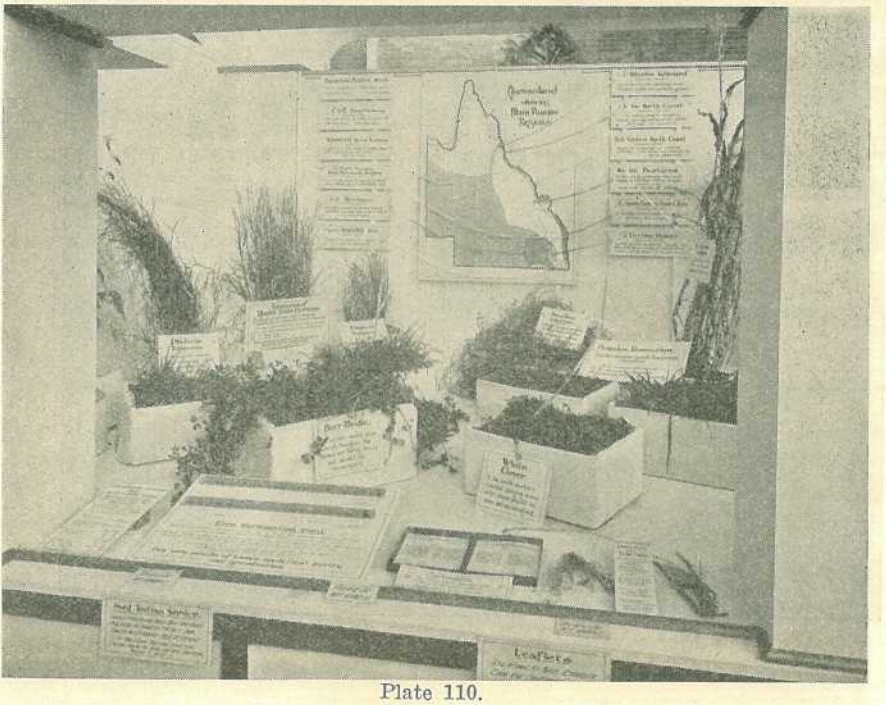


Plate 110.

Rhodes grass swards, wherever practicable, should be renewed at frequent intervals. The advantage of this practice was shown in this section of the Departmental Court. The sods in the upper left-hand corner included one showing first year's growth—green, tall, and succulent. A sod of second-year growth was tall and still dense, but rather spindly. A sod five years old was low, thin, and wasty. Productivity, nutritive value, and palatability of Rhodes grass decrease with the ageing of the stand.

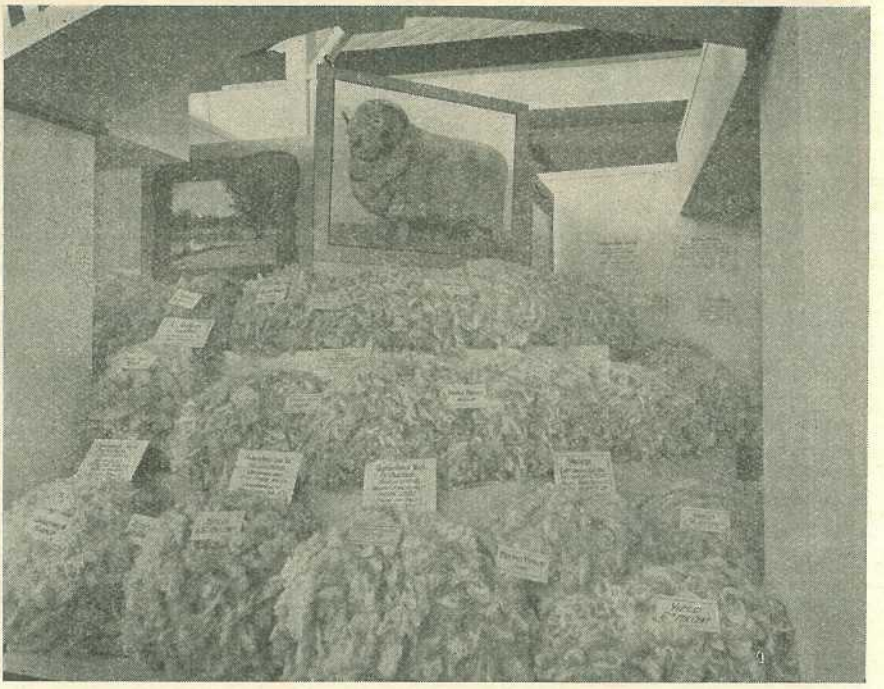


Plate 111.
Merino and Cross-bred fleeces represented Queensland's wealth in wool.

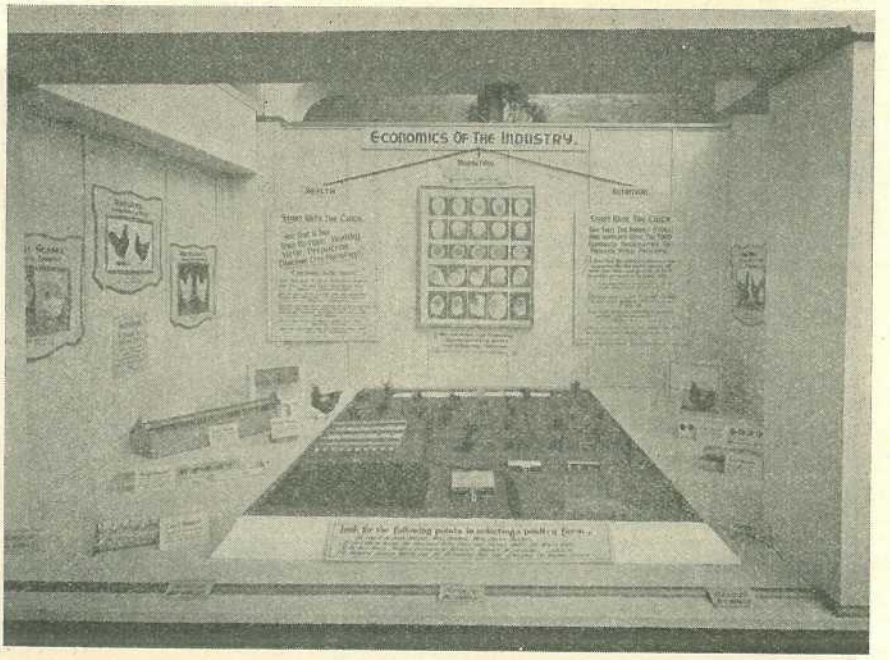


Plate 112.
A scale model poultry farm was a popular exhibit.

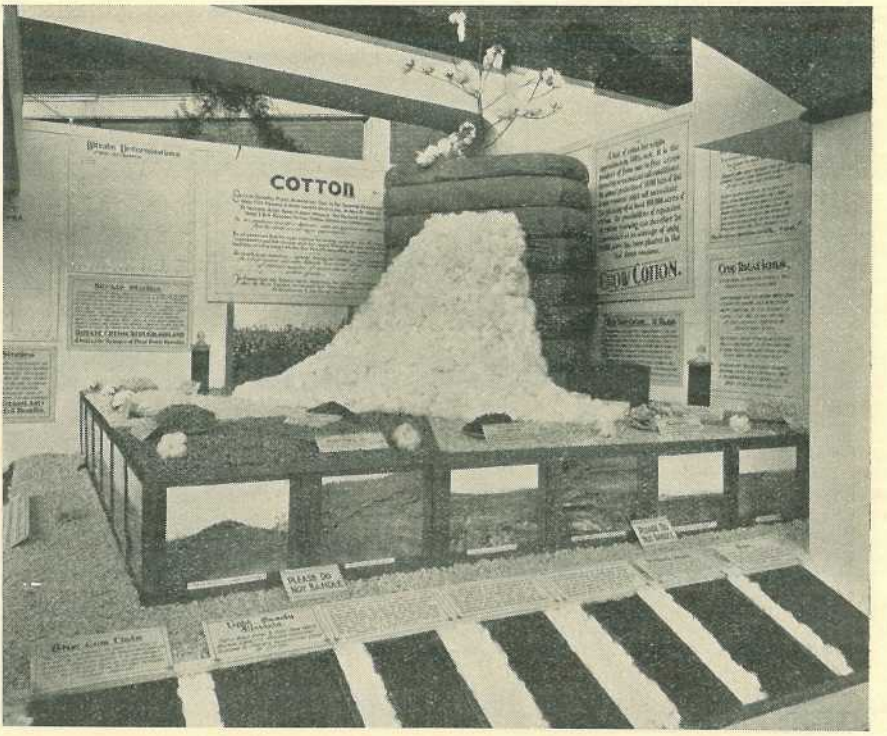


Plate 113.

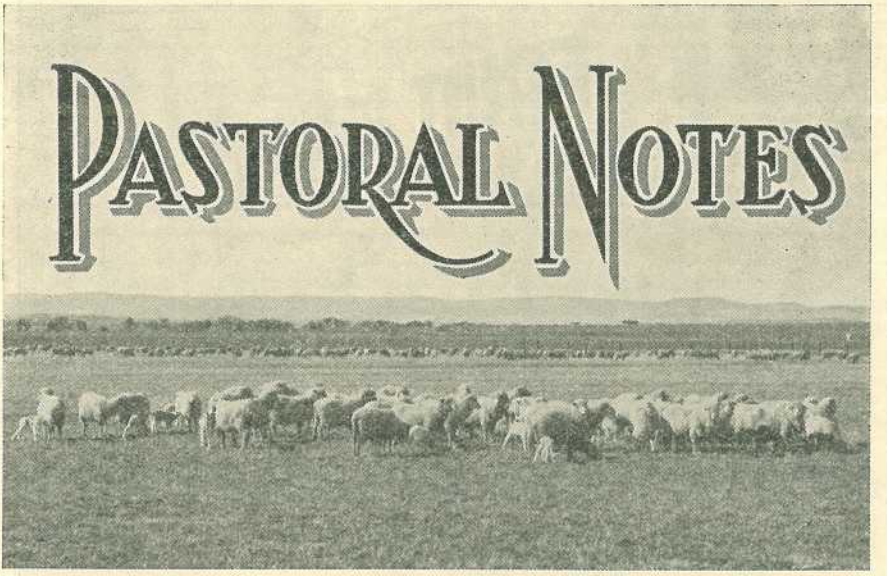
A fleecy cascade of snow-white lint, backed by baled cotton, was the central feature of the Cotton Alcove in the Departmental Court. By-products in impressive array also demonstrated the value of the cotton industry to Queensland. Cultural practices were also typified, and models of eroded fields provided an excellent object lesson on the importance of soil conservation.

Plate 114.

Queensland tobacco in leaf and bale and commercial grades of high quality attracted the keen interest of visitors to the Agricultural Court.

Plate 115.
"The Pick of the Pack."

Plate 116.
A clearing house for Departmental information. The "Journal" alcove at the Show, with Mr. Colin Burns in charge. Officers representing every branch of the Department of Agriculture and Stock were in daily attendance to explain exhibits to Show visitors.



Bloat in Cattle.

A. F. S. OHMAN, M.V.Sc.

RECENTLY, numerous reports have been received from dairymen on the Darling Downs respecting the condition of tympanites or bloat. The condition is brought about by the excessive ingestion of easily fermenting foods, e.g., clover, lucerne, peas, and quickly-growing cereal crops.

Symptoms.

Back arched, colic pains, head turned towards flank, kicking at belly, switching of tail, groaning, lying down and getting up, belching of offensive gases and sometimes vomiting. Defecation is at first normal, followed by constipation. Respiration is accelerated, lactation diminished and the animal may show a staggering gait with a definite weakness of the hind limbs. It may appear to be suffocating.

The abdomen becomes enlarged especially on the left side and this "ballooning" may become serious enough to even burst if the animal is not given attention.

Tapping of the swelling with the fingers causes a drum-like hollow sound.

Treatment.

1. Remove the animals from the succulent feed. (Under present seasonal conditions this may not be possible.)

2. Give the following drench immediately symptoms are shown:—

Aromatic spirits of ammonia	1½ oz.
Sweet spirits of nitre	1½ oz.
Water (warm)	1 pint.

An effort should be made to elevate the forequarters. By this means the gastric or lower portion of the oesophagus (gullet) is brought above the gases and food thus giving the gases a better chance of escape.

3. In severe cases it may be necessary to tap the abdomen with trocar and canula or, in the absence of these instruments, a sharp knife. Tapping of the abdomen is always done on the left side and at a point midway between the last rib and the hip bone. In short, it is at the highest point of the swelling. The accumulated gases should be liberated slowly, otherwise collapse may occur.

LICE INFESTATION OF CATTLE.

A heavy lice infestation of all classes of cattle, particularly dairy cows, has become a serious matter to stockowners in parts of Central Queensland. The lice—the long-nosed sucking louse and the short-nosed sucking louse—usually make their appearance on cattle in the winter months, becoming most active in the spring when the warm weather sets in.

The presence of lice on cattle is indicated by ceaseless skin irritation. In their efforts to ease this irritation, the cattle rub themselves against fences, stumps, and trees and soon become almost denuded of hair on the neck, dewlap, and rump. Whole patches of skin become raw from rubbing; other parts of the animal also become affected.

The ordinary arsenic and soda dip is ineffective against the lice, but if three-quarters of a gallon of crude cresylic acid is added to every 400 gallons of dipping fluid, good results will be obtained. For the treatment of dairy cattle and stud bulls by spraying, a solution of one ounce—two tablespoonsful—of nicotine sulphate solution (40 per cent. or thereabouts) in six gallons of water has proved effective. In either case, the treatment must be repeated in fourteen days in order to destroy the pest. The reason for this is that the first treatment only kills the lice actually alive on the cattle at the time, and will not destroy the small eggs which are attached to the hair of the animals. Within fourteen days all these eggs will have hatched and the young lice will soon be capable of laying eggs, and so continuing the cycle. For treatment to be effective it is, therefore, most important that a second dipping or spraying should be done not later than fourteen days after the first treatment.

Cattlemen who are at present troubled with lice in their cattle will be well repaid if treatment on these lines is carried out as soon as practicable.

QUEENSLAND'S BUTTER CHEQUE.

Queensland's butter cheque for the 1937-38 season—that is, for the year ended on 30th June last—was more than two and a quarter million pounds (£2,250,000) bigger than during the previous season. Production for the year was about 2,000,000 boxes, worth about seven million pounds (£7,000,000), as against 1,507,494 boxes worth £4,761,915 last year.

Worms in Sheep.

IN recent times, the problem of control of the parasitic worms in sheep has claimed attention in different parts of the world, more especially in South Africa, Great Britain, and Australia. Previously, drug treatment was successful only in the case of the stomach worm. Worms inhabiting the small intestine, e.g., the hair worms, and the large bowel, e.g., the nodule worm, were practically unaffected by drugs given in the ordinary way through the mouth. This was due to the fact that, under the conditions usually accompanying treatment, the drug passed into the first stomach or paunch and thus became diluted to such a degree that, by the time it passed through the three remaining stomachs of the sheep, it reached the small intestine in too weak a concentration to be in any way effective against the worms situated there or lower down in the gut.

The process of swallowing in sheep is governed by a groove which passes from the gullet along the roof of the first and second stomachs and eventually into the fourth stomach, which then leads directly into the small intestine. When the sheep grazes, the food is passed directly into the paunch, to be later brought back into the mouth, chewed as a cud, and then swallowed again. This time, however, the groove closes and the thoroughly masticated food goes direct to the third stomach or bible and then is passed on with little delay into the fourth stomach. When the sheep drinks, the groove is again closed and the water passes almost directly into the fourth stomach. It was therefore considered that if some way could be found of getting this groove to close during treatment, the drug would pass directly into the fourth stomach and would reach the worms in the small intestine and large bowel in a sufficiently high concentration to kill most of them.

After a large number of experiments, copper sulphate was found to produce this effect. Various strengths from 1 per cent. to 10 per cent. were tried, and it was found that a very small quantity of a 5-10 per cent. solution gave very consistent results. This work was carried out simultaneously in Australia and South Africa. For the small hair

worms, nicotine sulphate was then combined with the copper sulphate, with very excellent results. This drench was found to be effective against both stomach worms and tape worms. Another point which was brought out by this was that starvation before drenching was not desirable. It was previously considered that by a starvation period prior to drenching, the locality in which the worms were present would be rendered free of ingested food and better contact of the drug with the worms would be given. It was subsequently found that this was more likely to be achieved without starvation, for with starvation the animals brought up the food from the first stomach, ruminated it, and then swallowed it, thus surrounding the worms in the third and fourth stomachs and in the small intestine with the ingested material. Details of this treatment may be obtained on application to the Animal Health Station.

—Dr. F. H. S. Roberts.

SKIRTING THE FLEECE.

Probably the greatest defect in the get-up of small clips for market is faulty skirting. The usual mistake is to take too much off the fleece. Every pound skirted off the fleece unnecessarily means a loss in money equivalent to the difference between the prices received for fleece wool and for pieces and broken wool. On the other hand, a loss is sustained if a clip is not skirted properly. If it is payable to "free" a wool it should be done. This consists of removing all burr and other vegetable matter from the fleece. If, however, the fleece is so matted with burr or grass seed that it is impossible to "free" the wool, skirting should be very light, and the wool put up and offered for sale as a "burry" or "seedy" line.

An appreciation of these points may mean substantially enhanced returns to the farmer.

—J. L. Hodge.

TRUCKING FAT LAMBS.

Complaints of the bruising of lambs consigned to market are not uncommon, but to a great extent the remedy lies in the hands of growers.

The tenderness of sucker lambs is often not appreciated sufficiently, and in many cases they are handled like fat sheep. Sheep, too, may be bruised by bad handling, although not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken, some of the ewes should accompany the lambs to the trucking yards. A lamb should never be lifted by the skin. Prodding sticks should never be used. Overcrowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly, complaints of bruising would be rare.

—Jas. Carew.

SHEEP NASAL FLY.

During the spring and summer, graziers in many parts of the State may be puzzled for an explanation as to why their sheep, for no apparent reason, suddenly gallop round the paddock, or stand in bunches with their faces buried in each other's wool, or held very closely to the ground. If such a group is watched closely, the attitude of the animals will be seen to be due to the presence of a stout, greyish fly, which is to be seen frequently at this time of the year resting on the fly screens and water tanks around the homestead. This is the sheep nasal fly, which lays its maggots on the edges of the nostrils of the sheep. The action of the animals in burying their noses in the wool of other sheep, or in the soil, in an endeavour to protect them from the flies, is easily understandable.

The maggots, after they have been laid by the female fly, crawl up the sheep's nostrils and into the communicating cavities. Here they remain for several months. Being provided with a pair of stout hooks in the region of the mouth, they attach themselves to the lining of the sheep's nostrils and cause the secretion of much pus-charged mucous, on which they feed. The condition in sheep known as "snotty nose" is caused by the presence of these maggots, which also may be responsible for such a severe irritation that the infested animal loses condition.

Control of the sheep nasal fly is not very effective at present, but much good can be done by daubing the animals' noses at frequent intervals with Stockholm tar. This procedure should be especially carried out between October and January, inclusive, when the flies are most numerous.

—*Dr. F. H. S. Roberts.*

THE AGES OF SHEEP.

Questions on the ages of sheep and how to tell them are frequently asked. It is a matter of dentition, and, although teeth indications of age are not strictly accurate, they are usually close enough for all practical purposes. Thus a lamb has all temporary incisors or sucking teeth. At about thirteen to fifteen months of age, the two permanent incisors appear. The sheep is then called a "two-tooth." At from eighteen months to twenty-four months, two more permanent teeth appear—one on either side of the original permanence. The animal is then known as a "four-tooth." At the age of 30 months to 36 months, the four permanent incisors are added to again, one on either side, and the sheep becomes a "six-tooth." After a sheep becomes 42 months of age and up to 48 months, yet another pair of permanent incisors make their appearance on the outside of those already there. The sheep is then referred to as "full mouth."

It may be thought that the intervals given of the teeth's appearance are elastic, but this cannot be avoided as so much depends on the country and the state of the pastures.

After forty-eight months, a sheep is referred to as "aged," and the correct age can be indicated only by the soundness or otherwise of the mouth.

A GOOD SHEARING PERFORMANCE.

An excellent performance was put up by a team of shearers at Alice Downs, near Barcaldine, last month. The team numbered twelve, including a learner, and they shore 2,479 big weaners, carrying eight months' wool, in a day, thus averaging 206 a man. The top tally was made by J. H. Edwards with 262. (That sounds like a Bradman or Hutton score.) F. Cooley was the runner-up with 248. P. Moran was third with 233, while the learner had the remarkable tally for a novice of 111.

Nut Grass Eradication.

NUT grass is a weed found in all cane areas of the State; in some districts it is limited in its distribution, while in others it is widespread. In the sense that economic crops and weeds cannot thrive in the same land, nut grass must be regarded as a pest, though farmers are by no means unanimous that it does any serious injury to their cane crops, even where the land is heavily loaded with "nuts."

Attempts have been made from time to time to control nut grass, and the best means employed to date is the growing of a crop which will smother the grass. Lucerne and pasture crops are examples. But no satisfactory method has yet been devised for land under cultivated crops.

Farmers will doubtless be interested in the results of an experiment which is reported from the United States of America, and in which an attempt has been made to eliminate the weed by *frequent cultivation.* The object was to break apart the tubers and expose them to drying at or near the surface of the soil. Other tubers would be stimulated to germinate, in the moist soil; apparently this takes place only when the individual tubers are broken away from the general plant system. It was further shown, in the particular sandy soil studies, that less than 1 per cent. of the "living" tubers were below plough depth.

Separate plots were selected, and various treatments were tested. Both ploughing with a mouldboard plough (which inverted the slices and facilitated drying out) and harrowing with discs, were employed. The implement used in the latter treatment consisted of 10 discs, each 16 inches in diameter, and the plots were treated twice at each working. Ploughings or discings were made at 1-, 2-, and 4-week intervals from June to October. On other plots, the treatments were made whenever sprouts were general over the area. The average interval in these cases was about three weeks, and operations were continued from April to October.

The results show that over a period of two years, nut grass was either completely eradicated or very nearly so on all plots except those which were disced every four weeks. The infestation was reduced by about 80 per cent. in the first season. Further trials at a later date

showed that by ploughing at three-week intervals, over two consecutive seasons, the nut grass was completely eliminated.

It is therefore concluded by the authors that nut grass can be eradicated from sandy soils by the method employed. It is suggested that the method is particularly practicable when small areas of nut grass occur in a field, though it may not be applicable on a farm-wide scale.

Before anticipating similar success under Queensland conditions, it must be borne in mind that the soil type under consideration is important. These experiments were made on light sandy soils, which dry out rapidly. This is an essential feature of the project. Furthermore, the proportion of winter killing of the young nuts which persisted after the first season could not be expected in Queensland; but at least the results are interesting, and the scheme is worthy of trial under selected conditions.

—H. W. K., in The Cane Growers' Quarterly Bulletin for July.

FARM GATES.

On every farm there is always a lot of maintenance work to be done, such as fencing repairs, the making and hanging of gates, the painting of buildings, and the overhauling of machinery, implements, and harness. Some of these jobs can be done during dry weather, and others are better reserved for rainy days.

It is advisable to give attention to the outside jobs first, and, of these, the erection and repair of gates is important. It is surprising to find so many makeshift gates on the farm when strong light gates can be made or bought at very reasonable prices.

Of the different types on the market, the wooden gates are the best, as those having a steel pipe frame, if once bent out of shape, are difficult to straighten, whereas a broken rail or two can readily be replaced. The self-opening types are favoured by some farmers, but these are more expensive and more liable to get out of order than the simpler kind.

Gates should always be swung on good heavy posts placed 4 feet in the ground, with a sill log in between. The hinges, which should be strong, are generally placed in a vertical line. Occasionally it is desirable that the foot of a gate should lift when opened, and this can be arranged by placing the lower hinge half an inch off the plumb in the opening direction.

The materials required to make a double five-barred bolted gate for a 12-foot opening without any morticing are—

112 running feet of 3-inch by 1-inch or 4-inch by 1-inch timber;

3 lb. of 3½-inch by ⅜-inch bolts and washers;

2 pairs hook and eye hinges 2 feet by 2-inch by 5/16-inch.

Butts and heads should be cut 4 feet long, and should be double —that is, placed on each side of the bars. The bottom of the first rail should be 3 inches from the bottom of the upright. The distance between the first and second rails should be 6 inches; between second and third, 6 inches; between third and fourth, 7 inches; and between fourth and

fifth, 8 inches. There should be two double stays on either side of rails on each gate running from the bottom of the butt to the top of the head.

When hinges are being placed in position small pieces of 3-inch by 1-inch timber should be inserted against the rails for packing purposes. A sliding piece of 3-inch by 1-inch timber along the third rail between the stay and the head makes an excellent fastener.

Gates are not finished until they have been painted, and if the first two coats are given before the gates are put together, the job will be easier and considerable time will be saved.

—R. E. Soutter.

THE SWEET POTATO—A VALUABLE CROP.

The sweet potato is not cultivated in Queensland to-day to the extent that its usefulness warrants. At one time it was used largely on the householder's table, but now it is a rarity.

When questioned about the shortage of sweet potatoes for table use, the farmer usually replies, "There is no demand for them." This is true only in part, but the demand still exists for the right varieties. A dry floury, or a moderately moist, potato will suit the consumer best. No doubt, some of the good varieties in use in the past are not now available, owing to droughts and irregular planting, but many are still to be found in certain localities. If the planting is confined to varieties which have proved popular with the consumer, and which could be sold on name, the demand for them should be continuous. Under present conditions a householder may buy sweet potatoes which are unpalatable. If, however, consumers realised that there were different types and varieties of sweet potatoes, they would learn very soon to purchase only types which they liked.

Market gardeners should, therefore, cultivate varieties for which they could readily find buyers. Some market gardeners are already doing this with good results. Very watery or stringy varieties are both undesirable. It is a mistake for a grower to allow a portion of his crop to stand over after maturing, as the tubers then begin to deteriorate in quality.

Sweet potatoes are easy to grow, and can be raised on a variety of soils, the period of growth from planting to harvesting being approximately three months. The period of planting is dependent very largely on the locality; in most parts along the coast it may extend from October until the end of February. The crop must mature before the frost commences. The crop does not require a big rainfall—in fact, excessive moisture is detrimental to good results, in that it increases the growth of vines, and lessens the crops of tubers.

The most satisfactory method is to plant a few medium-sized tubers in a nursery bed of good friable soil, which is mulched in order to retain moisture and promote rapid growth, and to pick cuttings as growth progresses. A bed of fifty selected tubers planted in this way will provide many thousands of cuttings. The alternative, and less satisfactory, method of obtaining planting material is to procure cuttings from an old plot, which is usually neglected. The terminal cutting from the vine is generally regarded as giving the best results. The land is set up in ridges 3 feet apart. The cuttings should be 12 to 15 inches in

length, and planted on the ridge to a depth of approximately 6 inches, cuttings to be set from 20 to 24 inches apart. On well-prepared soil weeds should not be troublesome, and little attention will be necessary until harvesting.

A good crop of sweet potatoes will yield 20 tons of tubers to the acre. Several of the old varieties were known by different names in various districts. A classification of all varieties grown in Australia was carried out in recent years by an officer of the Department of Agriculture and Stock, and cuttings of a known type, together with a number of new seedling varieties, were distributed in different agricultural districts of the State. Some recommend varieties for planting for table use are Gold Coin, Seedling No. 3, Brook's Gem, and Snow Queen.

It is advantageous to the grower to market the tubers in a clean and attractive condition.

—W. Goodchild.

PLANTING OF GRASS CUTTINGS.

Grasses which are propagated commonly by means of stem cuttings, plantlets, or crown divisions, include Kikuyu grass, Para grass, couch grass, elephant grass, and Guinea grass. In special circumstances, the planting of vegetative material of the grasses mentioned may be carried out on rough country and on timbered land with some prospects of successful establishment; but, wherever possible, well-worked land should be provided.

Where stem cuttings are used, these should be cut with a knife, shears, or chaff-cutter into lengths, each containing at least two nodes or joints. If abundant material is available, it is advisable to allow several nodes to each cutting. The cuttings may be laid flat in shallow furrows and covered or placed vertically so that one or more nodes are buried and the remainder are above the surface. The soil should be well firmed about the cuttings. The cuttings shoot and root at the buried nodes and also form shoots at the other joints.

If plantlets or crown pieces are being planted, the best method is to set them out in holes in lines across the paddock. The holes are made with a hoe, the tool being used with its head at right angles to the line. When planting, the planter works along the line, places the plant against the hard far edge of the hole, fills up the hole, and compacts the soil with all his weight on his right foot, while putting in the next plant. To avoid setting the plants too deeply, the tuft should be held from above, but close to the crown, so that the knuckles of the hand are on top of the ground when the plant is being set.

—C. W. Winders.

SUDAN GRASS IN THE MARANOA.

Sudan grass is outstanding as a hay and grazing crop for the drier farming areas, as is indicated by its popularity on the Darling Downs and in the Maranoa district. Lack of harvesting machinery and implements, such as the reaper and binder, or mower and rake, on many stock farms, is often the retarding factor so far as the conservation of hay is concerned.

With the more extensive use of blue panic and Rhodes grass, the conservation of Sudan grass as hay and silage, and the more widespread utilisation of winter fodders, such as wheat and barley, it should be possible to carry on dairying in the drier country away from the coast right through the winter, even in the Maranoa. At present many dairy farmers in those regions dry the cows off during the autumn, and may not milk again until the spring.

In recommending Sudan grass as a grazing crop, the risk of fatalities as a result of hydrocyanic acid poisoning must be kept in mind. By taking reasonable precautions in feeding, many farmers have utilised Sudan grass in all stages of growth as a grazing crop without ill effects. An effort should be made to procure pure seed, free from admixture with sorghum or Johnson grass hybrids. Full information regarding the cultivation of Sudan grass can be obtained from the Department of Agriculture and Stock, Brisbane.

—H. W. Ball.

OVERHAUL OF HARVESTING MACHINERY.

Now is the time for a complete overhaul of the harvesting plant. Modern farm machinery is usually complicated, with many different yet inter-dependent working parts which require close attention, in order to ensure mechanical efficiency when it is brought into use in the field.

A breakdown at harvest time must be avoided as far as humanly possible. A detailed inspection of every part of the machinery before commencing operations is, therefore, essential. All loose bolts should be tightened, broken or worn parts replaced, bearing packed and adjusted where required, pulleys aligned, grease cups cleaned and filled, and belting overhauled and oiled. Castor oil is useful for making leather work pliable, besides being a good lubricant for a bearing tending to run hot.

There also should be on hand an assortment of bolts, nuts, spring washers, lubricating oils, and graphite—the latter for mixing with water and painting the sprockets, chain belts and cogs, for which it is far superior to oil.

—R. E. Soutter.

PROTECTING ROOFS OF FARM BUILDINGS.

The galvanized iron roofs of all buildings adjacent to the coast will rapidly deteriorate if not specially protected by painting. The usual preparation employed is iron oxide paint. Though this is effective, it cannot be claimed that it is very attractive in appearance after a year or two, while it is well known that the red colour is highly absorbent of the heat rays of the sun.

Recently it was necessary to treat the roofs of the Experiment Station buildings at Bundaberg, Mackay and Meringa, and it was decided to use as a finishing coat, a specially prepared aluminium paint. As an undercoating, to prevent the development of rust spots which had appeared on many of the roofs, a well-known rust-killing primer was first applied. This was followed by one coat of aluminium paint.

The finished job has proven to be entirely satisfactory, and the highly-reflecting silver surface of the roof ensures a minimum of temperature rise under the action of sunshine while the appearance is also attractive. We will be pleased to supply further particulars of preparations and costs on application either to our Station officers or to the Brisbane office.

—H. W. K., in The Cane Growers' Quarterly Bulletin for July.

FIJI AND DOWNY MILDEW DISEASES.

Cane planted in the Southern districts in January and February of this year will be showing the symptoms of Fiji and downy mildew diseases where cuttings infected with these diseases have been planted. Although farmers may not be able to recognise either disease with absolute certainty they will be able to see that there is *something* wrong with the stunted stools of Fiji disease or the yellowish stools of downy mildew. If any doubt exists a letter or a telephone message to the nearest Experiment Station will bring an inspector.

Neither Fiji disease nor downy mildew spreads to any appreciable extent at this time of the year. Both these diseases seriously menace P.O.J. 2878 in Southern Queensland and farmers are most strongly urged to go through their young cane *now*, make row inspections and dig out any diseased cane. Only by such attention can P.O.J. 2878 be retained.

In the Mackay district downy mildew, if present, should be commencing to show up in autumn-planted cane. Inspections and digging out of diseased stools should be started now and continued at intervals during the dry spring months.

—A. F. B., in The Cane Growers' Quarterly Bulletin for July.

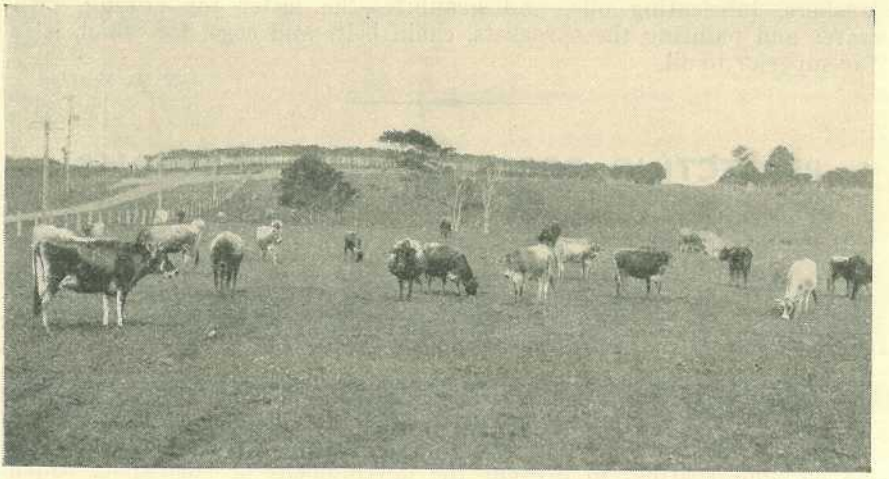


Plate 117.
Some of the Wootha Jersey herd, Maleny, South Queensland.

Plate 118.

Australian-made Auto-Header, 12-feet cut, and nine Standard Headers of 8 by 10-feet cut, working in a 10-bushel crop of wheat at Pittsworth, Darling Downs, Queensland.

What is Pasteurisation?

ALTHOUGH the term pasteurisation is very commonly used nowadays, there, perhaps, are many who do not know its origin and meaning. Actually it dates back to 1860-1864 when Louis Pasteur, the famous French scientist, conducted experiments on "diseases" in wine and beer, and found that heating for a short period at a temperature of 140 deg. F. was sufficient to prevent abnormal fermentations and the souring of these beverages. This process of heating liquids to check the growth of undesirable microbes was extended to other industries, and was given the name pasteurisation in honor of Pasteur, who had first employed it.

To-day it is best known through its application to the dairying industry. The pasteurisation of milk simply means that the milk is heated to a temperature of 145 deg. F. for thirty minutes and then cooled as quickly as possible to 50 deg. F. or lower. Cream in the butter factories is heated to 185 deg. F. for a few seconds, and then cooled rapidly to 40 deg. F.

Pasteurisation aims, firstly, at making milk and milk products safe, by destroying any disease germs that may be present; and secondly, at improving the keeping quality of butter and cheese made from milk and cream so treated. It, however, has its limitations. It cannot perform miracles, such as improving the grade of cream from second to choice, or eliminating strong weed taints. Most dairy farmers are now aware of this and know that the production of choice quality cream depends on the care and attention given at the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

—O. St. J. Kent.

A COMMON CREAM TAINT.

On of the more common defects in cream is that which is referred to as "disinfectant flavour."

The cause of this taint, in most cases, is carelessness in the handling of disinfectants before and during milking. The use of dilute solutions of some disinfectants—other than Condy's fluid—for bathing cows' udders and teats before milking also can give a taint to the milk. The cleansing of milking machines and utensils with disinfectants possessing strong odours, is another cause of this taint, which is imparted to the cream, either by absorption of the vapours or direct contact. No amount of aeration or stirring will remove the taint from the milk or cream. For this reason, disinfectant-tainted cream cannot be used with safety, even in the manufacture of pastry butter; consequently, it is rejected at the butter factory as being unfit for human consumption.

To avoid the risk of taint, the following suggestions are offered:—

1. Don't use disinfectants with marked odours.
2. Sore teats should be treated with petroleum jelly or some odourless ointment.
3. Use a solution of washing soda—from 3 to five per cent., say—for cleansing dairy utensils. It removes grease readily and corrects acidity.

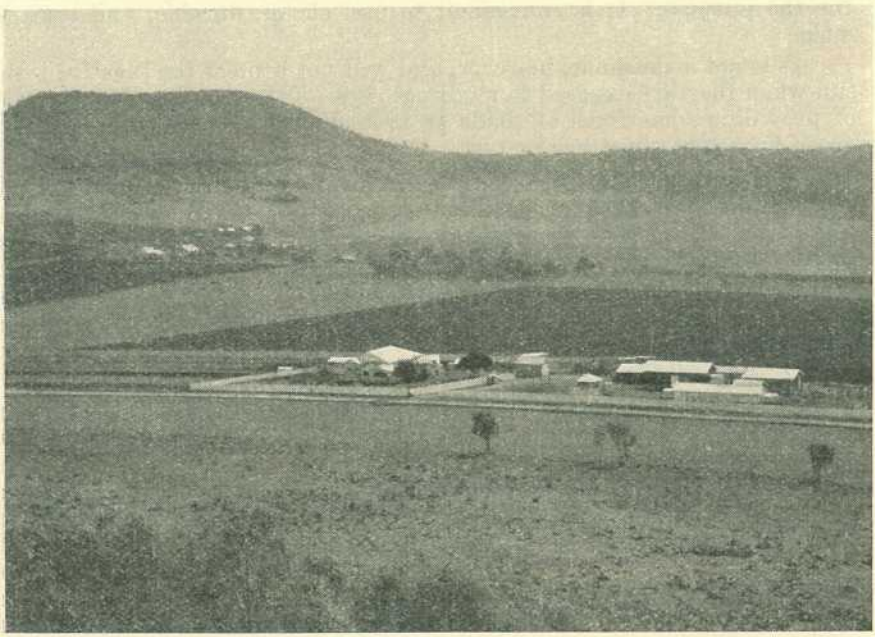


Plate 119.

GLENROY FARM.—Typical Darling Downs country at Glencoe, the property of Mr. W. F. Kajewski.

How to make a Pig Net.

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

WHEN transporting pigs in an open wagon or truck, a net or cover is required. The net illustrated is the type usually recommended for the purpose. It is convenient to use, cheap, durable, and easy to make.

It is not a sunshade, however, and will not protect the pigs from the sun when they are exposed to its direct rays. This suggests the necessity of providing some form of shade or protection, even if it is only a few green bushes or a wet bag or two.

The method of making a pig-net is simple. The materials required are rope and a length of softwood or hardwood board rounded at the edges and 12 to 18 in. long and of the same width at both ends. This piece of board is referred to by net makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 in. wide will make a 4-in. mesh; a 3-in. stick a 6-in. mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-in. mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of timber, but in the case of a pig-net the rope had better first be rolled up in the same way as the ordinary rope clothes-line or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

In setting out to make the net, first tie a loop in one end of the rope as in A, Fig. 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Fig. 2. Now

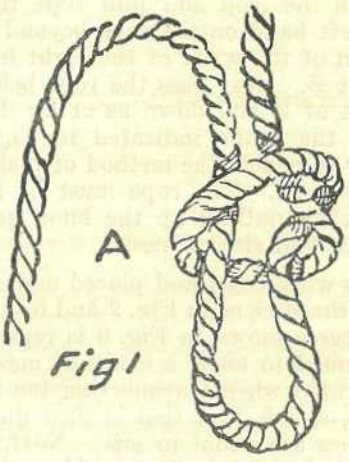


Fig 1

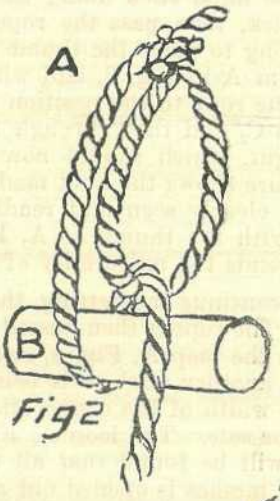


Fig 2

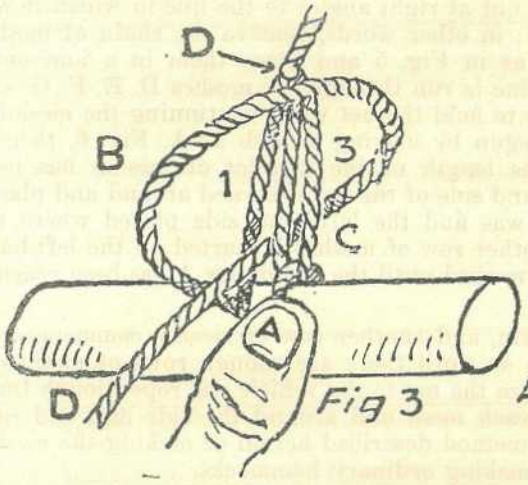


Fig 3

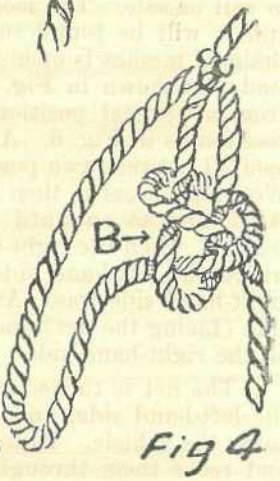


Fig 4

Fig 5

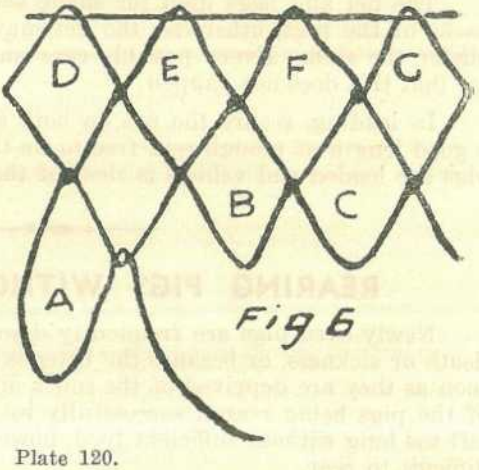


Fig 6

Plate 120.

place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Fig. 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Fig. 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Fig. 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

To continue the netting, the stick is withdrawn and placed under A, Fig. 4. The rope is then passed around the stick as in Fig. 2 and brought through the loop A, Fig. 4, and the process shown in Fig. 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figs. 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next, the chain of meshes is opened out at right angles to the line in which it was made, as shown in Fig. 6; in other words, remove the chain of meshes from a vertical position as in Fig. 5 and place them in a horizontal position as in Fig. 6. A line is run through the meshes D. E. F. G. and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Fig. 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right-hand side of the net is turned around and placed where the left-hand side was and the left-hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

The net and bags used for shade should be at least 1 ft. above the backs of the pigs, otherwise the net may rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen.

In loading, secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is clear of the loading race.

REARING PIGS WITHOUT THE SOW.

Newly-born pigs are frequently deprived of the sow's care through death or sickness, or because the litter is too large. If taken in hand as soon as they are deprived of the sow's milk, there is a very good chance of the pigs being reared successfully by artificial feeding. If they are left too long without sufficient food, however, they become weakened and difficult to rear.

Sometimes a large litter is divided into two lots, and each lot is put with the sow separately for a drink at frequent regular intervals. Although this entails a lot of attention, it gives satisfactory results. Foster mothers are sometimes available, and a sow with a small litter may be given some pigs from another sow, provided they are about the same age as her own.

When hand feeding is resorted to, the pigs should be given a warm, dry camping place, and have access to clean pasture. A movable shed in the run is very convenient. In the absence of the sow's milk, which helps to build up a natural resistance to disease, every possible precaution should be taken to prevent infection in the young pigs. A clean and comfortable pen should be a first consideration. Access to pasture assures a supply of vitamins and minerals, which are essential to a complete diet.

A method of feeding which has given very good results with pigs taken from the sow when a day or two old is as follows:—Start the pigs on whole cow's milk fed warm and as fresh as possible, six times daily. After three weeks the whole milk may be gradually replaced by separated milk, and the six feeds daily may be gradually reduced to three feeds daily. When the change from whole to separated milk is being made, a trough of a dry meal containing 90 per cent. of pollard, bran, maize-meal or wheatmeal, and about 10 per cent. of meatmeal should be kept in the pen with food always available to the pigs. This trough must be sheltered and kept dry. A constant supply of drinking water should also be kept before the pigs when they are given the dry food.

In teaching the young pigs to drink, the bottle and teat are neither necessary nor desirable—a shallow dish serves the purpose well. The warm milk should be placed in the dish about ½ inch deep and the pigs taken one at a time and stood in the dish. Then, if the pig is held firmly over the top of the neck, its head can be placed down into the milk, and held there long enough for it to get a taste of milk, but not long enough to allow it to inhale the milk. This operation may be repeated a few times at each feeding. After two or three such lessons the piglets will usually drink readily without assistance and afterwards will give little trouble.

When the piglets are drinking well, the dish may be replaced by a shallow trough. Both the dish and the trough used for holding the milk should be made of metal or earthenware and free of cracks so that they can be cleansed and scalded after each meal. This is most important for the prevention of digestive disorders.

—L. A. Downey.

LONGER AND LEANER PIGS REQUIRED.

The most important single attribute of a good bacon pig, provided, of course, the pig is in suitable condition and is very fleshy, is length of body. Measurements have shown that at about 120 lb. dressed weight long-bodied pigs possess as thick, if not thicker, streaks of lean meat than short pigs. Lengthy pigs tend to have that leanness throughout which now is in such great demand. Long-bodied pigs have, generally, lighter shoulders than short pigs at the same weight. Undue length, of course, has disadvantages, but not as many as undue shortness, because the

shorter pig always has a tendency to become overfat, while the longer pig carries more lean meat.

The framework of the pig tends to become coarser, and the hams not so fully developed, if the pig is kept growing. There is a tendency also for the flesh to be not so well proportioned throughout the thicker portions of the carcase.

It is false economy to hold pigs until they become overfat.

—*E. J. Shelton.*

Plate 121.

Cascades in the National Park, Lamington Plateau, South Queensland.

The Brown Vegetable Weevil.

DURING the months of July, August, and September mainly, the plants in market and home gardens are liable to attack by a small insect known as the brown vegetable weevil. The plants principally affected are the vegetables, including beetroot, carrot, lettuce, mint, potato, radish, tomato, turnips, and watercress; tobacco seedlings and cineraria have also been recorded as hosts, and among the weeds the insect feeds mainly on the cape weed. Both the larval, or grub stage, and also the adult weevil feed on the plant tissue, while the pupal stage occurs in the soil. The larva, when full grown, is pale green in colour with a brown head, soft bodied, and about half an inch in length. The adult is a small weevil about one-third of an inch long, brownish in colour, usually with a pale, oblique stripe on each wing cover, forming a wide V-shaped mark on the back. The head is produced into a trunk or snout, typical of the weevils.

The adults feed mainly by night, sheltering in the soil during the day, but the grub stage usually remains on the foliage, either on the under-side of the leaves or sheltered at the leaf bases. The insects injure plants such as potato, tomato, tobacco, and lettuce by chewing holes into the leaves, and in cases of extreme infestation cause complete defoliation. On the tuberous root crops, such as carrots, turnips, and radishes, as well as the ordinary foliage injury, the insects feed on the young centre growth, and also burrow into the tops of the fleshy roots. Where infestation is heavy the tuberous roots may be riddled.

Control of the insect on crops such as potatoes may be obtained by the use of arsenate of lead, applied either as a spray or as a dust. Similarly, young tuberous crops may be so treated *in the early stages.* In the later stages of development in tuberous crops, and at any stage in the growth of plants such as lettuce, arsenate of lead cannot be used with safety because of the danger of poisonous residues accumulating on the plant. A general practice in these cases is to apply a bait, the attractant

being the cut tops of plants such as tomatoes, that have passed the productive stage, or cape weed. This plant tissue may be dipped in an arsenate of lead solution or dusted with arsenate of lead powder, and it is then distributed among the plants to be protected. Preferably, the cut tops should be partly buried at intervals beween the crop rows, the distribution taking place in the late afternoon.

Because of the good rains during recent months, weeds are extremely plentiful in a number of infested crops. Some of these weeds are themselves infested, and others provide excellent cover for the pest. Chipping may, therefore, drive both larvæ and adults on to the cultivated host and may, unless precautions are taken, accentuate the position. When weeds are prevalent, they should, therefore, be sprayed or dusted with arsenate of lead a week or so prior to chipping, if the application of this insecticide may be made without contaminating the edible crop. Many of the insects will then be destroyed and chipping can be carried out with reasonable safety.

Thorough ploughing before planting a crop and, also, subsequent to its removal, should destroy a considerable number of the pupæ in the ground and reduce the amount of carry-over from season to season.

—*J. A. Weddell.*

MITE INJURY OF TOMATOES.

With the approach of the warmer spring months, tomato-growers in Central Queensland will need to take precautions against injury caused by the tomato mite.

The mite is minute, creamy white to greyish in colour, and invisible to the naked eye. Its presence, therefore, is not detected until the first symptoms of injury appear. Normally the field crop does not show obvious symptoms until in bearing, but seedbeds and newly planted out seedlings may carry heavy populations of the pest. The mites breed rapidly, particularly if a wet period is followed by warm weather.

Mite injury to tomato plants is frequently wrongly attributed to unfavourable soil for climatic conditions. The injury, however, is quite characteristic and is first seen at the base of the plant. The lower leaves curl slightly, acquire a bronze colour, wither and die. The stem loses the surface hairs, becomes smooth and smoky in appearance, and may show superficial cracks. Because of the stem discolouration, mite injury is often known as "smoky stem." The mites gradually spread along the vines towards fresh growth, discolouring the stem and destroying the foliage until, ultimately, only small bunches of new growth remain at the tips. Heavy blossom loss is common and the setting of the fruit is seriously curtailed. In Central Queensland, stem and foliage injuries are most important, but occasionally, in very heavy infestations, fruit may be damaged. Attacked fruit loses its lustre and then develops a pronounced darkening and cracking of the skin, which produce an unsightly though usually edible fruit.

Smaller fruits, a shortened picking period, and greater susceptibility of the fruit and stem to sunburning are some obvious results of mite attacks.

The wild gooseberry, the cape gooseberry, and other allied plants commonly found in tomato areas of Central Queensland carry a mite similar in habits and appearance to that on the tomato plant. Mites on these weeds very probably spread to the tomato plant, and clean cultivation throughout the season on the headlands and within the field is therefore desirable.

Sulphur dust and sulphur compounds are very satisfactory for the control of the tomato mite.

Proprietary dusting sulphurs, flowers of sulphur, or ground sulphur can be used at the rate of 4 lb. to 14 lb. per acre, depending on the age and size of the treated plants. The addition of an equal quantity of fine hydrated lime or kaolin to the flowers of sulphur or ground sulphur gives a free running dust which is more easily applied than sulphur alone.

Lime sulphur, one in 80 to 120, gives excellent control, the weaker dilution being used in warm weather. Several proprietary brands of wettable sulphurs are also satisfactory.

A thorough spraying with lime sulphur checks mite infestation more quickly than the sulphur dusting, but the effect of the latter treatment persists for a longer period.

Tomatoes should be treated from the seedling stage onwards, the interval between applications depending on the weather. In the warmer months treatments may be necessary every fortnight, but in the winter once in six weeks may be sufficient.

In the warm coastal areas, the successful culture of tomatoes without the use of mite control measures is frequently impossible. The loss of the foliage cover is such that plants wilted by the tomato mite seldom regain their normal vigour. Consistent attention to the control of the tomato mite will result in better yields, larger and more attractive fruit, and a marked extension in the bearing period of the crop.

—W. J. S. Sloan.

CUCUMBER GROWING.

The warmth of the climate makes this crop a very suitable one for Queensland. In the coastal and northern districts several crops can be grown during the season.

Planting is carried out usually in the southern coastal districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet on "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply in addition to the following artificial fertilizer:—

1½ cwt. sulphate of ammona or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixture fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was sown always on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about one inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly full grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes, Imperial White Spine; for pickling, Early Green Cluster.

—*C. N. Morgan.*

PREPARING FOR AND PLANTING CITRUS TREES.

The selection of the orchard site is of great importance. Citrus trees thrive in a frost-free, well-sheltered, warm situation. In districts where the prevailing winds are likely to interfere with the normal tree growth, belts of standing timber or scrub should be retained as a protection to the orchard. In inland areas, where timber is scarce, shelter belts should be planted.

The site should be an area of unbroken, nearly level or gently sloping land. Steep hillsides should be avoided, for, in addition to the risk of irreparable losses by soil erosion, the costs of general orchard practice are high. Most places along the coast are free from damaging frosts. In the Burnett district, however, low temperatures have occurred on occasions, causing injury to young citrus trees. In such districts, hollows and low areas, where frosts are likely to be experienced, should be avoided as sites for citrus orchards.

The first essential in planting an orchard is to plough the land thoroughly and subsoil it, always, however, taking care that the subsoil is not brought to the surface. This can be done by ploughing a furrow in the usual way, followed by a subsoiler to loosen up the bottom of the furrow before the next sod is turned. Ploughing should be followed by harrowing, working-down, and grading.

Citrus trees require plenty of room for growth and cultivation. The mistake of close planting has generally been a common one. In the drier areas, where the application of water can be controlled, plantings should be made at least 30 feet apart. This distance, of course, can be varied according to soil and climatic conditions, but it should never be less than 25 feet.

To ensure the young trees being placed exactly in the position occupied by their place pegs, a planting board will be found useful and is easily constructed. A board some 4 or 5 feet in length, 4 or 5

inches in width, and 1 inch thick, is used, and a "V" notch is cut in the middle of one side and of each end. The centre notch is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at either end of the board. The board and the tree peg are then removed, leaving the latter two pegs in place.

The hole to receive the tree is next dug, the board being again brought into use, and fixed, as before, at the ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre notch in the board, taking the position formerly occupied by the tree peg, and the soil filled in.

The planting board serves another purpose in that it ensures the planting of the tree at the proper depth—the depth at which it was grown in the nursery. The mark can usually be distinguished on the tree.

The union of the stock and scion is usually a weak spot in a tree and liable to attack from fungus diseases; it should, therefore, be kept above the level of the soil. When using the planting board, the union should be kept slightly above the top of the board to ensure that the tree is not planted too deeply.

In digging the holes for the trees, the surface soil should be taken out and kept on one side. The subsoil at the bottom of the hole should be finely broken up. If the land has been properly prepared, there will be no need to dig deep holes. So long as they are large enough to space the roots without cramping they will serve the purpose. A little top soil may be returned to form a small mound at the bottom of the hole.

The roots, which should be carefully washed and trimmed, should be spaced as evenly as possible, and with a downward and outward slope of from 40 to 45 degrees. The spaces should then be filled with fine soil and pressed firmly, water being applied and allowed to soak in before the hole is completely refilled with soil. Where there is danger of sunscald the trees should be protected by cylinders of paper placed around the trunks.

—R. L. Prest.

ROSELLAS.

The selection of a sound, fertile seed is the most important point in rosella growing. Seeds grown in this State are generally of good quality, because of the long maturing season due to absence of frost.

Any moderately good soil will grow rosellas well, but if the crop is to be grown on a large scale, a soil with a clay subsoil close to the surface should be avoided.

The seeds are usually planted out in a seed bed in spring, and the plants, when 6 inches high, set out in rows about 6 feet apart. If the grower is not disposed to start his seeds from beds, the seed may be planted where the bushes are to remain.

Thorough cultivation is essential and weeds should be kept in check, as they affect seriously the growth of the plants.

When the fruit is mature, it is advisable to lose no time in picking it, as the fruit stalk has a tendency to toughen, thereby making gathering a slower task than it should be.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions during August showed improvement on those prevailing earlier, as the fruit was keeping much better, giving buyers more confidence in paying higher prices. Good quality oranges are now selling at firm payable values, but small or skin-marked lines are very hard to sell. Mandarins of quality return as high as 15s. per case, but small lines are almost unsaleable.

Pineapples have eased in price on all markets. Complaints of green and black-heart fruit are still received from the South. Papaws are also being sent to Southern markets in too green a condition, to the detriment of the market. It is unfortunate that this warning has to be continually repeated.

Custard apples are now scarce and will soon be off the market. First consignments of mangoes will be displayed in the near future, and again the warning is sounded against sending green consignments; green, immature fruit, while, perhaps selling at its first appearance on the market, is usually the cause of following consignments failing to gain favour.

The following were the ruling market prices during the last week of August, 1938:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 4s. 6d. to 5s. 6d.; sixes, 5s. to 12s; sevens, 7s. 6d. to 15s. 6d.; eights, 12s. to 16s.; nines, 14s. to 16s. 6d.

Sydney.—Sixes, 10s. to 14s.; sevens, 13s. to 16s.; eights, 16s. to 19s.; nines, 16s. to 19s.

Melbourne.—Sixes, 10s. to 12s.; sevens, 12s. to 15s.; eights, 14s to 17s.; nines, 14s. to 17s.

Lady's Finger, 1½d. to 7d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 3s. to 5s. 6d. per case, 4s. to 6s. per dozen; Ripley, 3s. to 4s. 6d. per case, 3d. to 2s. 6d. per dozen.

Sydney.—Smoothleaf, 6s. to 9s. per case. Old stocks and poor lines from 4s. and hard of sale.

Melbourne.—Smoothleaf, 7s. to 8s. per case.

Southern buyers have complained of black heart in some lines. Green fruit is still being sent in and is hard to sell.

Papaws.

Brisbane.—Yarwun, 3s. to 7s. tropical case; Gunalda, 3s. to 4s. 6d. bushel case; Locals, 1s. 6d. to 3s. bushel case.

Sydney.—2s. to 10s. The wide discrepancy in prices speaks for itself. Green lines will not sell, and reduce all values.

Melbourne.—8s. to 12s. Too many lines of green fruit have forced values to ease.

Custard Apples.

Brisbane.—2s. 6d. to 5s. per half-bushel.

The season is now drawing to a close and good lines of fruit are scarce.

Monstera Deliciosa.

4s. to 6s. per dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—4s. to 5s. per case; choice grades to 7s.; small sizes 3s. per bushel.

Mandarins.

Brisbane.—Gayndah Ellendales, 9s. to 15s. per case; Glens, 6s. to 13s.; Emperors, 6s. to 9s.; Scarlets, 4s. to 9s.

Small sizes practically unsaleable.

Grapefruit.

Brisbane.—Locals, 4s. to 8s. per bushel; Southern Marsh, 7s. per bushel.

Lemons.

Brisbane.—Gayndah, 6s. to 9s.; specials higher; Locals, 3s. to 6s.

DECIDUOUS FRUITS.

Apples (Southern).

Brisbane.—Jonathan, 7s. 6d. to 12s.; Granny Smith, 8s. to 14s.; Delicious, 9s. to 11s.; Cleopatra, 7s. to 11s.; Sturmer, 5s. to 8s. 6d.; Rome Beauty, 8s. to 10s.; French Crab, 7s. to 8s.

Shrivelled and specky lines hard of sale.

Pears (Southern).

Brisbane.—Winter Cole, 10s. to 14s.; Josephine, 7s. to 13s; Beurre Bose, 6s. to 8s. 6d.; Winter Nelis, 6s. to 11s.

Strawberries.

Brisbane.—4s. to 6s. per dozen boxes; Specials to 8s. per dozen boxes.

Sydney.—Trays, 2s. to 4s. 6d; boxes, 5s. to 10s. per dozen.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 2s. to 4s.; green, 2s. to 4s.; choice coloured, 4s. to 5s. Poor quality fruit unsaleable.

Passion Fruit.

Brisbane.—8s. to 9s. half-bushel; Specials to 11s.

Cape Gooseberries.

5d. to 6d. per lb.

MISCELLANEOUS, VEGETABLES, &c.

Cucumbers.—8s. to 9s. per case.

Pumpkins.—5s. to 7s. per bag.

Marrows.—1s. 6d. to 4s. per dozen.

Lettuce.—6d. to 2s. dozen.

Cabbage.—1s. 6d. to 3s. dozen.

Cauliflowers.—Small, 1s. to 4s.; large to 11s. dozen.

Beans.—14s. to 18s. sugar bag; poorer lines lower. **Melbourne** prices 6d. to 9d. lb.

Peas.—6s. to 8s. per sugar bag; special higher.

Beetroot.—4d. to 9d. bundle.

Chokos.—6d. to 1s. 6d. dozen.

Carrots.—3d. to 1s. bundle.

CLEAN CROPS.

With the coming of the warmer weather, all kinds of weeds will be making their appearance on cultivated land and among row crops. Where practicable, inter-row cultivation and chipping are effective methods of weed control.

Crops on land that has been fallowed thoroughly show a greater freedom from weed infestation than crops in adjacent paddocks which have been prepared hurriedly and incompletely. Where sheep are kept weeds can be controlled very inexpensively, for the flock will keep the fallowed field and headlands free from infestation.

The sowing of clean seed on clean land will be well repaid in the resultant clean crop and the higher price obtained for it. Therefore, wherever possible, field work should be so planned that weeds are never allowed to grow to the seedling stage.

An Experiment in Soaking of Cane Plants.*

N. J. KING.

THE subject of plant soaking prior to planting has received considerable attention at different times and in various sugar countries of the world. Experiments have been carried out with the soaking of plants for periods from twelve to forty-eight hours in water and in solutions of lime, magnesium sulphate, and other compounds. Results have not always been conclusive, and frequently they have been almost contradictory. But when one considers the variety of conditions obtaining in sugar countries on opposite sides of the globe, some inconsistencies are to be expected. Factors which may have effect on the results of plant soaking would include (1) age of cane plants, (2) succulence of the plants, (3) moisture content of the soil, (4) state of advancement of buds, and (5) possibly the cane variety.

Plate 122.

Showing effect of soaking plants under conditions of perfect soil moisture. Rows on left of photograph planted with soaked plants, on right unsoaked plants.

For years it has been the general practice on the Bundaberg Experiment Station to soak cane plants. Soils are usually dry for spring planting, and frequently so for autumn planting. In many cases the plants also are lacking in succulence at this time of the year, and it was inferred that the soaking and absorption of water would enable the plant to germinate more quickly.

During the spring of 1937 we received at the Bundaberg Experiment Station 109 points of rain on 27th August. We were just ready to plant and were forced to delay operations until the 30th

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

August, as the land was too wet for the drill plough. The plants were just eleven months old irrigated cane, full of growth, and very succulent. Under these conditions of optimum soil moisture and young soft plants one might not consider that any advantage would accrue from soaking in water. However, the plants for the first day's planting were soaked from 5 p.m. to 8 a.m., taken to the field and planted in the moist soil. For the next day's planting on the same block, the plants came from the same source but were not soaked. In this case the plants were just bagged and stacked overnight. The accompanying photograph shows the difference in germination a month after planting. The cane on the left of the photograph is from soaked plants, while that on the right is from unsoaked plants.

Whether such a remarkable difference would result under all conditions in Bundaberg is doubtful, but it would appear that at least some improvement could be expected.

The unsoaked section did germinate ultimately and gave just as good a strike as the soaked section, but the advantage is that the soaked section got away to an early start and retained its lead.

A word of warning should be issued in respect of soaking cane plants when planting susceptible varieties in localities where gumming and/or leaf-scald are present; under such conditions the soaking of plants could serve to spread the disease, and the practice is to be discouraged.

SEASONS AND COSTS.

The present sugar situation reminds us again—if a reminder *is* needed—of the great difference between farming and other industries. The manufacturer, for instance, can make an accurate estimate of the raw materials he requires to keep his business going and can calculate to a fraction the cost of production.

The farmer can certainly make his estimates, but with all the skill and will in the world there can be no certainty about them. Nature is bountiful, but sometimes capricious, as she has been during the past winter. The farmer has to make allowances for the unexpected, and this margin of safety applies all round in agricultural production and adds to the cost.

The moral of this is that, in providing a stable economic foundation for the farming industry, we must take seasonal risks as well as real costs into consideration.

FALSE ECONOMY.

The other day I ordered some cement to do some repairs around the yard. The cement was delivered in paper bags, and so one small problem was solved—I hadn't to worry about the return or the saving of the bags. A friend of mine—a farmer—has a pet economy that, you'll agree, is not peculiar to himself alone. Whenever he gets a parcel he carefully undoes every knot in the string with which it is tied, winds it up, and puts it carefully aside for future use. He laughs at his own little weakness and admits that if he gave as much time to keeping his gates in order or knocking a few nails in where they are required he would save far more than a few pence worth of string and, in comparison, earn as many pounds.

This false economy is a common disease which we all have in some form or another. How often every one of us in effecting tiddly-winking economies have neglected the worth-while jobs that mean real money to us in the long run!—"Blythe," in *The Farmer and Stockbreeder* (England).

A Green Manure Crop.*

N. J. KING.

DURING November, 1931, seeds of several green manure crops were received in small quantities from the Council for Scientific and Industrial Research, and were planted out on the Bundaberg Experiment Station. From these only one, *Crotolaria goreensis*, has survived several trials, and is considered to be of sufficient value to justify a short note on its performance. The several varieties were planted here on 2nd December, 1931, and it says much for the hardiness of *C. goreensis* that it was the only one to withstand the drought which began in January, 1932. During these severe drought conditions the rainfalls at the Station were—January, 1·62 in.; February, 0·27 in.; March, 0·10 in.; April, 1·75 in.

Seed was collected from the crop and was replanted in the spring of 1932 and again seed was collected. Since that time several sowings have been made on a small scale and seed has been supplied to the Queensland Acclimatisation Society and for distribution to the pine-apple growers of coastal South Queensland for use as an inter-row crop for humus production.

C. goreensis is a small-leafed, upright, branching plant. It does not lie down or run along the ground and does not possess runners similar to the cowpeas and Mauritius beans. It appears to be a hot weather grower, not developing much growth before late November in Bundaberg and making most prolific growth from December to March. It is definitely a long fallow cover crop. Planted in spring it will not flower before April, and mature seed is not obtained from the plant prior to late April or early May. On account of its upright habit it is easy to plough in, no vines being present to impede the work of the plough. The seed is flat and kidney shaped and about one-eighth of an inch in length. The crop will seed very prolifically if allowed to do so. The small size of the seed allows of an acre being planted thickly with 10 lb. of seed. Germination is sometimes irregular, possibly due to the picking or sowing of immature seed.

The advantage of such a crop over Poona pea is that where land is being prepared for spring planting the *C. goreensis* provides a much longer cover crop without danger of seeding and consequent volunteer plants in the cultivation. Poona pea must be ploughed in in January to avoid seeding and volunteer crops. *C. goreensis* can be left to take full advantage of the wet season, produce a much larger crop thereby, and then be ploughed in during April when soil conditions are usually sufficiently dry to enable uninterrupted ploughing to be carried out.

Insofar as North Queensland is concerned Poona pea is not an ideal green crop. The ploughing-in period is the wet season, and if rains prevent this the crop may seed and produce troublesome volunteers in the subsequent cane crop. Since a long fallow crop would be a definite advantage in those areas some small plantings of *C. goreensis* are being made to test its suitability to North Queensland conditions.

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

As regards mass of foliage the crop is quite satisfactory. The crop illustrated was 7 ft. 6 in. high in May, 1938, just at time of flowering. It was desired to collect seed from this crop, so it was allowed to stand. In June a section 10 ft. x 10 ft. was cut out and weighed, and the weight calculated at 15·8 tons per acre. By this time, however, much of the leaf had fallen owing to seeding and the stems had become woody and lighter than in the younger stage.

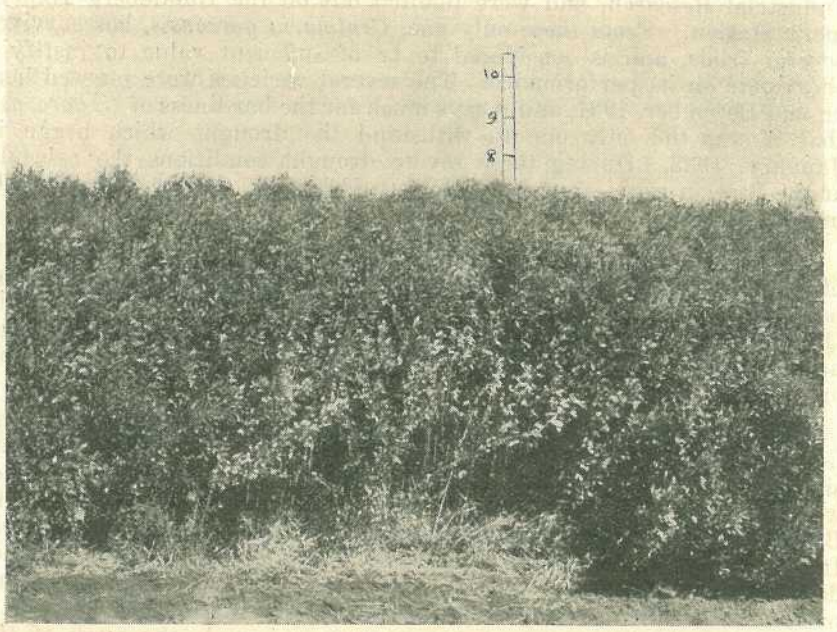


Plate 123.

A crop of *Crotolaria goreensis*, 7 ft. 6 in. high, growing on the Bundaberg Experiment Station.

The nitrogen content of the plant was 2·18 per cent. on the dry material. Estimating the moisture content of the plant at 75 per cent. this crop would return to the soil nitrogen equivalent to 905 lb. of sulphate of ammonia per acre.

Some of the crotolarias have been reported as being poisonous to stock. There is no evidence that this variety is in any way harmful.

The Cane Beetle Borer.*

J. H. BUZACOTT.

DURING the past year further work has been carried out with regard to the control of the cane beetle borer.

A number of trashing trials were established in different localities and observations were made on the effect of artificial trashing of cane on weight, c.c.s., rind-hardness, and borer population. In each trial there was included untrashed cane, cane trashed twice, and cane trashed three times. Trashing was carried out at 2-monthly intervals and was done carefully; this proved costly, but as the experiment was made in order to determine as accurately as possible whether any advantage could be obtained from trashing, it was deemed advisable, at least in these preliminary tests, to make trashing thorough, regardless of cost.

The first trashing was made when stools showed about a foot of cane, and in view of the fact that, at least in the cane trashed three times, there was no accumulation of trash at any time around the stalks, it is not thought that trashing, when carried out on a commercial scale, could yield results equal to these experimental plots.

An increase in weight of trashed cane over untrashed cane was registered in two out of a total of six plots, and no significant difference was recorded for the other four. The two plots in which the increase occurred were both plant cane in which borers were plentiful, and it is believed that the increase in weight was mainly due to the smaller number of borers (and so less borer damage) in the trashed cane.

In all cases there was a smaller borer population in trashed cane than in untrashed. This difference was very marked, and in one of the badly-infested plant cane plots the figures were as follows:—

Untrashed	132,000 borers per acre.
Twice trashed	27,000 borers per acre.
Thrice trashed	12,000 borers per acre.

No significant difference in c.c.s. occurred except in one plot; this was somewhat unexpected, as it was thought that the greater borer damage in untrashed cane would have been responsible for a lowering of the c.c.s. However, it is possible that there would have been a much greater difference in c.c.s. had the plots been harvested later in the season; as it happened, both plots with high borer infestation were harvested early in the year and apparently at that time much deterioration of the cane had not occurred.

Previously, it had generally been supposed that trashing caused a reduction in borer damage by virtue of the fact that exposure to light and the weather caused the cane rind to harden. When rind-hardness tests were made on cane from the various treatments it was therefore

* Paper contributed at a Conference of Cane Pests Destruction Boards, held at Meringa, 25th May, 1938.

somewhat surprising to find that the hardness was unaffected by the removal of trash. This leads one to the assumption that the trash in itself must be the important factor in the infestation of the untrashed cane. Presumably it affords cover for the beetles and possibly also assists them in the act of oviposition.

This experimental work, in general, seems to indicate that where intense borer populations exist some relief may be expected by trashing the cane. It has yet to be proved, however, that trashing the cut but a short time before harvest, as has been the usual practice, will afford much benefit.

A number of varietal trials to determine the comparative resistance of several varieties to borers were carried out during the season. These trials further indicated that Q.2 is highly resistant to borers and emphasised the susceptibility of Badila. The variety Q.10 also showed fair resistance and seems worthy of a trial in borer-affected areas provided that its other tests prove satisfactory. Still further tests with new varieties are in progress now, and the results from these will be obtained during the coming crushing season.

Considerable progress has been made in testing the rind-hardness of varieties, and it is confidently expected that the use of this reading in conjunction with observations on certain habits of the varieties will enable us to forecast the reaction of them to borers and thereby enable us to eliminate many of the trials which take so long to produce results. In the meantime it is necessary to continue with the trials in order to obtain a basis for the correlation of rind-hardness and other factors with the known reaction towards borers.

PREPARED POULTRY FOODS.

The domestic fowl appears to have no sense of smell and but little of taste. The senses of sight and touch, however, are very keenly developed, so that it becomes important to prepare poultry foods in an attractive form. The fowl relies largely on past experience in accepting food, and for that reason feeding problems must be always a subject of close study.

Excessively fine, dusty foods—e.g., some biscuit meals—should never be fed without some preliminary treatment. They tend to cause clogging in the mouth, and fine particles lodged in the respiratory tract are a source of irritation. There also is the additional danger of distended crops. Such dry foods should be incorporated carefully in a mash and, if necessary, moistened.

A food which is flaky but not brittle is well taken by fowls—hence the popularity of bran in mashes. Hard grains should be crushed or ground coarsely.

Soaking is an alternative method of helping the gizzard to cope with hard foods.

Predigested, fermented, or malted foods are actually lower in nutritive value than the material from which they are derived, and, in normal circumstances should not be purchased.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of July, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard 350 lb.).				
Alfa Vale Gem 4th (365 days)	W. H. Thompson, Manumbar road, Nanango	21,325·25	884·217	Reward of Fairfield
Daisy 22nd of Sunnyside	P. Moore, Wooroolin	10,895·65	405·765	Patrol of Cosey Camp
Junior, 3 Years (Standard 270 lb.).				
Trevor Hill Larkspur 2nd	G. Gwynne, Umbiram	8,466·47	386·403	North Glen Emblem
Senior, 2 Years (Standard 250 lb.).				
Alfa Vale Nellie 6th	W. Hinrichsen, Ardilea, Clifton	8,039·5	324·164	Reward of Fairfield
Junior, 2 Years.				
Rosenthal Roseleaf 17th	M. C. and A. M. Sullivan, Pittsworth	11,217·98	469·624	Rosenthal Carbine
Trevor Hill Satin (255 days)	G. Gwynne, Umbiram	6,627·96	281·411	North Glen Emblem
Navillus Charm 3rd	Con. O'Sullivan, Navillus, Ascot	6,548·8	237·656	Alfa Vale Re Nell
JERSEY.				
Mature Cow (Standard 350 lb.).				
Condong Seashore	J. Sigley, Millaa Millaa	8,040·8	445·372	Northern Star of Binna Burra
Beryl of Kensington	Miss J. Nolan, Lindum	7,450·9	356·193	Banyule Lord Tiddlewink
Junior, 4 Years (Standard 310 lb.).				
Brooklodge Marina (245 days)	L. Nicholls, North Tambourine	5,962·85	330·071	Pineview Modeller
Junior, 3 Years (Standard 270 lb.).				
Woodbine Royal Lady (260 days)	T. Elliott, Sandy Creek, Gympie	5,490·85	295·019	Brooklands Royal Gift
Senior, 2 Years (Standard 250 lb.).				
Oxford Princess Daffodil	E. Burton and Sons, Wanora	6,148·29	361·415	Oxford Peer
Junior, 2 Years (Standard 230 lb.).				
Wyreene Lotus Lily 3rd (365 days)	G. Schroder, Warra	8,613·57	453·241	Lyndhurst Majesty
Pineview Spotted Queen	J. Hunter and Sons, Borallon	4,754·01	290·767	Oxford Peer
Pineview Jean	J. Hunter and Sons, Borallon	5,002·69	288·414	Oxford Jeweller

The Tropics and Man

Man versus Machine.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

FRANKENSTEIN was popular as a character of fiction but immensely more popular as a film fantasy. The pleasure of terror—in small doses—finds widespread acceptance, and "thrills" will fill any auditorium. Grotesque machine-age caricatures of the beautiful Grecian Galatea have fixed in the minds of most people a vague fear that some day the invention will evade control and take charge of human affairs, forcing its creator into timorous submission if not actually into annihilation. Almost without exception the triumphant machine is endowed with bodily form—and human viciousness. The battle is depicted in the same terms as primitive man regarded his war with the elements of nature—a titanic struggle between living, thinking creatures.

As I shall show before concluding this talk, the battle is already joined. While we sit and wait for our anthropomorphic enemy to appear, the issue is being decided in a totally different fashion. The game is not being played according to the rules; large numbers of people are unaware that anything untoward is taking place. But, before we consider the situation, let us examine the chief participants side by side, for, in whatever guise he may appear, an enemy known is an enemy half-defeated.

The Characteristics of a Machine.

If I say "machine" to you, what immediately springs to your mind? I venture to think it is somewhat as follows—a fairly large, robust, moving mass of wheels, cranks, and noise, designed to do a particular job, and to do it continuously as long as it gets raw material and the engine-driver says it shall keep going. (This is, of course, not completely true of every machine, but it will do as an example.) First and foremost, it has a definite job to do. We have printing machines, bottling machines, lottery machines—did somebody say "political machines?" I cannot accept responsibility for them. Even Heath Robinson, in his most inspired moments does not expect a bottling machine to print a treasury note. Man seems to expect and to be expected to do almost any job that comes his way (even to giving and listening to talks).

Next comes the question of size. In order to carry out a relatively simple job a machine must usually have a huge mass. To print and fold a paper is not in itself a terrific operation, but look at the vastness of printing machinery as seen on the films. The secret is, of course, the enormous power or rapidity with which a machine works. Puny indeed is a swimmer beside the Queen Mary; feeble the output of Caxton against the rushing torrents from the giants of Fleet Street.

Simplicity is a further characteristic of the machine. What, you might object, do you call that complicated mass of wheels, belts, levers, tubes and dials, "simple"? Indeed, I do. Compared to the simplest living creature, the most complicated machine is as a child's blocks to a motor factory.

A last important point is that a machine must be directed. Starting, stopping, and adjusting must be carried out directly or indirectly by some agency, usually human, outside itself. It is true that science has made them more and more automatic, like the light-buoy which switches itself on at dusk or when a fog settles, the boiler fire which stokes itself, and the aeroplane which guides itself to its destination, but these are all simple short-cuts in planning, not to be compared in any way with the adaptability and judgment of any living creature, let alone man.

These then are the general characteristics of a machine—singleness of purpose, size, stability, relative simplicity, continued operation, power, need of control. What of Man?

Man—the Unknown.

Bearing in mind the title of Alexis Carol's book—"Man, the Unknown"—dare I venture any opinion on this subject? Upon what do we pride ourselves, in what way do we arise above the merely inanimate?

First and foremost I would put adaptability. What is there that man cannot attempt, where lie the unconquered places of our sphere? Our submarines can go to a depth of over 300 feet in the ocean, our airplanes fly with comparative ease up to 30,000 feet, our intrepid balloonists have penetrated to the stratosphere. What other animal is there which can live in the tropics, and a few weeks later at the pole? Is there a machine which can reflect with foreboding upon European events, luxuriate in a warm bath, digest a more or less appetisingly fried egg, give a supposedly authoritative discourse upon some obscure subject, play tennis, attend an organised relaxation and memorise a mass of unimportant detail all in the space of sixteen hours with only minor external adjustments to the momentary situation? Yet this is only a fraction of what the average man accomplishes in that period, day after day, for years. There are not many machines which can produce a record like that of the human heart, carrying out most complex chemical changes and pumping blood under pressure from upwards of sixty times a minute without a pause for fifty, sixty, seventy or more years—2,207,520,000 times—with no mechanical renewals and no specific attention (let us hope). Remember too, that this heart has had to adjust its work to rapidly changing conditions—that 100 yards you ran in $10\frac{1}{5}$ seconds, that enormous dinner you ate last Christmas, that speech you had to make at the Intelligentia Club, that time you saw your name after the winning number in the lottery—no kindly engineer to come along and adjust the valves or attend to oiling, no new piston rings or even timing adjustments.

Consider into what a confined space is packed all the apparatus necessary for the remarkable, nay miraculous, diversity of purpose.

Nature has developed her machinery along entirely different lines. Man has taken certain somewhat superficial aspects of Nature's machinery and evolved from them his existing mechanical craft, adding just an odd new invention here and there, such as the free wheel, as he went. In man's plan, singleness of purpose was the keynote; in man's own structure multplicity of purpose provides an infinite variety of orchestration. A hopper to a machine remains a hopper; the corresponding organ in the body—the stomach—has a variety of other functions. Not only does it hold food, but it starts treating it, the rapidity with which it treats

it being automatically adjusted to the type and amount of food. Furthermore, it cleans the food of harmful germs, pours out a substance necessary for blood formation and another one necessary for the nervous system. What a treasure such a hopper would be to the industrialist—a veritable factory in itself.

For these remarkable properties, a price has to be paid. That price is susceptibility. The body, for all its adaptability, is by no means robust. The buffets it can take are very limited, the opportunities for its becoming temporarily, or permanently, incapacitated are many. Fatigue is a common experience. Many different activities can be carried out in succession, but the same one cannot be continued for more than a limited period. The human body owes its triumphs, therefore, to its adaptability, self-direction and compactness, but suffers the weaknesses of complexity, instability and fatigue.

Which, then, is the superior—man or machine? Like most quandaries, this has no answer—there is no question? Man and machine are each designed for the work they have to do; machine for power, simplicity, stability; man for adaptability, self-direction and compactness. On this plane there is not, nor can there be any real competition. The danger lies in a very different realm, the realm of civil organisation.

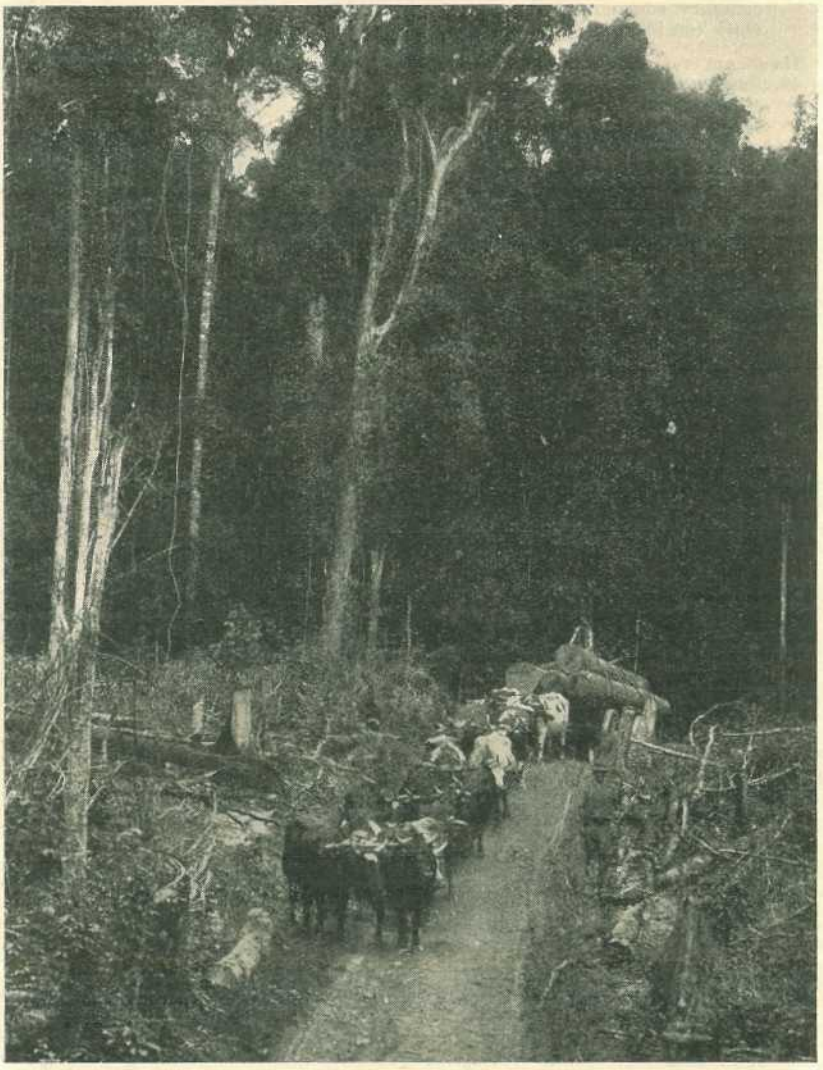
Civil War.

If production is increased in quantity and variety, as it certainly is by the extensive development of machinery, one or both of two things must in the long-run happen—(1) an increased use of products by mankind, or, in the words which are so familiar, "an increased standard of living;" (2) a decrease in the personal labour expended in production. The latter should logically result in increased leisure. Both of these consequences have come about, but by no means in the simple logical fashion than an idealist might expect. Unfortunately, the human machine has shown up its weaknesses only too clearly. What would have been clear enough in a purely intellectual exercise, has been obscured by the smoke and dust of bitter conflict—conflict within the human ranks. When all should have been united in developing all the benefits of machine labour, violent schisms rent the ranks and self-interest was allowed to supplant human welfare. While humans rose and fell, fought and even died for their limited ideals and interests, the evil consequences of mass production were allowed, and even at times encouraged to develop side by side with the benefits. Unemployment, industrial unrest, depression, bankruptcy, distressed areas were the inevitable crop. In war there are no victors, all must be losers. While men bickered and fought, the machine quickly developed and seized the very ground over which men were fighting. Useless to complain now; the machine is here and the machine will stay. All we can do is to sink our differences and combine to develop the good, remove or nullify the bad, and control this Frankenstein of our own creation. The quantity and variety of goods produced are not entirely available to mankind, or how could we have a glut in a commodity while people have to go without. The logical increase of leisure is often linked with a decrease in purchasing power.

Mutual recriminations will do nothing to remedy the situation. Mankind in general is at fault in failing to keep control over the mechanical progress, in ignoring the logical consequences of limitless production, in not preparing channels for the distribution of its benefits before

they opened the hopper-doors. It might not be so bad if the faults of distribution were confined to luxuries, but they affect also the very necessities of life, our foundation foods.

It is a fallacy to compare the structure and working of a machine, with that of the human body. The fundamental principles upon which they are based are so widely different. It is a waste of time to gaze forward to the day when a machine will be invented to be the equivalent of man. The existence of civilisation depends upon winning the battle to-day against the economic and social consequences of an uncontrolled or exploited machine age.



[*Photo.: Foresty Service.*

Plate 124.

A PAUSE ON TOP OF THE PINCH.—Bullock teams are still regularly engaged in log-hauling in the rain-forests on rough range country in Queensland.

Answers to Correspondents

BOTANY.

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

Burr Trefoil. Some Summer-growing Fodder Plants.

F.J.M. (Bundaberg)—

The specimen is the burr trefoil, or burr clover (*Medicago denticulata*), one of the best winter trefoils in Queensland. Seed is obtainable through the ordinary commercial channels, and should preferably be sown during May. Once established in a locality, it generally spreads naturally fairly well.

There are very few summer-growing Clovers and Trefoils. You may try the Japanese Clover (*Lespedeza striata*). This is now very common in some districts, and we think, on the whole, it improves the pasture. Some pastoralists look rather askance on it, as it tends to push out the grass, and in summer time there is generally a good flush of feed. One of the very best of the summer-growing legumes is the Townsville "lucerne" (*Stylosanthes sundaica*). Seed is obtainable from Messrs. Michelmore & Co., Mackay. This legume comes in with the early summer rains. It does not seem to be very attractive to stock in its green state, but apparently becomes so when it is dying off. It is thus of value in late summer when often there is a dearth of green grass.

Queensland coastal pastures contain several natural summer-growing legumes of considerable value. One of the commonest is the tick trefoil (*Desmodium triflorum*). Seed of this legume is not stocked as far as we know, but usually it enters naturally into a pasture. It has one disadvantage—in closely grazed pasture, it grows rather too close to the ground to give stock much of a bite.

As to Kudzu (*Pueraria Thumbergia*), this plant has been boomed at different times as a fodder, but it has never taken on to any great extent in Queensland. Its principal value lies probably in its forming a dense mat and preventing erosion on gully-sides and river banks, and other places liable to soil washing. We have had very little experience with this plant, but what we do know of it suggests that stock do not take readily to it. It may be like some other plants—once they get a taste for it they will eat it readily, but they have to acquire the taste first. It is a very rampant grower in cultivated land. One of our correspondents had it growing, and became so scared of its over-running his garden and cultivation, that he cut it all out. He is a dairy farmer, and threw the vines over the fence to the cows, but although they tossed it about they would not eat a bit of it.

Specimens from Dalby.

R.A.H. (Dalby)—

1. Blue grass, *Dichanthium sericeum*.. Seed of blue grass is not usually stocked by the seed merchants. You might try Messrs. Yates and Co., of Sussex street, Sydney. They sometimes list it.
2. Burr Trefoil, *Medicago denticulata*. This is probably the best trefoil of the Downs and inland Queensland generally. The burrs cause some trouble in the belly-wool of sheep, but, apart from this, it is an excellent fodder when once established. It generally comes up regularly each year, dying off at the approach of the hot weather.
3. Gall Weed, or Twin Leaf, *Zygophyllum apiculatum*, a very common weed in the brigalow country. We have never seen stock eat it, although it has been suspected of poisoning on several occasions. Force-feeding tests with it in both New South Wales and Queensland, however, have given negative results.

We have seen very good Mitchell grass in the brigalow and belah country, and the best results have been obtained by sowing the seed in October.

A Saltbush Species.

"Inquirer (Cunnamulla)—

The specimen of weed found growing on a bare claypan is *Dysphania myriocephala*, a small plant of the Saltbush family, with a fairly wide distribution in Queensland. It has been suspected of causing losses in sheep at odd times. Like sorghums, and some other plants, it contains a prussic-acid-yielding glucoside. In this condition, if eaten by hungry sheep, trouble is likely to ensue. Ordinary paddock stock, both sheep and cattle, seem frequently to feed on these prussic-acid plants with impunity. Tired and hungry animals, however—such as travelling stock—often succumb.

The grass from the Warrego River frontage, which you thought was a variety of spinifex, cannot be determined in the absence of seed-heads. Perhaps later on in the season you could send a larger specimen.

"Oriental Mustard." Knot Grass. A Common Weed.

I.R. (Jandowae)—

1. Oriental Mustard or Tumbling Mustard, *Sisymbrium orientale*, a native of Southern Europe and the near East. It is now a common naturalised weed in most temperate countries, and is a common farm weed in Queensland. It belongs to the cabbage and turnip family (the *Cruciferæ*), and like other members of this family, taints milk badly if cows are allowed to feed on it to any extent.
2. Knot grass, *Polygonum aviculare*. This is not a true grass, but belongs to the family *Polygonaceæ*. This family contains the docks and rhubarb. The present species is sometimes said to cause impaction in stock. This is because of its long running, rather fibrous stems.
3. Specimen is imperfect, but looks like *Verbena officinalis*, the common vervain, an upright plant about 3 to 4 feet high, and bearing numerous small blue flowers. It is a very common weed on the Darling Downs. Your specimen of this was very imperfect, and determination is therefore doubtful.

Pepper Cress.

H.T. (Mulgeldie)—

The specimen forwarded with your letter of the 1st instant is pepper cress, *Lepidium ruderale*, a very common weed in Queensland, and one that is very widely spread over the temperate regions of the world. It belongs to the cabbage and turnip family (the *Cruciferæ*), and is perhaps best known here as turnip weed, a name, however, given to many plants of this family in Queensland. It is a good fodder, but one of our worst offenders in the field of milk-tainting weeds. We have never heard of it causing any trouble with working horses, either in Australia or elsewhere.

Rubber Vine.

J. C. McL. (Mackay)—

The specimen bore flowers or seed-pods, but we think there is no doubt that it represents the plant commonly know in North Queensland as rubber vine, *Cryptostegia grandiflora*. It is a native it is thought of Madagascar. It is now very widely spread in most tropical countries. At one time, it was looked upon as a possible source of commercial rubber—the rubber being known under the trade name of "Palay." As to its poisonous properties, we have no definite information, but it belongs to a dangerous family, and we should say that is is probably poisonous. Stock rarely eat it to any extent, however. It has run wild in parts of the Gulf Country, making it very difficult to muster stock running on country where it abounds.

A Caustic Plant.

A. McD. (Cunnamulla)—

The specimen is *Euphorbia eremophila*, a caustic plant. This plant has a very wide distribution in Australia, from the coast to the far interior, and is generally regarded as poisonous to stock, particularly sheep. Most trouble seems to be with travelling sheep. The symptoms are described as similar to those of the effects of the ordinary caustic creeper (*Euphorbia Drummondii*). The head and neck of affected animals are said to swell considerably. If this swelling is pierced, an amber-coloured fluid exudes, and the life of the sheep may be saved. The animal's face has the appearance of having been badly scorched.

General Notes

Staff Changes and Appointments.

Mr. G. W. J. Agnew, inspector under the Diseases in Plants Acts and agent, Banana Industry Protection Acts, will be transferred from South Johnstone to Nambour, and Mr. W. G. Hancock, agent under the Banana Industry Protection Acts, who has been given the additional appointment of inspector under the Diseases in Plants Acts, will be transferred from Brisbane to South Johnstone.

Constable T. C. D. Monaghan, Tiaro, has been appointed also an inspector under the Brands Acts.

Mr. C. W. Thiele, Bundaberg (as representative of growers of sugar-cane) has been appointed to fill the vacancy on the Sugar Experiment Stations Advisory Board.

Mrs. Nancy Yaun, of Numinbah Valley, Upper Nerang, has been appointed an honorary protector under the Fauna Protection Act.

State Wheat Board.

Amendments to the State Wheat Board hail insurance scheme regulations have been made on the recommendation of the Board, and will be published in the *Government Gazette*.

The principal object of the amendments is to provide that assessors, when assessing losses, shall estimate the grade of the crop so damaged or destroyed, in accordance with the Board's classification scheme, and that the loss shall be assessed on the basis of the estimated value which the wheat would have had on the stalk at the time of harvesting if no loss through hail had been sustained, taking into account the estimated grade and any material deterioration caused by frost, rust, drought, or any other adverse cause prior to the damage or destruction by hail.

Another amendment provides that in the case of a disputed assessment, an umpire may be appointed by the claimant and the assessor, and in the event of their failing to agree on such appointment, that the umpire may be appointed by the Board.

Under a further amendment, a claimant desiring to appeal to an umpire must lodge an objection in writing and deposit two guineas with the assessor. Should the claim not be upheld, it is provided that the deposit shall be forfeited. In previous seasons, umpires were appointed by the Board and if the claim were not sustained, the grower was required to pay two guineas to the Board.

The other amendments which have been made are of a minor nature and form no material departure from the existing hail insurance compensation scheme.

Bacon for Export.

The export baconer pig class of the 1938 Royal National Exhibition was judged on carcase standards at the Brisbane Abattoir—where the live pigs were exhibited—at the conclusion of the show. A full report is being prepared for publication, with illustrations of all the carcases, in the next issue of *The Queensland Agricultural Journal*.

Lakeside Lagoons a Fauna Sanctuary.

An Order in Council has been issued under the Fauna Protection Act declaring Lakeside Lagoons, being Camping and Water Reserve R. 378, parish of Mungore, to be a sanctuary for wild life. Mr. L. A. Bates, of Lakeside, has been appointed an honorary protector.

Wild Life Preservation.

Messrs. H. J. McCulloch (Main Beach, Southport) and J. V. Sullivan (Dalrymple Heights, via Mackay) have been appointed honorary protectors under the Fauna Protection Act and honorary rangers under the Native Plants Protection Act.

Messrs. L. C. Souten and W. S. Green (Upper Nerang) have been appointed honorary protectors under the Fauna Protection Act.

Milk and Cream Test Bottles and Milk Pipettes.

New regulations have been issued under the Dairy Produce Acts setting out the specifications of the Babcock test bottles for testing milk and cream and the milk pipette for the testing of milk by the Babcock method.

Rural Topics

Keep only Good Layers.

Experiments have shown that a hen laying 160 eggs a year is worth approximately three times as much as a hen laying only 100 eggs a year. As poor layers cost almost as much a year, it is clear that net returns multiply fast from heavy layers.

It pays to weed out the poor layers from your flocks right along, keeping only the good layers especially for breeding purposes.

Here are four main characteristics to observe:—

Earliness of maturity.

Rate of egg production recorded by trap-nesting or indicated by bleaching of beak and shanks in yellow-skinned fowls.

Absence of broodiness.

Persistence of production.

A New Process for Making Butter.

The Cobden butter factory in Victoria is using a new process for making butter. The process is now in its second year, and is regarded as revolutionary. The cream is pasteurised over a Flash pasteuriser, and goes direct through the separator to a salting vat, and then to a machine which turns the liquid into butter in an instant. It is all done in a matter of seconds, it is said. Sweet cream has to be used. A saving of £6 a ton is claimed. Test shipments overseas have been favourably commented upon. The new method, however, means collecting the cream twice a day, which bars its adoption by most country factories.

Is the Australian Dairy Farmer Better Off?

That the Australian dairy farmer is in a definitely better position than the New Zealand dairy farmer, in respect of the figure he receives for butterfat, is the opinion of the associate editor of the New Zealand "Dairy Exporter," who was at the Empire conference in Sydney. He attributes this to the operations of the Equalisation Committee and says: "The Australian housewife pays two-pence per lb. more for her butter than her New Zealand counterpart, and does it cheerfully as an assistance to the well-being of an essential industry."

Waste in Pastures.

Professor Stapledon of Wales, estimates that in England and Wales there are 16,000,000 acres of rough grazing and permanent grass waiting to be improved and brought up to a higher standard of production. He says that buttercup pastures on the good lands and poor grass on the poor lands represent the greatest waste of nutritive materials which the present British system of farming tolerates.

The Economic Cow.

The economic cow is not always the high yielding cow. She may be. High yields are apt to be deceptive. Under certain conditions it certainly pays to have extremely high-yielding cows; under other conditions it does not. Cows have to live in different climates, and have to put up with all sorts of management. In America it has been shown that, other things being equal, the bigger the cow the more milk will she give. It also has been shown that it does not always hold that because a cow is giving a big yield of milk she is producing that milk more economically than perhaps a smaller cow giving a lesser yield. There is an immense difference in the food consumption of different cows per gallon of milk produced, and there is every reason to believe that this is inherited.

The economic cow has other qualities besides that of the ability to make the greatest use of the food she eats. The economic cow must be a hardy cow. She must also be a prolific cow. There are cows which have calved every year for more than ten years. Such cows possess an important characteristic of the economic cow.—*The Australian Dairy Review.*

Beauty in the Milk Bucket.

Bathers at Willow Lake, near Glendale, California, have adopted mass-production methods to speed up the process of acquiring coveted coats of sun tan. They use a motor driven atomizer to apply a newly-developed milk spray, which is said to protect the skin from unaccustomed exposure to the sun's rays, and to help prevent burning and peeling.

Another new use for milk is developing from an unexpected quarter. A large cosmetic-manufacturing company in the United States recently placed on the market a powdered milk preparation, made principally from cows' milk, for my lady's beauty bath. A handful of the powder, it is said, will convert a tubful of water into a white, foaming mixture resembling the froth-topped contents of the bucket in the morning milking. It is claimed that it is most refreshing and beneficial to the skin. If all the ladies of the land take to using it for their daily dip, it should prove a big thing for dairy farmers.

Jersey Cows Larger in Australia.

According to Dr. John Hammond, the noted authority on animal husbandry of Cambridge University, Jersey cows in Australia are of a larger type than those in the United Kingdom. Many breeders, he said, believe that the British Jersey is too small and fine. He also said that in England cows are milked three times a day. It is claimed that the yield is 12 per cent. more than when they are milked twice a day.

Cows in Luxury.

It is reported from America that an Ayrshire breeder in New York State has provided rubber beds for his cows. The beds are made of spongy rubber a quarter of an inch thick; they cost about £4 to £5 a cow, but save 75 per cent. of the cost of straw bedding—in other words, a saving of about 28s. a day in a cow shed accommodating 100 cows. There is no likelihood, however, of rubber beds for cows becoming common on Queensland dairy farms, thanks to our fine climate.

Skim Milk as Paint.

Skim milk makes a cheap and lasting paint if used in this way:—Stir into 1 gallon of skim milk about 3 lb. of ordinary cement, and then add any colouring desired. It is necessary to stir the mixture frequently. Six hours after using, this paint will be as immovable and unaffected by water as ordinary paint that has been on for a month.

Banana Grade Standard.

An amendment to the Regulations under the Fruit and Vegetables Acts provides that all Cavendish bananas marketed in the bunch shall comply with the following grade standard: Not less than 80 per cent. of the total fruits comprising any bunch shall measure at least 5 inches in length (measured on the outside of the curve from the junction of the fruit at the stem end to the apex of the fruit), and at least 4 inches in circumference.

The "Eternal Squeal."

It was the "eternal squeal" about the disadvantages of farm life from the whole community, including the farmers themselves, that was causing the dearth of young men to go on the land, said Mr. J. Cocker at the South Taranaki Conference of the New Zealand Farmers' Union. "Farming is a good life—I would not change vocations with anyone—and I have followed it all my life," added Mr. Cocker.

Quality of Sudan Grass Seed.

Buyers of Sudan grass seed should make certain that their purchases comply with the prescribed germination standard of 70 per cent.

An examination of seed offered for sale has revealed many undersized and mouldy samples of poor germination, containing an abnormal quanity of unformed or sterile seeds.

Any farmer in doubt as to the quality of seed may forward a 4 oz. sample to the seed testing station, Department of Agriculture and Stock, Brisbane, for a free test. In doing so, care should be taken to mark the sender's name and address clearly in block letters on the sample, which should be accompanied by a letter of advice of the despatch.

Beyond the Western Border—The "Desert" of the Text Books.

In an introductory note to an article contributed by Mr. Randolph Bedford, M.L.A., to *The Courier-Mail* (Brisbane) we are reminded that Central Australia is "no longer Australia's forgotten territory. Across it fast planes carry passengers and mails; Federal investigators have pointed to its possibilities. . . ."

In the subjoined excerpts, Mr. Bedford presents a vivid picture of the country beyond Queensland's western border fence:—

"Dajarra, the railhead, is 900 feet above sea level. The western extension is already formed—banks and cuttings and some bridges—for 20 miles west of Dajarra. At that point the hilly country ends, and for over 200 miles westward and for 500 northward the plains are open to the Barkly Tablelands flat as pancakes, except for occasional gently rolling country. On it, as in the old Coolgardie days, the railroad builders could lay a mile of track a day. And a mile of new railroad is of more value to the Central Territory than all the street and garden beautification of Alice Springs—desirable as that is.

"From the end of rail formation there are limitless plains far into the Territory —Mitchell grass, infrequent creeks, whitewoods trimmed to the formality of a Dutch garden, by sheep feeding from the trees to the height of a sheep standing on its hindlegs. In this perfect climate of hot days and cold nights there is but one perennial pest, the fly, although less offensive than the fly of a city slum area.

"And for a temporary pest of continued dry weather there are the grasshoppers; large grey yellow fellows that in their blind rush, and with the added momentum of the speeding car, can give a man a black eye, and leave him without the usual excuse of wood-chopping, because there is little wood to chop. But the grasshopper did not offer us the final insult, which is to fly into the billy and be well stewed in tea made of the last quart of water.

"With water anything will grow on these great plains to the border and for 130 miles west of it into the Territory until the mineral country replaces it.

"Mitchell and Flinders grasses, a self-cured hay on their own stalks; thousands of galahs dressed in pink and slate colour, thousands of rosy breasts turned to the sun as the birds wheel as one; the fresh winds of the downs blowing cleanliness into the land, the pastures breathing the scents of hay all day; and the cold nights that produce the fine wools of Australia.

"Over the deep channels and flood plain of the wide Georgina to Gidyea belts in the Mitchell grass the way led, and then through a gate in the unnecessary fence that marks the border. . ."

"These Eastern Central lands are not of heavy carrying capacity, but they are good, clean, light pastoral areas; Mitchell, gidyea, mulga, and good summer grasses, including the fluffy top that seeds as many times as there are rains in the year. Tobermory's homestead is a big two-storied house, and the lessee has drilled wells and installed windmills to make the country safe at Bluebush, Pituri, and No. 6; supplementing Ileriqua and Alikea waterholes and the big lagoon at Coockroach, 64 miles west of the border—and this with little or none of Government recognition.

"It is understandable that the Territory pastoralists nearest to a telegraph line or resident in the southern States are more easily heard at Canberra than the smaller men on the border fences adjoining Queensland but not of it, their voices inaudible in Darwin or Canberra. But that condition calls for a better, if not a larger staff.

"In these brilliant sun-saturated days of the alleged winter travelling is a joy. The long wide plain, gently rolling country from horizon to horizon; roly poly, or as the Americans call it, "tumbleweed," rotates before the gentle wind, sowing seed as it travels.

"A mob of horses full of curiosity mixed with a little fear, gallop towards the car, wheeling within 200 yards of us and galloping away again but to return. Galahs by the thousand wheeling all at once—kangaroo and brolga, life, warmth, sunlight, hot days, and cold nights—these are the ideal conditions for the production of fine wool, and this is the "desert" of the text books."

Cooling of Cream.

If properly used under conditions of scrupulous cleanliness, a cream cooler will give excellent results. Besides lowering the temperature of the cream and thus checking bacterial development, a cooler aerates the cream, releases gases and food flavours, and improves its consistency. Freshly separated cream, after it has been cooled sufficiently, should be mixed with the cream already held in the dairy. Fresh and over-ripe cream should not be mixed, as is often done when lots are held in separate vessels until delivery day. Cream should be stirred frequently while it is held on the farm. Proper stirring controls the ripening.

The Loquat a Pest in the Warwick District.

A proclamation has been issued under the Diseases in Plants Acts declaring loquat fruit to be a pest in the fruit district of Warwick during the period from 1st September to 31st December in each year. Orchardists in the Warwick district must, therefore, remove all loquats from their trees on or before 1st September every year.

Pure Milk Demanded.

Here is an interesting item from America: By its terms the United States Filled Milk Act prohibits the interstate distribution of any combination of milk, cream, or skimmed milk with any fat or oil, other than milk fat, so as to resemble or imitate milk or skimmed milk in any form. The United States Congress determined and declared: "That filled milk, as herein defined, is an adulterated article of food injurious to public health, and its sale constitutes a fraud on the public."

A Tale from the Other Side.

Rolling stones gather no moss, but mossy stones roll in the cash for an enterprising farmer on the other side of the Pacific. From a barren hill on his farm, in California, he sells rocks to city and suburban people who want them for making gardens and rock pools. He soon found that gardeners preferred stones with moss growing on their shady sides. Now he has raised the price of green rocks and is "turning them into greenbacks"—another name for dollars. It is better to stone the gardens than "stone the crows," apparently.

A Great Shorthorn Herd.

Farmers who as A.I.F. Diggers visited many of the famous stud stock establishments in Scotland will be interested in the news of the recent sale of the great Collynie herd of beef Shorthorns which brought renown to the little village of Tarves, not far from Aberdeen, and where it flourished for nearly a century. The famous herd will not be dispersed, however, and has been transferred to Surrey, in the South of England. One of the finest herds of Shorthorns ever bred, the Collynie cattle have contributed some splendid animals to Queensland stock and to herds in other States. Probably no herd of pedigree stock has achieved a greater world-wide reputation. Some years ago a single sire from the Collynie herd sold for £5,565.

Butter Substitutes.

Talking about butter substitutes, Mr. Lowsby, general manager of a big co-operative butter company in Victoria, told a conference of butter factory workers that this trouble has become a serious menace to the butter industry. Apparently, he said, it paid manufacturers to evade the law, for despite successful prosecutions, the business continued. However, the co-operation of Melbourne suburban municipal councils has been obtained whereby health officers will exercise more vigilance in combating this menace, and a further arrangement has been made with retail grocers and dairy produce retailers to attach to their windows a statement that "we do not sell any substitute for butter," which, no doubt, will be very helpful to the dairy industry.

A Man Named Mort.

It is good to recall on occasion something of the work of our industrial pioneers. It was a man named Mort—one of Australia's historical characters—who had the vision to investigate the possibilities of sending frozen meat to the British markets. He made one mistake, however, and that was based on his idea that Australia would never be able to grow wheat in competition with other countries. He obviously had not thought of what our Farrers, our Suttons, and our Soutters could do in the way of evolving wheats suitable for Australian conditions. To-day, wheat and meat are already among the major exports which return immense sums to Australian producers every year.

Although Mort's judgment was out in wheat, he made no mistake about meat. He was one of the first to advocate the development of secondary industries in Australia, and spent £100,000 of his own money in the research which led to the establishment of the refrigeration industry. Up to last year—and since the first frozen meat cargo was sent to England—more than 2,300,000 tons of beef, nearly 2,000,000 tons of mutton and lamb, and more than 1,700,000 tons of butter had been sent overseas. Those figures give us some slight idea of the value of Mort's pioneering work in the transport of meat.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture may be again emphasised. Thorough cultivation of all orchards, vineyards, and plantations therefore is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch, and no weeds of any kind must be allowed to grow, as they act only as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants.

All newly planted trees should be watched carefully and if they show the slightest sign of scale insects or other pests they should receive attention at once.

Bananas.

In the warmer districts banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done, before the winter, young plantations planted the previous season should be desuckered without delay. Those desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of Paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation will be several years during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care must be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. per acre. Keep down weeds with the Dutch hoe; but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are interfered with by the use of horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus eliminate much fungus trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards must be kept loose, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers must not rely on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be looked after carefully and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is very necessary, as if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

THE BRANDING OF STOCK.

The attention of stockowners is directed to the necessity for following the rules of branding, especially in regard to re-branding.

The Brands Act provides that the second or subsequent brander must, if there is room, imprint his brand on his stock at a distance of not less than 1½ inches nor more than 2½ inches from and directly underneath the previous brand.

If there is not room, the re-branding must be done on the next succeeding position, *and on the same side of the animal as the preceding brand in the case of cattle*, thus confining the branding of cattle to one side.

The size of all brands is restricted to not less than 1¼ inches in length, or more than 2½ inches in length for horses and cattle.

Owners are advised to note their obligations in these matters, the observance of which will help to lessen the present unnecessary deterioration of hides through excessive and incorrect branding.

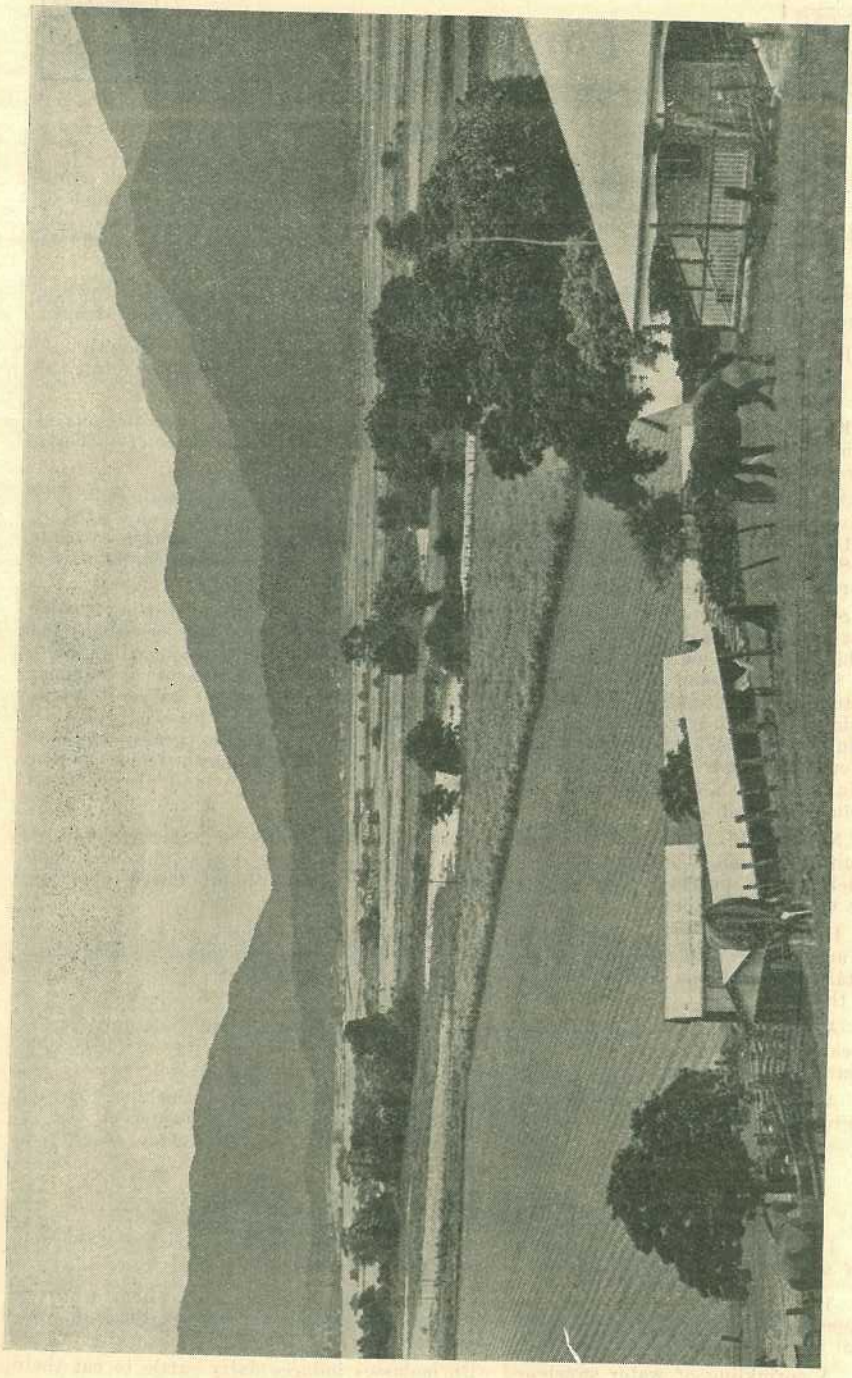


Plate 125.
Canefields at Babinda, North Queensland.

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown raw crops in order to eradicate weed growth and maintain a surface mulch, as much of the summer rains falling on a caked surface soil will fail to penetrate to any great depth. To check losses of soil during summer storms, all raw crops should be sown at right angles to the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, &c., can be continued and sweet potatoes planted out.

Increased attention is being paid to the sweet sorghums such as "Saccaline," both in the coastal areas and on the Downs, in which latter district the crop has been profitably fed to cattle, horses, and sheep.

For the western Downs and Maranoa, farmers are advised to make sowings of sudan grass, which has proved outstanding in recent years as a summer crop, being utilised for grazing, hay, or silage.

An endeavour should be made to reduce the tonnage of feedstuffs annually received from the Southern States, as with the exception of oat grain, and possibly small quantities of prime oaten chaff, local growers should be in a position to cater for State requirements of lucerne, wheaten and oaten chaff, sudan chaff, millet, and panicum chaff, staver, &c.

Some interest is also being taken in the cowpea as a summer growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum). Suitable varieties are groit, poona, brabham, and black. October is a an opportune month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub burns or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed per acre, adding white clover seed at the rate of 2 lb. per acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed.

No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub "burn," as it is essential to plough or renovate sufficiently to provide cover for the seed. From 4 to 6 lb. of tested seed per acre will usually provide a good stand.

In the wheat areas, hay-making will be in progress where crops are not too far advanced for this purpose. Crops cut a few days after the flowering stage will contain the maximum nutritive value, the nutriment being then spread evenly throughout the plant.

A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour. During periods of scarcity, good quality wheaten chaff realises £7 to £10 per ton.

As harvesting becomes general during November, all necessary machinery should be given a thorough overhaul, in order to avoid stoppages at a critical period.

PEANUT REFUSE FOR DAIRY CATTLE.

In preparing peanut kernels for market, the shells, small particles of kernel, leaf and stalk or root attachments are separated and represent offal.

The shells and stalky parts are only low-grade roughage, but when, as often happens, the leaf and kernel fragments form an appreciable part of the bulk, the offal has a feeding value comparable with fair hay.

A sprinkling of water sweetened with molasses induces dairy cattle to eat their fill.

Dairy farmers seeking a cheap source of roughage are recommended to use the abovementioned product of a Queensland industry.

Plate 126.

HIGH TOR.—Mr. G. E. Lawrence's picturesque farm home, built largely of bush timber, at Maleny, Blackall Range, South Queensland.

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 WORK OF THE BABY CLINICS.

A VERY worried mother with a small boy of two attended at one of our Baby Clinic Sub-centres the other day. The child's condition was such that he had to be referred for medical attention. But most of his troubles could have been prevented by correct diet and attention to simple health rules. The mother had four other children whose teeth were not in good condition and whose development was poor.

"Why have you not come along to the Clinic before?" enquired Sister, feeling so sorry for all these ills that could have been avoided by proper advice earlier on.

"Oh," said the mother, "none of my children have ever been really sick."

So, in spite of the fact that baby clinics have been in existence in Queensland since 1918, there still exists in many places a good deal of misunderstanding as to the real work done by them. I will therefore use my little talk this month to explain all about it.

Many people still think that clinics are institutions to which sick children are brought for advice or treatment. This is not so. If sick children are brought to a clinic they are advised at once to go to a doctor or hospital.

One of the most important objects of the baby clinics is to advise expectant mothers in matters regarding their own health and that of their babies before and after birth. For this purpose, in Brisbane,

antenatal clinics have been established. There are two such clinics; one is held at the Woolloongabba Baby Clinic on Monday evenings and the other at the Valley Baby Clinic on Thursday evenings. A doctor is in attendance. In the country centres where there are no antenatal clinics, but where baby clinics are established, the clinic nurse is prepared to give advice to expectant mothers who may seek her help. That she may be qualified to do this, each nurse must hold an obstetric certificate in addition to general and child welfare certificates. The nurse cannot take the place or do the work of a doctor; but in many matters, including one very important one, the diet of the expectant mother, she is able and willing to advise.

Another of the objects of the clinics is to visit, as early as possible, all mothers of new-born infants in the district in which the clinic is situated. To enable them to do this, the clinics receive lists of new-born infants and the names and addresses of their mothers, and by this means are able to get in touch with the mothers at the time when advice is of most use, that is, when the babies are very young.

The most important piece of advice given to the mother at this time is that she can nurse her baby. The baby who is fed by his own mother is both healthier and happier than the one who is artificially fed. If she has any doubts or difficulties as to the baby's care and management either then or in the future, the clinic nurse will be very pleased to assist her in solving these difficulties. If all the mothers in Queensland knew how much less likely naturally-fed infants are to become sick during their first year there would be far fewer artificially-fed infants.

The clinics cater for more than the baby in arms. The nurses are trained to advise in regard to general care, and especially the correct dieting, of children up to school age. The state of a child's health is dependent very largely on the food he eats. If the food is not right the health, and in particular the teeth, suffer. Reports on the state of the teeth of young children when they first attend school show that sound advice on this matter is badly needed.

You will realise that the work of the clinic nurse consists, not in curing sickness or in treating ailments, but in trying to keep mothers and their children well.

By keeping supervision over the mother-to-be our aim is to safeguard her health in order that she may suffer no disability as the result of the additional strain placed upon her, and that she may give birth to a healthy baby.

By teaching mother's milk for mother's baby we hope to save more infants.

The baby clinic nurse invites healthy mothers and healthy babies to the clinic so that with her specialised knowledge she may supervise the feeding and care of the baby. As the health of the mother is inseparably bound up with that of the child, it follows that the nurse in giving advice in regard to the feeding and care of the baby must advise the mother in regard to the care of her own health.

The objects of baby clinics are:—

To advise expectant mothers in matters regarding their own health and that of their babies before and after birth.

To visit all newborn infants within their districts as far as possible and invite the mothers to visit the clinics.

To encourage the natural feeding of infants as the best method of reducing sickness and mortality during the first year of life.

To help all mothers in the management and feeding of babies and children before school age.

To spread sound knowledge regarding the rearing of healthy children and to discourage all practices calculated to injure their health.

To advise medical or hospital treatment for such cases as may need it.

To educate the women of Queensland in mothercraft so that the next generation may be stronger and happier than the present.

Clinics were first established in Queensland in 1918. They started in Brisbane with four in the metropolitan area, but they have long since extended to the country and there are now twenty-six resident centres. In addition there are seventy-eight sub-centres, making a total of 104 centres supplying a very large area of the State.

There are forty-nine nurses on the Baby Clinic permanent staff and every nurse appointed must hold general, obstetric and child welfare certificates. For, while we do not treat sick babies, the general certificate is necessary so that the nurse is qualified to observe, in either mother or child, signs or symptoms of sickness and need for the patient to be sent on for advice. The nurse's obstetric training and experience in antenatal clinics qualify her here again, to note anything wrong and advise accordingly. She is qualified to give advice as to the diet and general health of the expectant mother. The child welfare training equips her still futher by teaching her to recognise, and be familiar with, the characteristics of the normal baby and healthy child, to know the mental and physical qualities which should be present at a given age, and here again note departures from normal. In each case, whether it be the expectant mother, the nursing mother and her baby, or the toddler, early recognition of abnormal symptoms permits the patient to be sent on to a doctor or hospital at the time when treatment is likely to be most useful, that is, in the early stages of the ailment. Very many cases are sent on in this way from the baby clinics of the State.

Another, and very important, branch of clinic work is the Child Welfare Training Centre which is attached to the Valley Baby Clinic. That the nurse of to-day is alive to the importance of this training, is shown by the number who desire to take this course. Not only in the cities but nurses from far distant parts of the State realise the importance of, and need for, this training. Up to the present about 500 nurses have taken the course and there are thirty now in training.

Our work in the interests of our mothers and children is done by means of our antenatal clinics, which seek to safeguard the health of the expectant mother; our day clinics to which mothers bring themselves and their infants when in doubt or difficulties; our district work which brings us in touch with the mother and her new baby; the railway car which takes the nurses to help the mothers in the distant places; and last but not least, our Welfare Training Centre from which the nurses pass to positions in many parts of the State, and there to carry on and help us in our work.

IN THE FARM KITCHEN.

SOME APPETISING PUDDINGS.

While the weather is still cold, puddings will be a welcome item in the menu. Here are a few tested recipes:—

Jam Layer Pudding.

Take ½ lb. flour, 3 oz. suet, ½ teaspoonful baking-powder, pinch salt, water to mix, jam (without stones).

Mix the flour with the chopped suet, then add salt, baking-powder, and water, sufficient to mix the whole to a fairly stiff paste. Knead lightly and roll out to the thickness required. Grease a basin and put a layer of jam at the bottom. Divide the pastry into four, take a quarter and shape it into a piece to fit the bottom of the basin. Add another layer of jam and continue until the pastry is used up, finishing off with a layer of pastry. Cover with a greased paper and steam for two to two and a-half hours. Turn out and serve at once. No sauce is required.

Marmalade Sauce.

Take ½ pint water, 2 oz. marmalade, 1 oz. sugar, lemon essence or juice.

Mix the ingredients in a small saucepan. Bring to the boil and cook for about ten minutes and serve as required.

Marmalade Pudding.

Take 6 oz. breadcrumbs, ¾ pint milk, 2 oz. sugar, 3 oz. marmalade, 1 oz. butter, 2 eggs, pinch salt.

Heat the milk and pour it over the breadcrumbs. Add the sugar, butter, salt, and marmalade. Whisk the eggs and stir into the mixture. Turn into a buttered mould or basin, cover with buttered paper and steam gently for about one hour. Allow it to stand a minute or two before turning out. Serve very hot with marmalade sauce.

Camp Pudding.

Take 4 oz. breadcrumbs, 2 oz. currants, 2 oz. raisins, 2 oz. chopped mixed peel, 4 oz. sugar, 4 oz. chopped suet, 3 oz. flour, 1 lemon, ½ orange, 2 eggs, milk if required.

Mix all the dry ingredients together, add the juice and rind of one lemon and half an orange. Whisk the eggs and add some milk. Mix all to a fairly stiff consistency. Turn into a greased basin, cover with a greased paper and steam for two hours. Serve with orange or lemon sauce.

Baroness Pudding.

Take 3 oz. flour, 3 oz. suet, 4 oz. raisins, 1 egg, 2 oz. sugar, pinch baking-powder, milk to mix.

Grate the suet, and mix all the dry ingredients together. Stone the raisins and add also. Beat the egg and add and mix with milk. Steam in a mould for three hours.

Devonshire Dumpling.

Take ¾ lb. flour, ¼ lb. lard or suet, 3 oz. sugar, 2 oz. sultanas or currants, 2oz. raisins, chopped fine, or chopped dates, a good pinch of salt, ½ teaspoonful spice, 1 teaspoonful carbonate of soda, enough sour milk to mix a stiff dough.

First sift the sugar, soda, and salt into the flour; then add the other ingredients, mix up quickly with sour milk, put into a greased pudding basin, and steam for three hours. Turn out and serve with white sauce. The dumpling is generally tied in a floured cloth and boiled in this way; but I do not recommend the method, because so much of the fat boils out in the water and is lost. The use of a basin is an economy.

Date Pudding.

Take ½ lb. flour, 3 oz. sugar, 6 oz. shredded suet, 1 orange, 6 oz. quartered stone dates, 2 teaspoonfuls baking-powder, ½ teaspoonful salt, 1 pint custard sauce.

Grease a pudding basin. Sift the flour, salt, and baking-powder into a bowl. Stir in the suet, sugar, dates, grated orange rind, and half the custard sauce. Mix all well together. Turn into a basin, cover with a greased paper, and steam two hours. Turn out on to a hot dish. Mask with the remainder of the custard sauce.

Jam Pudding.

Take 14 oz. flour, 7 oz. shredded suet, 1½ teaspoonfuls baking-powder, pinch salt, 1 lb. jam, water to mix.

Make a dough by adding water to the dry ingredients and mixing them to a soft consistency. Roll a third of this dough into a fairly large round to fit inside the basin. Line basin with the round of dough and make it smooth. Press the dough well up the edge of the basin and on to the rim. Now divide the remaining pastry into portions. These with the jam form the layers. Put jam at the bottom of basin. Fill up the basin with alternate layers of jam and dough, making each layer of dough cover the surface of jam. A layer of dough must be at the top. Cover the basin with a buttered paper and tie on a floured pudding cloth. Steam three hours. Serve piping hot.

Raisin Roly-Poly.

Take 1 lb flour, 1 lb. raisins, ½ lb. shredded suet, salt, and water to mix.

Sift flour and salt into a mixing bowl. Add shredded suet and stir till well mixed. Add sufficient cold water to make a stiff dough and roll into a strip. Stone the raisins and cut in half. Sprinkle these over the dough, wet the edges with water, roll up, and fold in ends neatly. Scald a pudding cloth, sprinkle it with flour and wrap round the pudding. Tie ends of cloth securely, place pudding in a saucepan of fast-boiling water, and boil from two and a-half to three hours. The water must not be allowed to go off the boil during the cooking, and the pudding must be covered with water the whole time. When cooked, remove cloth and serve with custard sauce. Tinned raspberries can be substituted for the raisins—with the juice previously strained off.

Almond Pudding.

Take 4 oz. flour, 2 oz. breadcrumbs, 2 eggs, 3 oz. ground almonds, 4 oz. butter or margarine, 4 oz. castor sugar, 2 oz. glace cherries, 1 level teaspoonful baking-powder, 3 tablespoonfuls milk, a few blanched almonds.

Sieve the flour, ground almonds, and baking-powder. Cream the butter. Mix in the sugar, and beat in each egg separately. Add all the dry ingredients alternately with a little of the milk. Cut the glace cherries into four and add them to the mixture. Blend thoroughly, put sufficient into small, well-greased moulds to three-parts fill them. Cover with greased paper and steam for forty to fifty minutes, according to their size. Just before serving "spike" with a few coarsely-shredded blanched almonds, and serve with chocolate sauce.

SOME MILK RECIPES.

Milk Meringue Jelly.

Take ½ pint milk, 2 egg-whites, 2 tablespoonfuls sherry, ½ pint hot water, 1 packet cherry jelly crystals, angelica, and a few glace cherries.

Dissolve jelly crystals in the hot water, and, when cold, stir in the milk and sherry. Leave until beginning to set, then whisk the egg-whites to a very stiff froth and fold in lightly. Turn into a fancy dish, and when quite set decorate with glace cherries and leaves of angelica.

Milk Solid.

Take 1½ pints milk, ½ lb. granulated sugar, 2 lemons, 1 gill water, 1¼ oz. gelatine.

Put the milk and sugar into a saucepan. Add the finely grated rind of the lemons, and when the sugar is dissolved draw aside. Dissolve the gelatine in the water and strain in, stirring all the time. Squeeze the lemons and strain the juice and add. Mix all together, and turn into a wet mould and leave to set. Then turn out carefully, or, if liked, put into a basin. When set break into rough pieces and serve.

Milk Mould.

Take 1¼ pints milk, ¾ gill water, 1 oz. gelatine, vanilla essence to taste, 2 tablespoonfuls desiccated cocoanut, 2 good tablespoonfuls castor sugar, ½ packet lemon jelly crystals, ½ pint hot water, a few glace cherries.

Dissolve the jelly crystals in the hot water, and, when cold, set a thin layer in the bottom of a mould which has been rinsed out with cold water. Decorate it with a few glace cherries, halved and dipped in a jelly. When these are set, cover with some more jelly and set again. Put the gelatine into a saucepan with the water and dissolve slowly. Warm the milk, then strain into the gelatine, stirring well all the time. Turn into a basin, add the sugar and vanilla, and, when the mixture begins to set, add the cocoanut. Mix all together, turn into the prepared mould, and, when set, dip into hot water and unmould carefully. Decorate the dish with the remainder of the jelly chopped up roughly.

Mock Cream.

Take 2½ gills milk, 2 oz. cornflour, 4 oz. butter, 3 dessertspoonfuls castor sugar, vanilla flavouring.

Beat the sugar and butter to a cream. Mix the cornflour to a smooth paste with a little milk. Heat the remainder and stir on to it, then return to the pan and bring to the boil. Cook gently for a few minutes, keeping it well stirred all the time. Draw aside and continue to stir until slightly cool. Then gradually mix in the creamed butter and sugar. Flavour with vanilla and beat all together until creamy. Serve with stewed fruit.

Tea Made With Milk.

Allow 1 good teaspoonful tea to ½ pint milk.

Heat the teapot, bring the milk to the boil, put the tea in the teapot and pour in the boiling milk. Leave for two or three minutes to draw before serving.

Sour Milk Scones.

Take ¾ cupful sour milk, ½ lb. flour, 2 oz. butter or margarine, 1 teaspoonful castor sugar, 1 teaspoonful baking soda, ½ teaspoonful salt.

Sieve the dry ingredients into a basin. Rub in the butter with the tips of the fingers and stir in enough sour milk to make a stiff dough. Roll out on a lightly-floured board and cut into rounds. Bake for a quarter of an hour in a hot oven.

MARGARINE.

"Margarine was a war product, and had best remain a war product," declared Professor Harvey Sutton, of the School of Public Health and Tropical Medicine, recently. He went on to say that margarine is useful in an emergency when better materials cannot be obtained. In Australia, where the best quality butter is available to everyone, margarine is out of place, especially in the feeding of children.

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Kindly renew your subscription without delay. Write your full name plainly, preferably in block letters. PLEASE USE THE ORDER FORM, which will be found on the last page of each issue.

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

THE GARDEN COMPOST HEAP.

The garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops, free of disease, and vegetable tops should be used in this way, but the coarse, woody stalks of strong-growing plants should be avoided.

The production of artificial manure from garden waste, straw, &c., depends on the decomposition, by fungi and bacteria, of much of the plant material. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity, and chemical composition, and by the presence of nutrients, such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. Such materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume some of the available nitrogen. This competition between the plant and the soil organisms for soil nitrates may result in the nitrogen starvation of crops.

The usual process of allowing plant refuse to decay, without any chemical treatment, results in a very acid product. With plant residues containing little nitrogen and phosphate, it is necessary to add available nitrogen to the heap, as well as lime (which prevents the development of acidity) and phosphate (which is required in the nutrition of the organisms). With materials rich in nitrogen and minerals, such as legumes (peas, beans, &c.,), green vegetable tops, and other green succulent material, the use of lime alone should be sufficint to ensure rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base and of such size that the final height is about 3 feet. The chopped up material should be spread in layers several inches deep, each layer being treated in the following way:—

Snow over with ground limestone (5 lb. per 100 lb. of material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia will be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that the loss will be kept at a minimum. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and bacterial action, the untreated capping can be used as a base for the next heap. The heap should be kept damp, but the amount of water used should not cause drainage from the heap.

In summer the material should be ready for use after two months, but in colder weather the process is much slower.

Properly prepared compost manure is very similar in chemical composition to horse manure, and gives equally good results in promoting plant growth.

A GATELESS OPENING.

In many places it is desirable to have an opening in the fence that a man can easily slip through without bothering with a gate, but through which horses or cows cannot pass. Four posts are set as shown—two in the fence line, which should be braced, and one on each side of one of the centre-line posts. Branch wires are carried from the other centre-line post to the two sideposts. These should be made

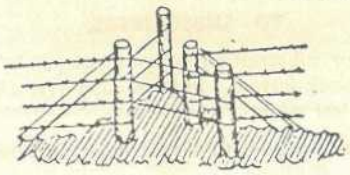
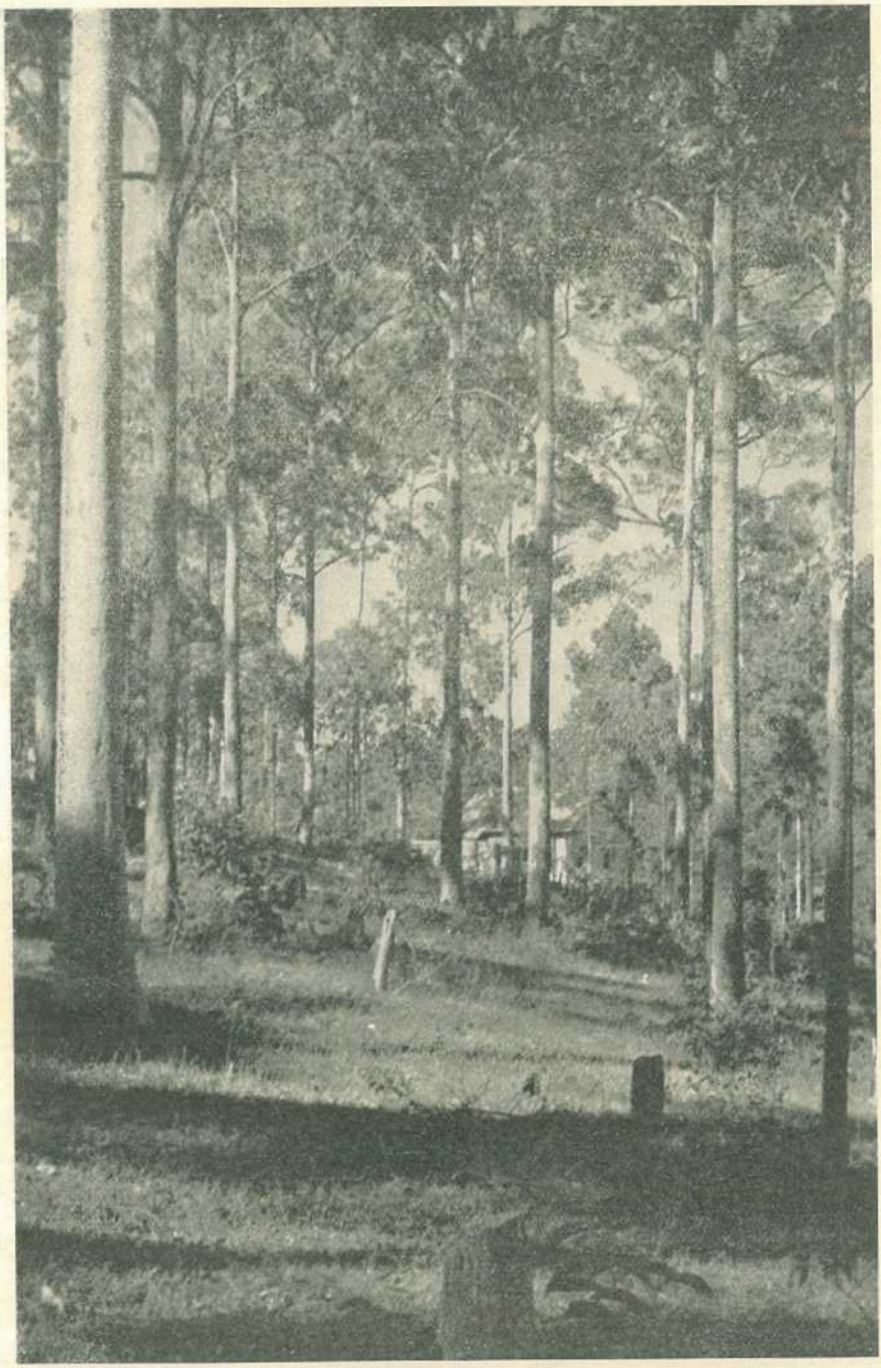


Plate 127.

of wire without barbs to catch on the clothes, as it is not desirable to make the openings larger than necessary. If the centre posts are long enough—say, 5½ or 6 ft. above the ground—they can be braced to each other by a piece of strap iron across the top. If this is possible, then the other braces will not be necessary.



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

Plate 128.

A YOUNG HARDWOOD STAND AFTER FORESTRY TREATMENT.—Observe the park-like appearance, each tree being well spaced.

[*Photo.: "The Telegraph."*

Plate 129.
A shadowed glade in a young hardwood forest.

National Radio Talks.

The following programme of national talks, supplied by courtesy of the Australian Broadcasting Commission, will be given over the national network of broadcasting stations, which includes:—

2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN, 5AN, 5CK, 7ZL.

All times stated are *Eastern Standard Time.*

SUNDAYS.

9.30 to 9.45 a.m.

SPECIAL NATIONAL TALK FOR COUNTRYMEN—relayed over the alternative network and all regional stations, i.e., 2FC, 2NR, 2NC, 2CR, 2CO, 3LO, 3GI, 3WV, 4QR, 4RK, 4QN, 5CL, 5CK, 7ZR, on the first Sunday in every month.

SEPTEMBER.

4th—

"The Improvement and Management of Pastures." By Professor A. E. V. Richardson (Melbourne).

OCTOBER.

2nd—

"The Scientific Aspect of Grass Lands." By Dr. H. C. Trumble (Adelaide).

10.15 to 10.30 a.m.

(South-Eastern Queensland tune to 4QG for this session.)

Review of CURRENT BOOKS WORTH READING.

This talk is given on alternate Sundays by Mr. Vance Palmer from Melbourne and Mr. Hector Dinning from Brisbane.

3.0 to 3.20 p.m.

"AN ARMCHAIR CHAT." By Mr. F. S. Burnell (Sydney).

6.30 to 6.45 p.m.

"SCIENCE IN THE NEWS." By Professor W. J. Dakin (Sydney).

SEPTEMBER.

4th September and on every second Sunday thereafter.

On the alternate Sundays the Talks will be as follow:—

11th—

"The Auld Hoose." By Mr. William Tainsh (Melbourne).

25th—

"The First Englishman—Dampier." By "Observer" (Melbourne).

OCTOBER.

9th—

OUR NATIONAL DEBT" (Series)—*"Our Debt to Antiquity: Judea, Greece, Rome."* By Professor Walter Murdoch (Perth).

23rd—

"OUR NATIONAL DEBT" (Series)—*"Our Debt to Modern Nations: France, Italy, Germany."* By Professor Walter Murdoch (Perth).

NOVEMBER.

6th—

"Talk." By Mr. Don. Bradman (Adelaide).

20th—

"OUR NATIONAL DEBT" (Series)—*"Our Debt to Britain."* By Professor Walter Murdoch (Perth).

8.30 to 8.50 p.m. every Sunday—INTERNATIONAL AFFAIRS:

On the following dates the Talks in this series will be given by Mr. H. V. Hodson, the well-known B.B.C. Foreign Affairs commentator: 28th August, 18th and 25th September, 2nd, 9th, and 23rd October.

MONDAYS.

7.40 to 7.55 p.m.

SEPTEMBER.

5th—

Talk by a delegate to the British Commonwealth Relations Conference.

"SOME WORLD ECONOMICS" (Series). By Mr. H. V. Hodson, well-known English economist and Foreign Affairs commentator for the B.B.C.

12th—

"The Future of World Trade and Empire Trade." (Sydney).

19th—

"Rearmament and the Future of Industry." (Sydney).

26th—

"The Future of Population and Migration." (Sydney).

OCTOBER.

3rd—

"The Future of Gold and Money." (Melbourne).

10th—

"HEINRICH HERTZ—AN IMAGINARY INTERVIEW IN 1888." By Professor A. D. Ross (Perth).

(In the year 1888 Hertz discovered electro-magnetic waves.)

"MEN TALKING."

On 17th October and on subsequent Monday evenings at 7.40 to 7.55 p.m., instead of a National Talk, there will be a new feature—*"Men Talking."* Listeners are invited to eavesdrop.

TUESDAYS.

7.40 to 7.55 p.m.

Every Tuesday "THE NEWS BEHIND THE NEWS" by the Watchman." During September, while "The Watchman" is on holiday, this talk will be given by one of the delegates to the British Commonwealth Relations Conference.

Also on Tuesday evenings, some time between 9.0 and 10.0 p.m., there will be a talk of a light nature. Those arranged for September are as follow:—

SEPTEMBER.

6th—

10.0 to 10.15 p.m.: Talk by Mr. S. K. Ratcliffe (Melbourne).

13th—

9.45 to 10.0 p.m.: *"I Put My Swag Up."* By Mr. G. F. Young (Melbourne).

20th—

9.25 to 9.40 p.m.: To be arranged.

27th—

10.0 to 10.15 p.m.: To be arranged.

WEDNESDAYS.

7.40 to 7.55 p.m.

"THIS CHANGED THE WORLD" (Series). The last two talks in this series. By Sir Henry Barraclough (Sydney).

SEPTEMBER.

7th—

"Steam."

14th—

"Electricity."

"GREAT AUSTRALIANS" (Series). *"And Still They Live."*

21st—

"William Charles Wentworth." By Dr. A. C. V. Melbourne (Brisbane).

28th—

"The Hon. Henry Bournes Higgins." By Professor G. V. Portus (Adelaide).

OCTOBER.

5th—

"Sir John Forrest." By Dr. J. S. Battye (Perth).

"MAKERS OF AUSTRALIAN PROSPERITY" (Series). By Mr. Brian Fitzpatrick (Melbourne).

12th—

"Thomas Sutcliffe and James Harrison."

19th—

"John Ridley."

26th—

"H. V. McKay."

"IN THOSE EARLY DAYS" (Series). By Professor Ernest Scott (Melbourne).

NOVEMBER.

2nd—

"The First European Woman in Australasia."

9th—

"Betsy Balcombe and a Lock of Napoleon's Hair."

16th—

"Abel Tasman."

"SCALLYWAGS OF THE SEVENTIES" (Series). By Mr. Frank Clune (Sydney).

23rd—
"Bully Hayes."

30th—
"De Rougemont."

DECEMBER.

7th—
"Henry Retford."

"PENAL STATIONS OF OLD VAN DIEMEN'S LAND" (Series). By Mr. W. H. Hudspeth (Hobart).

14th—
"Macquarie Harbour and Maria Island."

21st—
"Port Arthur."

28th—
"Tasman Peninsula."

THURSDAYS.

7.40 to 7.55 p.m.

SEPTEMBER.

8th—
Talk by Delegate to the British Commonwealth Relations Conference.

15th—
Talk by Delegate to the British Commonwealth Relations Conference.

"THREE TALKS" (Series). By Dr. F. W. Whitehouse (Brisbane).

22nd—
"What Became of Leichhardt?"

29th—
"The Dawn of Life in Australia."

OCTOBER.

6th—
"Red Sand and White."

"POPULAR SCIENCE" (Series). By Dr. S. W. Pennycuick (Adelaide).

13th—
"Why Do We Take Ourselves So Seriously?"

20th—
"Little Drops of Water."

27th—
"The Greatest Workers in the World."

NOVEMBER.

3rd—
"The Strange Adventures of Mr. Carbon."

"AUSTRALIAN READERS AND WRITERS" (Series). By Mr. Frank Dalby Davison (Sydney).

10th—
"Revealing a Continent."

17th—
"Australia the Heroine."

"I WONDER" (Series). By Professor G. V. Portus (Adelaide).

24th—
"What the Scientists Will Do Next."

DECEMBER.

1st—
"Whether We Really Have Progressed."

8th—
"If Seeing is Believing."

15th—
"Whether Intelligence is Enough."

"The NORTHERN TERRITORY" (Series). By Mr. E. Southwell-Keely (Sydney).

22nd—
"People and Personalities of the Far North."

29th—
"Our Northern Territory—I Have Lived There."

FRIDAYS.

7.40 to 7.55 p.m.

Every Friday evening a National Talk will be broadcast. This period is kept free as late as possible so that any talks by outstanding visitors or on topical subjects may be arranged at short notice.

SEPTEMBER.

2nd—
To be arranged.

9th—
"Some Peculiar Ways in America." By Colonel Boris Alexander, of the University College, Memphis, Tennessee (Melbourne).

16th—
To be arranged.

23rd—
"Some Unwelcome Immigrants." By Professor A. E. V. Richardson (Melbourne).

FRIDAYS.

Occasional National Talks of a light nature on Friday evenings, somewhere between 9.0 and 10.0 p.m., will be broadcast. During September the following Talks have been arranged:—

SEPTEMBER.

2nd—
9.30 to 9.45 p.m.: *"This Was News."* By Mr. L. Cerutty (Hobart).

16th—
9.0 to 9.15 p.m.: *"Where Did You Get That Accent?"* By Mr. John Horner (Adelaide).

WEDNESDAYS AND FRIDAYS.

6.0 to 6.15 p.m.

"YOUNG PEOPLE TAKE THE AIR."

Talks or discussions by young people on subjects of interest to young people.

During September the subject of the talks will be Professor Walter Murdoch's suggestions for "An Australian Creed."

SATURDAYS.

8.50 to 9.0 a.m.

"THE BIRDS IN YOUR GARDEN" (Series). By Mr. M. S. R. Sharland (Sydney).

On Saturdays during September these talks will be heard from the following stations: 2BL, 2NR, 2CO, 3AR, 3GI, 7ZL.

9.30 to 9.50 a.m.

"YOUR HOBBIES."

The young people's "Hobbies Session" every Saturday morning.

HANDY BAG NEEDLE.

A bodkin or needle suitable for sewing up bags can be made easily from an ordinary sardine tin-opener. The wire opener is straightened out, as illustrated, and

Plate 130.

the ends rounded with a file or a grindstone, so that they may pass freely through the open weave of the sacking.

Water Conservation on the Condamine.

Plate 131. [*Photo.: Lands Department.*
Reilly's Weir.

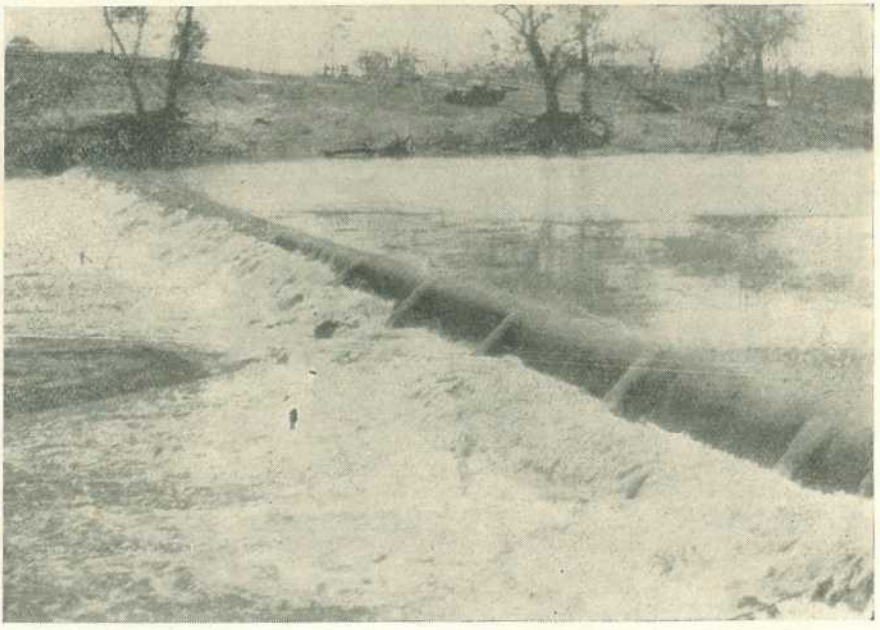


Plate 132. [*Photo.: Lands Department.*
The weir filled to capacity.

Plate 133. [*Photo.: Lands Department.*
The catchment.

Plate 134. [*Photo.: Lands Department.*
Access road to Bingil Bay, near Mourilyan, North Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1938.	July, 1937.		July.	No. of years' records.	July, 1938.	July, 1937.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·09	37	2·82	3·44	Clermont	1·04	67	2·80	0·80
Cairns	1·57	56	1·99	3·66	Gindie	1·11	39	..	0·14
Cardwell	1·37	66	2·66	2·08	Springsure ..	1·21	69	0·71	0·43
Cooktown ..	0·96	62	0·71	1·12					
Herberton ..	0 87	52	2·37	1 66					
Ingham	1·63	46	4·58	2·75					
Innisfail	4·75	57	8·17	10·62					
Mossman Mill ..	1·31	25	2·20	2·71	*Darling Downs.*				
Townsville ..	0·61	67	3·68	0·62					
					Dalby	1·73	68	2·19	0·97
Central Coast.					Emu Vale ..	1·60	42	1·50	0·88
					Hermitage ..	1·72	32	..	0·74
Ayr	0·67	51	3·30	0·37	Jimbour ..	1·53	50	1·91	0·86
Bowen	0·92	67	2·61	0·47	Miles	1·65	53	1·47	0·86
Charters Towers ..	0·63	56	1·91	0·43	Stanthorpe ..	2·04	65	1·74	0·90
Mackay	1·67	67	3·03	0·90	Toowoomba ..	2·09	66	2·30	1·08
Proserpine ..	1·54	35	2·68	1·25	Warwick ..	1·84	73	1·34	0·82
St. Lawrence ..	1·38	67	1·68	0·51					
South Coast.									
					Maranoa.				
Biggenden ..	1·37	39	3 24	0·90					
Bundaberg ..	1·84	55	4·29	1·60					
Brisbane	2·22	86	1·43	1·15					
Caboolture ..	2·15	51	2·04	0·73	Roma	1·47	64	0·34	0·60
Childers	1·70	43	2 98	2·08					
Crohamhurst ..	2 95	45	3·21	1·42					
Esk	1 95	51	2 86	0·65					
Gayndah	1 46	67	2·67	1·45					
Gympie	2·09	68	2·44	0·96	*State Farms, &c.*				
Kilkivan	1 59	59	2·35	0·69					
Maryborough ..	1·92	67	3·98	2·54	Bungeworgorai ..	1·41	24	..	0·72
Nambour	2·67	42	3·99	2·12	Gatton College ..	1·41	39	1·32	0·98
Nanango	1·65	56	3·29	0·95	Kairi	..	..	..	..
Rockhampton ..	1·77	67	2·05	1·89	Mackay Sugar Experiment Station	1·48	41	..	0·50
Woodford ..	2·34	51	2·64	0·61					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1938.

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	29·96	77	66	82	24, 25, 29	60	1	71	6
Herberton	..	70	50	82	22, 24, 25	34	5	237	6
Rockhampton	30·09	70	54	80	21, 22	45	5, 31	205	10
Brisbane	30·11	66	50	73	18	45	28	143	12
Darling Downs.									
Dalby	30·14	63	43	69	17, 18, 19	30	2	219	10
Stanthorpe	..	56	36	69	27	23	1	174	10
Toowoomba	..	59	42	67	17	33	1	230	14
Mid-Interior.									
Georgetown	30·00	79	60	88	23, 24	43	5	179	4
Longreach	30·09	72	46	83	22	35	4	132	3
Mitchell	30·14	65	39	74	23	28	5	55	3
Western.									
Burketown	30·04	78	57	91	22	43	5	61	2
Boulia	30·09	72	48	87	19, 20	39	4, 5	85	3
Thargomindah	30·12	64	43	77	19, 20	33	16, 17	36	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	Sept., 1938.		October. 1938.		Sept., 1938.	Oct., 1938.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					a.m.	a.m.
1	6·7	5·37	5·34	5·51	10·21	10·39
2	6·6	5·37	5·33	5·51	11·11	11·33
					p.m.	p.m.
3	6·5	5·38	5·32	5·52	12·1	12·24
4	6·4	5·38	5·31	5·52	12·49	1·16
5	6·3	5·39	5·29	5·53	1·40	2·8
6	6·2	5·39	5·28	5·53	2·33	3·2
7	6·1	5·40	5·27	5·54	3·26	3·56
8	5·58	5·40	5·25	5·54	4·17	4·53
9	5·57	5·41	5·24	5·55	5·12	5·48
10	5·56	5·41	5·23	5·55	6·6	6·48
11	5·55	5·42	5·22	5·55	7·2	7·49
12	5·53	5·42	5·22	5·56	7·59	8·50
13	5·52	5·43	5·21	5·56	8·57	9·52
14	5·51	5·43	5 20	5·57	9·57	10·52
15	5·50	5·44	5·19	5·57	10·57	11·46
16	5·49	5·44	5·18	5·58	11·58	..
						a.m.
17	5·48	5·45	5·17	5·59	..	12·35
					a.m.	
18	5·47	5·45	5·16	5·59	12·56	1·21
19	5·45	5·45	5·14	6·0	1·49	2·4
20	5·44	5·46	5·13	6·1	2·39	2·45
21	5·43	5·46	5·12	6·1	3·25	3·25
22	5·42	5·47	5·11	6 2	4·6	4·3
23	5·41	5·47	5·10	6·2	4·48	4·43
24	5·40	5·47	5·9	6·3	5·30	5·25
25	5·39	5·48	5·8	6·4	6·9	6·10
26	5·38	5·48	5·7	6·4	6·48	6·56
27	5·37	5·49	5 7	6·5	7·32	7·42
28	5·36	5·49	5·6	6·5	8·19	8·31
29	5·35	5·50	5·5	6·6	9·2	9·22
30	5·34	5·50	5·4	6·6	9·50	10·11
31			5·4	6·7		11·7

Phases of the Moon, Occultations, &c.

2nd Sept.	☽	First Quarter	3 28	a.m.
10th ,,	○	Full Moon	6 8	a.m.
17th ,,	☾	Last Quarter	1 12	p.m.
24th ,,	●	New Moon	6 34	a.m.

Perigee, 20th September, at 10.0 p.m.
Apogee, 5th September, at 3.0 a.m.

The Moon, a narrow crescent, will pass Venus at 7 p.m. on the 27th, at a distance of 4 degrees. The Moon will set about 9.10, and Venus 10 minutes earlier.

Mercury rises at 5.37 a.m., 30 minutes before the Sun, and sets at 5.9 p.m., 28 minutes before it, on the 1st; on the 15th it rises at 5.0 a.m., 50 minutes before the Sun, and sets at 4.22 p.m., 1 hour 22 minutes before it.

On the 11th Venus, our radiant Evening Star, will attain its furthest distance east of the Sun—46 degrees—and after that begin to decline in altitude; but before it disappears we shall see it at its greatest brilliancy, *in about a month hence, and again when it appears as the Morning Star at the end of the year.* On the 15th it rises at 7.42 a.m., 1 hour 52 minutes after the Sun, and sets at 9.8 p.m., 3 hours 24 minutes after it.

Mars rises at 5.34 a.m. on the 1st and sets at 4.40 p.m.; on the 15th it rises at 5.4 a.m. and sets at 4.26 p.m.

Jupiter rises at 4.31 p.m. on the 1st and sets at 5.45 a.m.; on the 15th it rises at 3.29 p.m., and sets at 4.43 a.m.

Saturn rises at 8.28 p.m. and sets at 8.8 a.m. on the 1st; on the 15th it rises at 7.26 p.m., and sets at 7.18 a.m.

Before Venus sets, soon after 8 o'clock, about the middle of the month we can trace the path of the planets from due east to due west by Saturn, Jupiter, Beta Scorpii, the brightest star in the head of the Scorpion; by Alpha Librii, a second-magnitude star in Libra, and by Venus and Spica, the clear white star in Virgo.

At 8 p.m. at the beginning of the month the Southern Cross reaches its greatest distance—30 degrees—west of the south celestial Pole and will be horizontal as at III on the clock-face. Six hours later, position VI, it will be below the horizon in Queensland.

1st Oct.	☽	First Quarter	3 6	p.m.
9th ,,	○	Full Moon	7 37	p.m.
16th ,,	☾	Last Quarter	7 24	a.m.
23rd ,,	●	New Moon	6 42	p.m.

Apogee, 2nd October, at 9.0 p.m.
Perigee, 16th October, at 6.0 p.m.
Apogee, 30th October, at 5.0 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.