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GENERAL INDEX.

INDEX TO ILLUSTRATIONS.

AUTHOR INDEX

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Event and Comment

Protection for Primary Producers.

THE Commonwealth Government proposes to take a referendum on 6th March on the subject of an addition to section 92 of the Commonwealth Constitution. Two questions naturally arise:—

(1) Why did the fathers of Federation draft section 92—the cause of the farmer's present difficulty—and adopt it in its present form? (2) Why, after thirty-six years of Federation, has it now become evident that this section of the Constitution has, to say the least of it, outlived its usefulness?

So far as can be understood, portion of section 92 was adopted as a compromise when all men's minds were concentrated on tariff policies. The section was deliberately inserted to prevent the different States of the Federation from adopting tariff policies which, while advantageous to them, would have been disadvantageous to other States within the Federation.

Discussing this matter recently, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said—

"In those far-off days there was no suggestion of the organisation of primary producers. In fact, the farmer had so long been the victim of economic forces that nobody even suspected that the time would come when the producer would put concrete proposals for his economic security before Parliaments and cause them to be carried into effect.

"It might reasonably be argued that the arbitration tribunals provided by the States and Commonwealth for wage-earners should have their counterparts for the agriculturist. As arbitration conditions obviously could not apply to the farmer, it became necessary to introduce legislation which gave the farmer some control over the disposal of his produce.

"The real intention behind this legislation was to enable the farmer to gain a fairer economic price for his commodities, and the national viewpoint was that the expansion of Australia must be largely agricultural, and that our expansion could take place only when based on a recognition of the claims of the producer for social and economic justice.

"Queensland was the first State of the Commonwealth to recognise these domestic and national equations, and as a result many years ago several pool boards under grower control were established, and it is safe to say that to-day the farmer does not desire, nor can he afford to go back to the old principles of exploitation, to which he was a victim in the years that are gone. The pool boards in Queensland succeeded in establishing a fair economic price for the producer. In fact, they translated into concrete terms that biblical axiom—'The labourer is worthy of his hire.' "

A successful movement of this description naturally attracted attention to Queensland, and after representations the Commonwealth Government entered into the field of organisation. The Federal Government relied on its powers under section 92, which it was believed at that time bound the States but did not bind the Commonwealth. By a series of legislative enactments several main branches of agriculture were able to organise on a Commonwealth plane, and by a combination of authority the State and Federal Governments were able to regulate interstate trade and set up domestic parities.

The position then was, or appeared to be, that the State had full control of domestic trade; the Commonwealth had the power to regulate interstate trade and to fully control export trade.

Then came the James judgment, in which the Privy Council said: "The State has full power to control domestic trade; the Commonwealth has full power to control export trade, but neither the State nor the Commonwealth has any power to regulate or to control interstate trade." As legislation cannot override the Constitution, the position then became grave in so far as Commonwealth-wide organisations functioning under legislation were declared by virtue of the James judgment to be operating on authority possessing no legal sanction.

The Coming Referendum on Commonwealth Marketing.

REFERRING to the referendum to be taken throughout Australia in March next, Mr. Bulcock stated that the people would be simply asked to give back to the Commonwealth the powers the High Court of Australia believed the Commonwealth was possessed of and which it operated for a number of years. He added:—

> "There are many reasons why this submission should be approved, and perhaps the greatest is that all permanence in society is based on justice. As the farmer is compelled to purchase his commodities in a protected market, and as he has made very large contributions to the solvency of Australia, more particularly during the difficult period of depression, it is obviously fair that he should have extended to him, in whatever form may be practicable, the protection that the people of Australia have given to manufacturers, wage earners, and others.
>
> "As the Constitution has proved itself incapable of adjusting itself to the changing conditions of national life and to the new conceptions of agricultural and commercial practices, a readjustment is imperative, for the farmer cannot survive on overseas parity, which he cannot control, and which frequently reacts against him."

For instance, recently there was a rapid decline in the overseas price of butter. This lessened earning power on the British market was in no way related to the cost of production in Australia. In fact, the production costs of butter were greater during the decline than ordinarily, owing to drought conditions. It represents a phase of marketing over which the producer has no control, and which is frequently harsh in its incidence.

These things were recognised nearly three years ago by Governments, when the Butter Stabilisation Scheme came into operation, and even before that the principle of domestic parity was recognised in respect to the Paterson Scheme, which stabilised butter prices to a degree, and also the Dried Fruits Acts, which was some years ago the subject-matter of an appeal to the Privy Council.

To argue that the farmer must rely on overseas parity, which ordinarily determines domestic price, is to assert that the standard of living of the farmer shall be the standard of living in the countries that determine the price in, say, London, or, in other words, that there will be a lowering of the Australian standard of living which shall be applied to one of the classes—the farming class. This, of course, would be obviously unfair, more particularly in view of the fact that, had it not been for the export of primary products during the last ten years, Australia would have been hopelessly insolvent, and would have gone through the grave financial crises that were so sadly in evidence in many countries of the world.

The Minister's New Year Message

WITH the dawn of the New Year, the farming communities are facing a poll of far-reaching importance to primary production throughout the Commonwealth. If the referendum is carried, producers may look forward to further advances in their economic position. As this question is likely to be the most important to be raised this year, and as important consequences for good or evil will follow the decision, I urge the farming community to close their ranks and make every effort to secure the much to be desired "yes" vote.

The year which has just closed has been one of tribulation and hardship for many sections of producers. Drought and disease have sown grim havoc over many of our landscapes, but the courage of our farmers remains undaunted, and all eyes are turned towards the dawn of happier days. I earnestly pray that these hopes will be realised and life on the land made more profitable from every point of view.

We cannot remain unmindful of the lessons of the past year, but must face the problems to which they may be applied in a spirit of resolute endeavour to overcome the difficulties with which our agriculture is faced, in common with that of every other country.

The coming year should see the introduction of a Federal system of marketing control and, in the State sphere, the launching of a too long-delayed scheme for water and fodder conservation.

At this time we remember the women of the bush and their loyalty to their men and their homes and their fortitude in the face of adversity, and especially hope that to them the New Year will bring its due rewards.

On behalf of the Officers of the Department of Agriculture and Stock, and on my own behalf, I sincerely wish our friends on the land in every part of Queensland a happy, contented, and prosperous New Year.

Frank. W. Bulcock

Seed Treatment of Maize.

R. B. MORWOOD, M.Sc., Pathologist, Department of Agriculture and Stock, and W. W. BRYAN, M.Sc.Agr., Instructor in Plant Breeding, Queensland Agricultural High School and College.

A SERIES of experiments designed to test the effect of a mercurial seed dressing on the yield of maize has been carried out at the Queensland Agricultural High School and College, the Departments of Public Instruction and of Agriculture and Stock co-operating. The series was the outcome of a previous experiment ("Queensland Agricultural Journal," XXXVIII. p. 22) in which the possibility of an increase was indicated. In the early experiment seed slightly affected with dry rot (*Diplodiă zeæ*) had been used, but it was suspected at the time that the effect of the treatment was due to stimulation rather than to actual control of disease. Further consideration of the problem in the light of the results now obtained with disease free seed would indicate that any increase was due to some disease control factor such as a lessening of the incidence of root rot associated with lightly affected seed.

In the experiments which form the subject of this report carefully selected clean seed was used throughout. A late variety—Fitzroy or Improved Yellow Dent—and a mid-season variety—Golden Superb—were included in the trials as were three different dusts tillantin R., ceresan, and semesan. Other dusts which have been favourably reported upon in America are not available locally.

An apparent definite increase in the yield following treatment with tillantin R. in the first year of the trials could not be substantiated in the subsequent more elaborate experiments. In the following season the crop failed and no results were obtained. In the 1934-35 and 1935-36 seasons extensive and carefully planned trials failed to show any advantage for ceresan and tillantin R. dust treatment of healthy seed. Slight increases in favour of treated seed in the former season were not maintained in the latter when with one variety of maize the untreated plots yielded significantly higher than the treated. In 1934-35 the plots planted with seed treated with the dust semesan had a higher average yield than the untreated and the result was just significant. The results with semesan were, however, little if at all better than those with ceresan, and in view of the generally conflicting results in different seasons little notice can be taken of such an isolated increase.

Results.

Yields for 1932-33 and 1934-35 are at 14 per cent. moisture content. In 1935-36 air-dried weights were taken. Row spacing throughout was 4 feet 6 inches.

Season 1931-32.—Trial lost through drought.

Season 1932-33.—

Plan: Four Beaven half-drill strips.

Plot size: Ten rows, 1 chain long, reduced at harvest to 8 rows, 18 yards long. Sown in hills 3 feet apart, 5 seeds sown, each hill thinned to 3 plants.

Planting date: 23rd November, 1932.

Rainfall: 1,742 points over growing period.

Variety: Fitzroy (late).

Treatment.	Bushels per Acre.	Significantly Exceeds.
1. Tillantin R.	56·75	2
2. Untreated	47·95	..

(Odds are > 200·1 in favour of a difference.
S.E. (single plot) = 1·98 b.p.a. Significant difference = 2·80 b.p.a.)

Season 1933-34.—Trial lost through drought.

Season 1934-35.—

Plan: Four 4 x 4 latin squares. (Two independently randomised squares for each variety.)

Plot size: Six rows, 1 chain long, reduced at harvest to 4 rows, 18 yards long. Sown in hills, as in 1932-33.

Planting date: 26th November, 1934.

Rainfall: 1,731 points over growing period.

Varieties: Improved Yellow Dent (late), Golden Superb (mid-season).

Treatment. (Golden Superb.)	Bushels per Acre.	Significantly Exceeds.
1. Semesan	35·53	..
2. Ceresan	34·72	..
3. Tillantin R.	34·02	..
4. Untreated	31·65	..

(Fisher's "Z" test showed that the differences were not significant.)

Treatment. (Improved Yellow Dent.)	Bushels. per Acre.	Significantly Exceeds.
1. Ceresan	31·01	..
2. Semesan	30·66	..
3. Untreated	30·52	..
4. Tillantin R.	29·56	..

(Fisher's "Z" test showed that the differences were not significant.)

Treatment. (Both Varieties.)	Bushels per Acre.	Significantly Exceeds.
1. Semesan	33·09	Untreated
2. Ceresan	32·86	..
3. Tillantin R.	31·79	..
4. Untreated	31·08	..

(S.E. (single plot) = 2·4 b.p.a.
Significant difference = 1·82 b.p.a.)

NOTE.—In this trial (1934-35) mature plant counts were made just prior to harvest. No significant differences in stand could be demonstrated and analyses of covariance for stand and yield showed that in neither variety was there any justification for adjusting yields on the basis of observed differences in stand.

Season 1935-36.—

Plan: Forty-two randomised blocks. (Twenty-one for each variety.)

Plot size: A single row, 86 feet long ($\frac{1}{10}$ acre approximately). Single seeds were spaced one foot apart in the row.

Planting date: 6th December, 1935.

Rainfall: 1,468 points over growing period.

Varieties: Improved Yellow Dent (late), Golden Superb (mid-season).

Row weights were adjusted for stand differences on the basis of a correlation of approximately 0.7 between stand and yield.

Treatment. (Golden Superb.)	Bushels per Acre.	Significantly Exceeds.
1. Untreated	31·26	2 and 3
2. Ceresan	28·23	3
3. Tillantin R.	25·87	..

(S.E. (single plot) = 3·26 b.p.a.
Significant difference = 2·18 b.p.a.)

Treatment. (Improved Yellow Dent.)	Bushels per Acre.	Significantly Exceeds.
1. Ceresan	25·22	..
2. Tillantin R.	24·10	..
3. Untreated	23·51	..

(Fisher's "Z" test showed that no differences were significant.)

Treatment. (Both Varieties.)	Bushels per Acre	Significantly Exceeds.
1. Untreated	27·29	..
2. Ceresan	26·69	..
3. Tillantin R.	24·96	..

(Fisher's "Z" test showed that no differences were significant.)

Conclusion.

The experiments warrant no recommendation for the treatment of well selected maize seed for sowing in Southern Queensland.

Studies on the Biology and Control of the Large Roundworm of Fowls, Ascaridia galli (Schrank 1788) Freeborn 1923.

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[*Continued from p. 746, Part VI., Vol. XLVI.—December,* 1936.]

PART VII.

II. PROPHYLAXIS.

The control of any parasitic disease cannot be brought to a very high standard of efficiency, unless measures are enforced which will prevent infestation by the parasites concerned, or will at least maintain their numbers below the numerical point at which the parasites become harmful.

As there are indications, as set out by Thomas[100], for example, that the treatment of poultry for helminths may not in all cases give beneficial results, the application of any measures which will prevent infestation becomes a very important factor in any worm control campaign associated with domestic birds.

In general, poultry are housed under either one of two systems of farm management, the intensive system or the free-range system. In the light of the knowledge which has been gained in this present investigation, the intensive system, both from the theoretical and practical standpoints, appears to lend itself more readily to helminth control than the free-range system. As the egg becomes infective in the minimum period of eight days, all that appears necessary, therefore, for the control of *A. galli,* where the housing is intensive, is the removal of the droppings at regular intervals of at least seven days. The floors in the houses must necessarily be of concrete or wood, which would permit a thorough removal of all fæcal matter.

As evidence of the degree of control which may be obtained through the adoption of this system some observations by Cuvillier and Jones[45] are of interest. These workers examined three groups of birds—(*a*) Group 1, which had been raised on concrete floors, and when adults confined to buildings with wooden floors; (*b*) Group 2, which had been raised on free range, and when adults confined as in Group 1 and (*c*) Group 3, which had been kept on free range throughout life. Comparing the worm burdens of each group it was found that 30 out of 40 birds were entirely free from worms in Group 1, whilst in Group 2 only two out of 40 birds, and in Group 3 only one out of 36 birds contained no worms.

Besides the removal of droppings at regular seven-day intervals, other measures which are considered to be of value in preventing infestation would be:—

1. Incubators should be given a thorough cleansing before use, and a boiling 5 per cent. disinfectant solution applied. All eggs should be carefully washed.

2. The young chicks should be confined in special brooder pens. These pens should be retained solely for the use of chicks. Concrete or wooden floors are desirable, concrete for preference, and these could be previously cleansed by the liberal application of a boiling 5 per cent. disinfectant solution.

Where it is found too expensive to put in floors of concrete or wood, brooder pens should be placed on soil on which poultry have never been present or have not been running for a number of years.

3. Special precautions should be taken with young birds till they are about three to four months old. For example, the use of a pair of goloshes slipped over the boots when entering a pen of young birds and retained solely for that purpose would be very desirable.

4. Food should be fed as far as practicable from hoppers. Drinking vessels should be of such a type as do not permit the surrounding soil being maintained in a state of constant dampness.

5. It would be advisable to give attention to all damp places in the yards, especially those in shaded positions. The yards and buildings should be kept clean and tidy.

6. Overstocking with the free range and semi-intensive systems is to be avoided. In the case of such animals as sheep, the rate of stocking depends largely on the available food. With poultry, on the other hand, the optimum number of birds per unit area is determined by the health of the birds and their productivity, and can be ascertained only by experience.

7. Rotation of runs and yards is advisable. Where possible yards, etc., should lie spelled from poultry for periods of at least one year.

8. Finally, the greatest consideration should be given to the ration employed. This should be well balanced, with adequate quantities of vitamins A and B and of animal protein. The closest attention should also be given to any other measures which would assist towards maintaining the birds in a good state of health.

Acknowledgments.

This investigation was largely dependent upon the financial assistance given by the Poultry Advisory Committee, Brisbane, to which the writer is duly grateful. Acknowledgment must also be made to Mr. J. Ladewig, late Experimentalist to this Station, for rearing the chickens used in the investigation; to Dr. H. R. Carne, McMaster Laboratory, Sydney, for his kindness in interpreting the histo-pathology of the experimental infestations; to Miss H. Newton Turner, Biometrician, McMaster Laboratory, and Mr. P. McGovern, of this Department, for the statistical analyses; to Mr. I. W. Helmsing, Illustrator, Entomological Branch, for the excellent illustrations and photomicrographs; and to the Poultry Branch of this Department for the assistance given by its officers at various times.

Summary.

1. An investigation has been made into the biology and control of the large roundworm of fowls, *Ascaridia galli*.

2. An examination of 579 birds from the Brisbane area showed the species to be present in 42·1 per cent.

3. A description of the fertile and infertile egg is given. The only other helminth egg with which the egg of *A. galli* could be confused in fæcal examinations of birds in Queensland is that of the cæcum worm, *Heterakis gallinæ*. Distinguishing features of the eggs of these two species are discussed.

4. The optimum temperature for egg development is 33°C. Fresh eggs may withstand temperatures as low as —7·5°C to —3°C for about seventeen days. Temperatures higher than 33°C. are eventually fatal.

5. Fresh and embryonated infectious eggs exposed to sunlight in a liquid medium did not survive for periods longer than three hours. When associated with conditions of desiccation no eggs survived exposure to sunlight for longer than two hours. Eggs in fresh normal-sized droppings allowed to dry out were killed in sunlight after fourteen days, whilst the presence of moisture increased their longevity to twenty-eight days.

6. Fresh and embryonated infectious eggs dried out on glass slides in the shade survived twenty-five, but not thirty, days. Eggs in fresh, normal-sized droppings allowed to dry out in the shade lived thirty-seven days.

7. The resistance of the egg to chemicals of possible use as ovicides was investigated. As a result of these trials it is recommended that a boiling 5 per cent. aqueous solution of a disinfectant with a relatively high tar-acid content be employed.

8. Studies on the longevity of the egg under laboratory conditions showed that in a tap water medium eggs may survive 368 days. Eggs in droppings exposed to natural conditions of rainfall, etc., survived 249 days in a shaded position and 103 days in a position constantly exposed to sunlight.

9. Studies on the life history of *A. galli* showed that under optimum conditions for development the egg may become infective in eight days. The infective stage is the second stage larva, the first moult occurring in the egg in about seven days.

Such infective eggs when fed to chicks hatch in the small intestine, the young larvæ being most frequent a few centimetres posterior to the entrance of the bile duct. For the first nine days the larvæ live freely in the lumen. From the tenth to the nineteenth day the larvæ attack the intestine tissues, and in general feed upon the epithelium lining the crypts. A few larvæ, however, may burrow more deeply into the tissues, and in rare instances may completely penetrate the bowel wall to subsequently occur in the liver, lungs, etc. After the nineteenth day, the larvæ again live freely in the lumen.

Three moults occur during the parasitic life cycle, five, twelve, and eighteen days respectively after infestation. The minimum maturity period observed was twenty-seven days.

10. Observations in the field, assisted by experiments in which birds were fed single and continuous doses of infectious eggs, have demonstrated that *A. galli* is a pathogenic helminth. The symptoms and lesions associated with infestation are described.

11. The resistance of the fowl to infestation was investigated, and it was found that under experimental conditions an age resistance and an acquired resistance could be demonstrated. Among old birds there is both a resistance to the worm itself and to its effects.

Age resistance experiments indicated that if birds could be reared under worm-free conditions till about four months of age they could then be turned on to infested soil with little subsequent ill-effects.

By virtue of this age resistance and assisted by a resistance developed as a result of continuous exposure to infestation old birds should therefore remain unaffected. An attempt to explain why this is not so under natural conditions, as based on Foster's work with *Ancylostoma caninum* in dogs and on Ackert's and Herrick's work on the effect of diet and repeated bleeding on the resistance of the fowl to infestation with *A. galli,* is that any condition likely to affect the health of the fowl makes it susceptible to infestation.

12. Both individual treatment and flock treatment trials were carried out.

Individual Treatment.—A series of tests with several drugs on young birds experimentally infested indicated that a very high efficiency could be secured with carbontetrachloride. Tests with this drug on naturally-infested adult birds confirmed these results. The effective dose rate is given as ·75 ml. per pound weight to a maximum dose of 2 ml., which dose rate is regarded as being reasonably safe. Starvation overnight is necessary for high efficiencies, but no after-starvation period is required. For the purposes of economy it is recommended that the drug be given by means of a syringe and rubber tubing, though higher efficiencies were secured in the young birds by the administration of the drug in capsules.

Two field trials with this drug were carried out on three-year-old birds over a period of eleven to thirteen weeks, and three treatments each of 2 ml. carbontetrachloride were given with an interval of three weeks between each treatment. Unfortunately no evidence of the existence of a heavy infestation in the birds used in either trial was obtained. Under the conditions of the experiments, however, it was found (1) that the handling and starvation associated with treatment did not affect production; (2) that treated lightly infested White Leghorn hens did not at any time reach the production of the untreated birds. The food consumption of the treated birds was also less; (3) in Australorps, in which the infestation was unknown, production was greater in the treated birds than in the controls. The treated birds, moreover, required less food to produce a dozen eggs; (4) treatment was effective against *Ascaridia galli.*

It was concluded that the drug as used in these experiments was not tolerated by the White Leghorns to the same degree as by the heavier Australorps.

Flock Treatment.—Nicotine sulphate mixed with the mash at the rate of ·5 ml. in 150 ml. water per pound of mash, and fed for a period of seven days proved very effective (82·5 per cent.) against *A. galli* under laboratory conditions. This mixture also gave an efficiency of 54.5 per cent. against *H. gallinæ.*

These efficiencies were confirmed by field trials in which four treatments were given at intervals of four weeks over a period of nineteen weeks. The results of these trials also indicated (1) that in the case of lightly infested light breeds treatment may have some toxic effects in so far as can be ascertained by egg production, but with heavily-infested light breeds the removal of the worms by treatment more than offsets any toxicity, so that egg production is increased, the amount of food required to produce a dozen eggs is decreased and the treated birds also convert more food into body weight; and (2) no ill-effects from treatment occurred in a heavy breed, in which the infestation was unknown, treatment resulting in an increased egg production.

Further trials are to be carried out in the field with both carbon-tetrachloride and nicotine sulphate. It would seem that where preventive measures are not enforced control by treatment can be secured only by the regular use of a vermifuge, the interval between treatments being such that the worms do not become large or numerous enough to be pathogenic. For such an experiment birds infested to a degree that their health is impaired are most desirable, otherwise any possible advantage of the removal of the infestation over any toxicity from treatment will not be shown.

13. Measures to prevent infestation are given and the advantages of the intensive system for the application of such measures are discussed.

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VAPOUR TREATMENT EXPERIMENTS FOR THE CONTROL OF BLUE MOULD OF TOBACCO.

Experiments with vapours for the control of blue mould of tobacco in seed-beds were carried out in Brisbane early last year, and have been discussed recently in a report prepared by the Tobacco Pathologist of the Department of Agriculture and Stock.

This method of disease control was developed some twelve months ago by the Council for Scientific and Industrial Research with experiments at Canberra and at various other centres. The most satisfactory results were obtained by evaporating benzol in vapour-tight seed-bed frames at a "normal" concentration, obtained when an area of liquid was exposed equal to 2 square inches for each square foot of seed-bed. In further experiments by the Council and by the agricultural departments of various States other volatile liquids such as toluol, petrol, and the proprietary material, "X3 Solvent," were tested, and in some cases concentrations other than normal were investigated.

In the Brisbane experiments the four materials, benzol, toluol, "X3 Solvent," as well as "X300 Special Boiling Point Spirit," were used at both the "normal" and half the "normal" concentration. In order to compare gas treatment with copper sprays some plots were sprayed with colloidal copper and soft soap. An attempt was also made to reduce the initial cost of equipment by using a special type of vapour-tight tent in place of the more expensive cold-frame for covering the seedlings during vapour treatment.

Although spores of the blue mould fungus were introduced into the seed-beds both by artificial and natural means, the gas-treated beds were successfully protected from the disease, and untreated plants contracted blue mould. This result was obtained with the four volatile liquids tested when used at both "normal" and half "normal" concentrations, and in glass-covered and calico-covered frames as well as in the special vapour-tight tent. Plants sprayed with colloidal copper became only slightly affected with the disease.

There was a tendency for plants treated with vapours to become stunted and pale. This was more pronounced when the higher concentration of vapour was used, and with benzol rather than with materials having a lower boiling point.

It was found that the rate of evaporation varied with the material used, the range of temperature experienced during the period of evaporation and also with the material used as a seed-bed covering, as well as the volume of the vapour-tight structure employed.

Experiments are now being carried out at several tobacco centres to confirm these results and to endeavour to evolve a more satisfactory type of vapour-tight tent.

Principles of Botany for Queensland Farmers.

(C. T. WHITE, Government Botanist.)

[*Continued from page 766, December, 1936.*]

CHAPTER XXIII.

Dicotyledons.

Subclass Archichlamydeæ.—Perianth either absent or rudimentary (as in the She-oaks or *Casuarinaceæ*), in one whorl or series (as in the Silky Oaks or *Proteaceæ*), or in two whorls, in which case the parts of the inner whorl (corolla) are free.

FAMILY CASUARINACEÆ (SHE-OAKS OR SHEOKES).

Casuarinaceæ is a small family of trees or shrubs. The leaves are reduced to minute teeth arranged in a whorl round the nodes. The number of these teeth in a whorl is an important aid to the identification of the various species. The branchlets are green, and function as ordinary leaves and form phylloclades or cladodes (see page 210) of a rather distinct type. The branchlets are usually grooved, with the stomata sunk in the grooves, transpiration thus being reduced and the trees adapted to a dry situation. The flowers are unisexual, and may be borne on the same or distinct trees. The males are arranged in slender cylindrical amenta at the ends of the branchlets. The structure is very simple. The flowers are arranged in whorls in the same way as the leaves; each male flower consists of a single stamen surrounded by two hood-shaped perianth leaves, which break off at their base as the stamen develops. Below the perianth leaves are two persistent bracts. The female flowers, like the males, are exceedingly simple. They are borne in heads or ovoid spikes (amenta) terminating in short lateral branchlets. Each flower consists of a single carpel subtended by a comparatively large bract and two bracteoles. The single ovary or carpel is surmounted by a style with two long, red, threadlike branches. The stigmas are pointed. The fruit or ripened carpel is a seedlike compressed nut with a smooth shining testa produced at the apex into a membranous wing enclosed within the enlarged and lignified persistent bracts and bracteoles, the whole inflorescence forming a compact woody cone.

The family is a small one, finding its greatest development in Australia and New Caledonia, in both of which countries the trees are a distinctive feature of the landscape. In Australia they are familiarly known as She-oaks or (to use the spelling adopted by the Victorian Naturalists's Club) Sheokes. Eight species are found in Queensland, among the commonest being the Swamp Oak (*Casuarina glauca*), which sometimes forms pure stands in the coastal brackish swamps of New South Wales and Queensland. The Belah or Belar (*C. lepidophloia*) is one of the characteristic trees of inland parts of all the eastern States; it is also found in South Australia and West Australia, but not to the same extent. It sometimes forms almost pure stands, but is more often associated with the Brigalow (*Acacia harpophylla*), producing the familiar Brigalow and Belah scrubs of many parts of Queensland. The Bull Oak (*C. Luehmanni*) is very widely spread through Queensland, and is, in fact, one of the most widely distributed species in Australia. It has a very distinctive sparse, upright growth, and is characteristic of a lot of sandy country a hundred miles or more inland in Queensland,

though it is also found nearer the coast. The Red Oak or Forest Oak (*C. torulosa*) is very common on better-class forest country throughout coastal Queensland and New South Wales. It is one of the principal fuel timbers of the State, and great quantities of it are used by bakers, being the favoured bread-baking fuel of coastal Queensland. The River Oak (*C. Cunninghamii*) has a wide range in New South Wales and Queensland, following the river and creek courses, and is a valuable tree for protecting river and creek banks. It is the largest member of the genus, and the wood is prized for the making of bullock yokes. Other species common are the Thready Bark Oak (*C. inophloia*), the Coast Oak (*C. equisetifolia*), and the Black Oak (*C. suberosa*).

Family Ulmaceæ (The Elms).

The family *Ulmaceæ* and the two following—*Moraceæ* and *Urticaceæ*—are now regarded as three distinct ones. In older works on the Australian flora, such as the "Flora Australiensis" and Bailey's "Queensland Flora," they were all included under the one family—*Urticaceæ*.

The *Ulmaceæ* or Elms form a family of trees or shrubs with watery sap and with alternate simple leaves. The flowers are hermaphrodite or unisexual, the calyx is 4-8 lobed, the petals absent. The fruit is dry or thinly fleshy, and is often winged.

The species are mainly found in the temperate zone of the Northern Hemisphere, and the family is of relatively small importance in Australia. Of the Australian species, *Aphananthe philippinensis*, the Axe-handle Wood, or native Elm, is a small or medium-sized tree common in the rain-forests of coastal New South Wales and Queensland, and extending northward to the Philippine Islands.

Trema is a genus of trees and shrubs widely spread over the tropical and sub-tropical regions of the globe. *Trema aspera* is the Peach-leaf Poison Bush, the toxic character of which is due to the formation at irregular intervals of a prussic-acid-yielding glucoside.

Family Moraceæ (Figs and Mulberries).

Moraceæ, the family which contains the Mulberries and Figs, is composed of trees or shrubs, rarely herbs, usually exuding a milky sap. The leaves are alternate or rarely opposite, stipulate with sheathing bud-protecting stipules, the stipules in most cases early deciduous. The flowers are unisexual, and may be borne on the same or different trees. The calyx lobes are four or less, or sometimes absent. The petals are absent. The actual fruit is a small achene nut or drupe, the product of the ripened ovary; in the mulberries the rachis of the female inflorescence and the calyx lobes becomes fleshy, forming a composite fruit. In the figs the flowers are borne on the inner wall of a fleshy receptacle.

The family is a large one, widely spread over the world, but finding its greatest development in the tropics.

The largest genus is *Ficus*, which comprises the fig trees, which are characteristic features of nearly all dense tropical jungles or evergreen forests. There are about 600 species in different parts of the world, about sixty of which are found in Australia, and, with the exception of three or four, all in Queensland.

The majority of fig trees commence life as epiphytes, the seedlings growing in the fork of the branches, or in cracks or wounds, of various

other kinds of trees. Aerial roots are then sent out—first long, slender, flexible roots which, gradually growing longer and stouter, finally reach the ground. These aerial roots keep growing in thickness and strength, and branch and rebranch until they eventually form a lattice-like growth which crushes the life out of the tree on which the seedling fig has started its life. The tree gradually decays, and its rotting wood and bark afford food which is absorbed by the roots of the fig. The whole

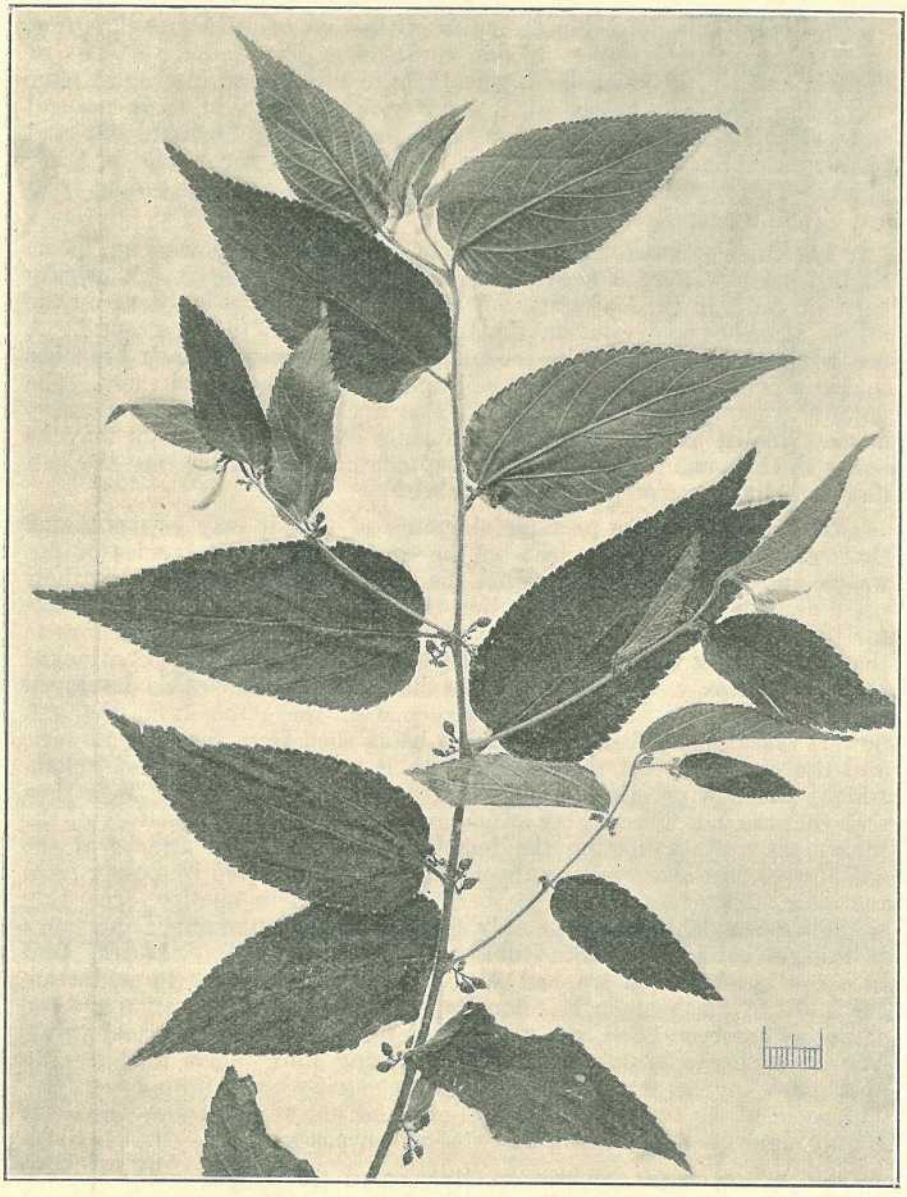

Plate 1.

PEACH-LEAF POISON BUSH (*Trema aspera*).—A common Queensland plant of the Elm family (*Ulmaceæ*).

of the trunk of most figs, with the exception of a small portion near the top of the tree, is thus formed of these aerial roots. Sometimes fig trees send from their branches roots straight down to the ground. These grow into stout column-like props, supporting the branch from which they spring. The branches keep on growing farther and farther out, every now and then sending down another prop-root, until a single tree in this way may eventually cover several acres. Fig trees that have this habit of growth are known as Banyans.

All species do not begin their life in the tops of other trees. A few, such as the common edible fig and the Cluster Fig, found in parts of Central and North Queensland, germinate in the ground in the ordinary way; also, species like the Moreton Bay Fig, which in their natural state start life high up in other trees, in ordinary horticultural and forestry practice are raised in flats or beds in the same way as other plants. The explanation, no doubt, lies in the fact that the young trees are "light-demanders."

The chief botanical characteristic of figs is that the flowers are borne on the inner wall of a closed receptacle. The receptacles are usually borne in pairs in the leaf-axils, but in some species may be borne on the larger branches and even on the trunk right down to the ground. A few tropical species bear the receptacles in clusters upon long branches that run over the surface of the soil and take root here and there. The flowers are unisexual, and there is also a class of neuter or abortive flowers known as gall flowers. The male and female flowers may be borne in the same or in different receptacles, in the latter case the gall flowers being associated with the males.

To understand the peculiar structure of figs, it may be mentioned that fertilization is dependent on the work of different species of fig-wasps, and the gall flowers are not the result of insect agency, but their peculiar structure rather determines the selection of them by the insect for the reception of its eggs. The gall flowers thus act as protectors to the seed-bearing flowers, which otherwise would probably be attacked by the fig-wasps, with the consequence that the grub afterwards developed would destroy the seed. The emergence of the pupa from the gall flowers takes place when the pollen is being shed from the male flowers, and the mature insect takes away with it a certain amount of pollen, which, somehow or other, is conveyed to the female flowers. It is thus seen that the gall flowers play an important part in the life history of the plant, not only protecting the female flowers from the attacks of the gall insects, but also insuring them later being pollinated by pollen from the male. Fig trees yield a rubber which varies in quality, according to the species yielding it. The only species of any commercial importance in this respect are the India Rubber Tree of India (*Ficus elastica*), and in a few species from tropical West Africa. The rubber formed from the juices of the common Moreton Bay Fig and other Australian species, so far as has been tried, has not proved to be of any commercial value. The inner barks of fig trees yield a strong fibre much used by the aborigines in the manufacture of twine, string-bags, fishing-nets, &c. The wood of fig trees is generally light and not very durable; hence it is only used for case-making and similar purposes.

Other important genera are *Morus* and *Artocarpus*. The former includes the Mulberries. The Black Mulberry (*Morus nigra*) is very abundant in cultivation in Queensland. The White Mulberry (*Morus alba*) possesses a fruit of very poor quality, but is extensively planted

in Southern Europe and other countries for silkworms, the silk produced being reputed of better quality than when the Black Mulberry is used as the food plant.

Artocarpus includes the Bread-fruit (*A. incisa*), very common throughout the Southern Pacific and an important article of food among the natives and the Jak (or Jack) Fruit (*A. integrifolia*), grown to a limited extent in Queensland. The true Bread Fruit is not to be confused with the Pandanus tree—common along the coast and often called "Bread fruit" by Queenslanders.

FAMILY URTICACEÆ (THE NETTLES).

The Family *Urticaceæ*, as now recognised, is a comparatively small one of herbs, shrubs, or soft-wooded trees often armed with stinging hairs. The leaves are simple, alternate or opposite. The flowers are unisexual, the calyx lobes 4 or 5, petals absent; in the female flowers the calyx often becomes enlarged and fleshy in fruit. The fruit is a dry achene or fleshy drupe.

Nine genera occur in Queensland, one containing trees. The family contains the Stinging Nettles, the genus Urtica, of which two species are very common in Queensland—the one *Urtica incisa*, a common herb or small shrub on "scrub" (rain-forest) edges in Queensland, the other the common English Nettle, *Urtica urens*, naturalised and common in South-Eastern Queensland, particularly on the Darling Downs, and in the cooler parts of the State generally.

The genus Laportea is widely distributed through the tropical regions of the world, and three species occur in Australia—all in Queensland. The Giant Stinging Tree (*Laportea gigas*) attains the dimensions of a very large tree; another—the Shining-leaf Stinging Tree (*L. photiniphylla*)—is a medium-sized tree; while the third—*L. moroides* (the Gympie)—is only a shrub. The characteristic feature of the trees is the irritating sting they inflict when brushed against the naked skin. This irritation varies in intensity with the different species. In some of the Laporteas the effects of the sting may last for months, being noticeable every time cold water comes in contact with the flesh.

When examined closely, the leaves of the Stinging Trees are seen to be clothed with innumerable minute hairs, with here and there larger ones scattered among them. These larger hairs take the form of hollow brittle tubes, and are filled with a strong acid. They usually arise from a raised mound or cushion and taper gradually to the apex. They are terminated by a small head, which breaks off at the lightest touch. When the sharp, broken point of the hair pierces the skin, it pours out the strong acid contained in the hollow part of the hair.

FAMILY PROTEACEÆ (SILKY OAKS).

Proteaceæ is a family of woody plants of very characteristic structure. The leaves are mostly alternate, rarely opposite or whorled, and are simple or variously divided. The flowers are mostly hermaphrodite, though sometimes unisexual. They have only the one series of perianth segments. In Bentham's "Flora Australiensis" and Bailey's "Queensland Flora" the floral parts are simply referred to as perianth segments. In his "Families of Flowering Plants," Hutchinson regards them as sepals or calyx lobes. Some authors regard them as petals, basing their decision on the similarity of the flowers to those of their close allies,

the *Loranthaceæ* or Mistletoes. On the other hand, Hutchinson may be right, and perhaps the hypogynous glands represent a very modified corolla. Under these circumstances of doubt, it is perhaps perferable to use the term "perianth segments," as adopted by Bentham, Bailey, and others. The perianth segments are four in number, and are usually united into a tube in the bud stage and variously split when open. The stamens are epipetalous—*i.e.*, attached to the petals and appearing as if they had grown out of them—rarely free. The ovary may be sessile or narrowed into a stalk (called the stipes) at the base. The fruit is various, being a nut, drupe, follicle, or capsule. The seeds are without endosperm, and in the follicular fruits are usually winged.

The family is a large one of about 1,000 species, distributed through fifty genera widely spread over the world, but poorly represented in the Northern Hemisphere and finding its greatest development in Australia and South Africa, particularly in the former country, where about 650 species are found. About 300 are found in South Africa, and the few remaining species are scattered over the Pacific Islands, New Zealand, South America, and tropical and temperate Asia.

The distribution of the family is rather remarkable. It reaches its greatest development in South Africa and Australia, but none of the genera are common to the two countries. South America, on the other hand, possesses two genera common to Eastern Australia and to the mountainous regions of West South America. Of these two genera, *Lomatia* has three species in South America and six in Australia; *Embothrium* has four species in South America and one or several in Australia, according to the view taken of the genus; *Helicia* is one of the few genera that extends to the Northern Hemisphere, several species being found in the southernmost islands of Japan. It is quite common in Eastern Australia, extending from the far North southwards to the Northern Rivers district of New South Wales.

To the Queenslander, the main interest in *Proteaceæ* arises in the beauty and value of the timbers, several of which are cut and sold indiscriminately under the name of Silky Oak. In previous years the familiar *Grevillea robusta* provided all the Silky Oak of the trade, but now practically all comes from various North Queensland trees—mostly *Cardwellia sublimis*. The outstanding feature of the wood is the great width and depth of the medullary rays, which give rise to the characteristic oak figure when the timber is radially or quarter cut, as is the general practice in Queensland with fancy timbers such as the Silky Oak and Maple.

The original Silky Oak of the Australian trade was the product of *Grevillea robusta* of South-eastern Queensland and Northern New South Wales. In Southern Queensland and in New South Wales a certain amount of the timber of *Orites excelsa* was also cut. In Queensland, this tree is found at altitudes of 2,000 feet and over. It is very well developed in the Killarney district, and is sometimes known as Killarney Oak. The commonest Silky Oak of the trade at present is *Cardwellia sublimis*, a large tree of the North Queensland rain-forests.

Silky Oak seasons well and rapidly, and is one of the most workable and ornamental of cabinet woods. It can be carved, veneered, bent, glued, and stained or polished with equal readiness. It is light, but firm and strong, and holds nails better than most timbers In North Queensland it is used for general building purposes, even as weatherboards, and generally for doors and window sashes.

Macadamia is a genus of three or four species confined to Eastern Australia, and finding its greatest development in Queensland. The principal characteristic of the genus is its fruit, consisting of a coriaceous pericarp split into two valves and enclosing one or sometimes two seeds. The seeds are enclosed in a very hard, bony, usually brown, and shining testa. The leaves are verticillate, opposite or alternate, toothed or entire. The flowers are borne in slender, either simple or branched racemes. The best-known species is *M. ternifolia*, the common Macadamia Nut, Queensland Nut, or Australian Bush Nut, unquestionably one of the finest flavoured nuts in cultivation. Many forms have been recognised, and the tree shows considerable promise as an economic nut producer. A remarkable feature about this tree is that, though it is a native of Southern Queensland and Northern New South Wales, and normally found in heavy rain-forest country with 45 to 70 inches of rainfall, the leaves remind one, by their leathery nature, of a xerophytic rather than a mesophytic type, and the tree has been found in cultivation to be fairly drought-resistant.

The seeds of two other species of the genus—namely, *M. minor* of South-East Queensland and *M. Whelani* of North Queensland—both contain a prussic-acid-yielding glucoside, and are only edible after the glucoside has been destroyed by washing and heat. Another species—*M. praealta*, the Ball Nut of South Queensland—is common in parts of the Wide Bay district. It is rather different from the other species of Macadamia in general appearance; the seed is not known to possess any poisonous properties, though it has an exceedingly bitter taste, which renders it of no value as a nut producer.

FAMILY LORANTHACEÆ (THE MISTLETOES).

The Loranths or Mistletoes are shrubs parasitic on trees or are very rarely erect terrestrial trees. The leaves are mostly opposite, and are sometimes reduced to scales. The flowers are hermaphrodite or unisexual, and are often brightly coloured; the perianth is double (*i.e.*, with both calyx and corolla) or apparently single by suppression of the calyx limb. The calyx-tube is adnate to and encloses the ovary. The petals are 4 to 8, free or united, stamens as many as the petals, opposite to them and usually epipetalous. The fruit is a berry with a solitary seed devoid of testa.

Loranthaceæ is a large family estimated to contain about 500 species, most of which are tropical and sub-tropical. The family is represented in Australia by about fifty species. Strange to say, none occur in Tasmania.

Mistletoe are parasites, or, rather, partial parasites, which live upon various kinds of trees, deriving their water supply and mineral food constituents from them. By means of green leaves or branchlets they can make the whole or at least part of their organic food by photosynthesis (see pages 617 and 619), though they probably obtain some organic food needful for their life from the host. The plants enfeeble the branches of the trees upon which they are parasitic, and are directly injurious by allowing the entrance of destructive insects and fungi at the swollen cankered places which are often produced where they take root.

The only method of eradicating and diminishing the attacks of Mistletoes is by cutting off the infested branches. Breaking off the branches of Mistletoes is of little or no use, as it usually only stimulates adventitious growth.

Mistletoes vary a good deal in regard to their choice of hosts. Some species show distinct preferences in this respect; others attack numerous species of trees indiscriminately. *Notothixos subaureus* is almost invariably parasitic on other species of Mistletoes. Sometimes there is a close similarity in general facies of the parasite to its host, thus *Loranthus linophyllus* is almost invariably found growing on *Casuarina*, and *L. pendulus* on *Eucalyptus*. Most are quite dissimilar to the host tree. Some are found on a number of trees, but favour some kinds more than others. *L. Bidwillii* I have not seen on trees other than Cypress Pines (*Callitris* spp.). *L. congener* is very common on most trees, but favours *Casuarina*. *L. vitellinus* is very common on most trees, but favours *Tristania suaveolens* (Swamp Mahogany).

The fruit of Loranthus is a one-seeded, commonly somewhat transparent berry. The seed is enclosed in a viscid and rather sweet pulp, which, when exposed to the air, dries rapidly. Birds carry the seed from tree to tree. Although numbers of seeds pass through the alimentary canal of the birds, a greater portion are rejected after having their exterior covering removed. These falling may adhere to branches, and in a short time become firmly cemented on the upper surface and sides.

The germination and life history of one of the common Australian Mistletoes (*Loranthus exocarpi*) has been studied by C. C. Brittlebank, and his observations published in the "Proceedings of the Linnean Society of New South Wales" (Vol. XXXIII.). The following notes are based on his work.

Seeds which have passed through the alimentary canal of birds germinate as readily as those which have fallen directly from the parent plant. If the seeds fall on larger branches covered with a thick layer of dead bark, they are unable to penetrate to the soft underlying cortex, and perish; owing to this fact, Mistletoes are generally found to start life upon thin limbs or on branches which have clean, tender, and sappy bark. The embryo runs through the longer axis of the seed, and is completely surrounded by a store of plant food (albumen), the whole of which—both embryo and albumen—is stained green by chlorophyll. The germination period varies greatly, in some cases the seeds starting to germinate within one or two days, but in other cases germination may be delayed for a couple of months. Germination having begun, the hypocotyl emerges from a terminal pore which up to this time it had filled, somewhat after the manner of a stopper in the neck of a flask. The hypocotyl may bend downward towards the branch, but in many cases it bends upwards and over the seed, reaching the branch behind. As the axis of the embryo lengthens, it becomes covered by little processes. The extremity of the hypocotyl becomes enlarged, club-shaped, and papillose. This and the clavate processes exude a clear liquid, which plays a most important part in the life of the plant. This fluid comes in contact with the bark of various plants, at once penetrating its structure, softening and partly dissolving the cellulose matter, and at the same time cementing the apex of the radicle, which now becomes flattened and disklike, to the branchlet of the host. The end of the hypocotyl now becomes rapidly enlarged, spreading out into a hemispherical mass. The cells of the distal surface grow out and enter the host as papillæ. The cotyledons may remain within the seed-coat or be carried up, in this case commonly acting as protective leaves to the young plumule. As soon as penetration of the host is effected growth becomes very rapid. It often happens that before much leaf-growth is made a

large tubular aerial root is thrown out from the sucker, and this root grows rapidly along the branch, soon seeking the under side. Here and there along these lateral aerial roots large suckers arise from which roots of the parasite penetrate the host. As growth develops, a wedge-shaped root or sinker passes down into the wood of the host, which it penetrates in various ways, according to the species of Loranth and the nature of the host wood which it invades.

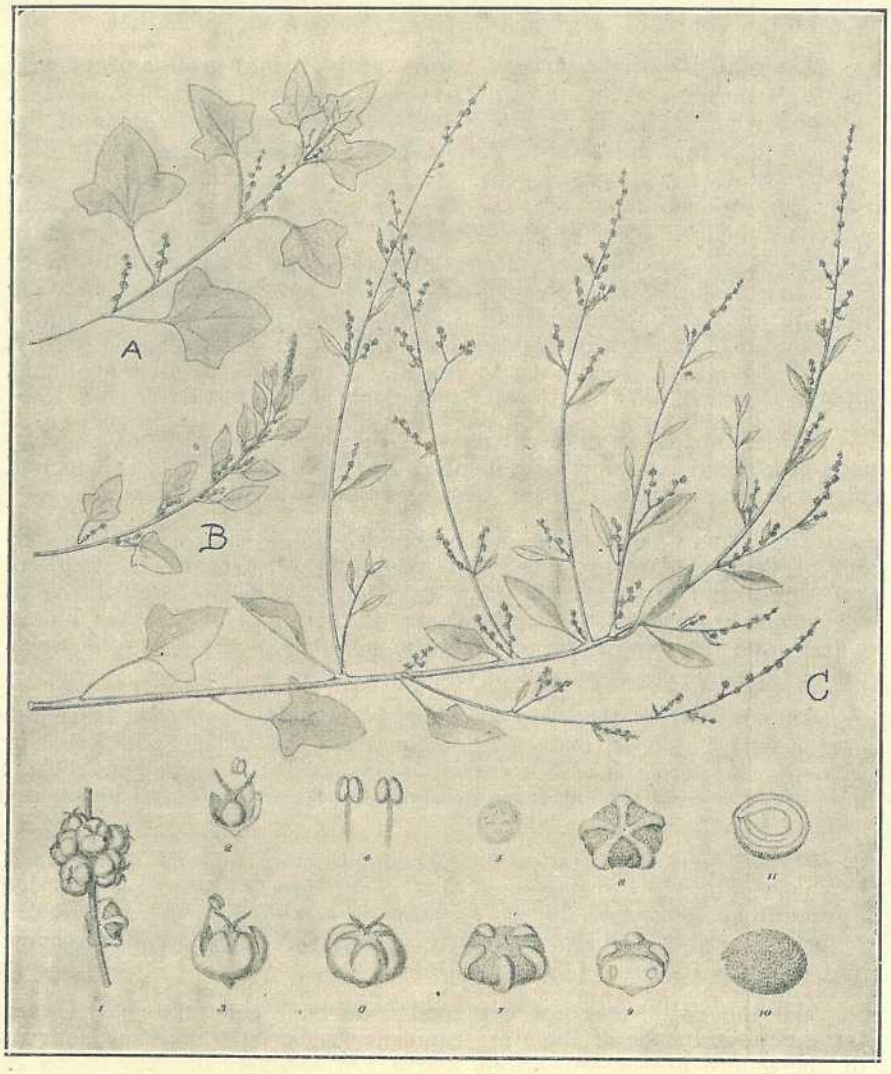

Plate 2.

GOOSEFOOT (*Chenopodium triangulare*), R. Brown. A very common plant of the Salt-bush Family (Chenopodiaceæ) A, B, and C.—Shoots somewhat reduced.

1.—Portion of branchlet bearing flowers.
2.—A flower, part of the calyx removed.
3.—A flower.
4.—Back and front view of a stamen.
5.—Pollen grain.
6.—A young fruit.
7 and 8.—Mature fruits (seeds).
9.—Longitudinal section of a fruit.
10.—A seed.
11.—Transverse section of seed.
1-11.—Variously enlarged.

(*After Mueller in "Iconography of Australian Salsolaceous Plants."*)

FAMILY CHENOPODIACEÆ (SALTBUSH FAMILY).

Annual or perennial herbs or shrubs. Leaves usually alternate. Flowers small, commonly green and insignificant, hermaphrodite or unisexual. Sepals 5, persistent, and often enlarged in fruit. Petals absent. Stamens 1-5. Ovary superior. Fruit, a seedlike nut.

The family is of most interest to the Australian farmer and pastoralist, on account of the number of edible shrubs (top-feed) and herbs it contains. Most of these are familiarly known as Saltbushes.

The edible Saltbushes belong to several distinct groups or genera, the three most important being *Atriplex, Chenopodium,* and *Rhagodia, Atriplex,* the largest, is widely spread over the warmer regions of the globe, but in countries other than Australia the species are mostly confined to sandy lands near the sea. *Atriplex nummularia* is the Old Man Saltbush, a shrubby species extensively planted both as a fodder plant and as a hedge. One of the commonest and most widely spread in Queensland is *A. Muelleri,* mostly known as the Annual Saltbush or Saltweed, a species that comes up in tremendous abundance following both autumn and spring rains. It grows to a height of 18 inches to 2 feet. Considerable divergence of opinion exists as to its palatability, but, on the whole, stock seem to reject it when other feed is available, though they will eat it at times, particularly when it is drying off.

Widely spread in different parts of the State, and particularly common on cleared Brigalow and Belah country on the Darling Downs and in the Maranoa district, is the Creeping Saltbush, *A. semibaccata.*

The genus *Chenopodium* is a large one. The species occur in different parts of the world—mostly as weeds of cultivation. In England and America they are frequently referred to as Goosefoots, owing to the common shape of the leaves being like the foot of a goose, but in Queensland the various forms of Fat-hen belong to the genus *Chenopodium,* the commonest being *Chenopodium album.*

In addition to the ones growing as introduced weeds, there are twelve native species, and some of these are of considerable value as fodders. Perhaps the best is the Blue Bush, *C. auricomum,* an upright growing species of the interior, mostly about 3 feet high, and producing a large amount of edible leaf.

Rhagodia is very similar to *Chenopodium* in general appearance, but has small, fleshy fruits, those of *Chenopodium* being quite dry. One of the Rhagodias—namely, *R. hastata*—is commonly used as a hedge plant, and some beautiful hedges of it can be seen about Toowoomba and other parts of the Darling Downs.

All the Saltbushes are not good fodders. The family is a very large one, and some of them are common weeds, more especially plants of the genus *Bassia,* several of which are common pasture weeds in Queensland. The best known is perhaps the Galvanised Burr, *Bassia Birchii.*

Important vegetables belonging to this family are the Beetroot, *Beta vulgaris,* and the Spinach, *Spinacia oleracea.* The Silver Beet mostly cultivated in Queensland as Spinach is a variety of the common Beetroot, *Beta vulgaris.* It is regarded by some botanists as a distinct species, *Beta Cicla.*

FAMILY ANNONACEÆ (CUSTARD APPLE FAMILY).

A family of trees, shrubs, or woody climbers. Leaves alternate, simple, entire. Flowers sessile or pedicellate, solitary or clustered. Sepals 3, usually free, but sometimes united into a toothed or lobed calyx. Petals mostly 6, sometimes 3 or 3 large and 3 much reduced. Stamens numerous, closely packed on the thickened torus or floral receptacle. Pistil usually composed of numerous carpels, free and distinct from one another. Fruit composed of several free carpels (berries) or a syncarp, as in the Custard Apple and its allies, formed by the growing together of the carpels and floral receptacle into a fleshy mass.

The family is widely spread over the tropical and sub-tropical regions of the world. A number of species are natives of the rain-forests or jungles of coastal Queensland. The most important genus, from an economic standpoint, is *Annona*, which contains the Custard Apple, *A. squamosa*, the Cherimoya, *A. Cherimola*, the Sour Sop, *A. muricata*, and the Bullock's Heart, *A. reticulata*. Most of the species of *Annona* come from tropical America. The name is usually spelt "Anona," but W. E. Safford, an American botanist, who has paid particular attention to these fruits, says the correct spelling and the one adopted by Linnæus (see page 748) is "Annona."

FAMILY LAURACEÆ (LAUREL FAMILY).

Lauraceæ is a family of trees or shrubs with alternate leaves, or in one genus—*Cassytha*—reduced to leafless parasitic twiners. The flowers are small, hermaphrodite or unisexual, and borne in panicles, though sometimes in racemes or spikes. The perianth tube is short; the lobes are usually six in number, but vary from three to six. The stamens are 3-9, or indefinite; the anthers open by valves. The fruit is a berry or drupe; the perianth entirely deciduous, as in *Endiandra*, or the tube enlarged and cup-shaped under the fruit, as in *Litsea* and *Cinnamomum*, or entirely closing over and adnate to it, as in *Cryptocarya*. The seed is ex-albuminous (see page 386 and plate 176), with large cotyledons.

The family is a large one, containing about 1,000 species distributed through forty genera, mainly tropical, but extending to the temperate regions of both the Northern and Southern Hemisphere. About fifty species are found in Australia, and all of these, with the exception of one or two members of the parasitic genus *Cassytha*, are found in Queensland. With the exception of the genus *Cassytha*, the species are all trees. They are common in Eastern Queensland and Northern New South Wales, and in many cases represent a fairly large percentage of the trees in the rain-forests or jungles.

The Laurels, though they represent a fair proportion of the trees in many of the rain-forests of coastal Queensland, yield only a few important as timber species. The most important is the North Queensland Walnut, *Endiandra Palmerstoni*. This is one of the largest and commonest trees of North Queensland, and a good deal of the timber, particularly of the walnut butts for veneer manufacture, has been exported abroad, largely to the United States.

The family contains the Avocado (*Persea gratissima* or *P. americana*), a native of tropical America now widely cultivated in tropical and sub-tropical countries. A peculiar feature that has been much studied of late is the sex-reversal of the one-day flowers. Some flowers mature the male organs (the stamens) first, and the female organ (the

pistil or gynæcium) later. These are known as protandrous flowers. Others have the reverse action, the pistil maturing first and the anthers later. Such flowers are called protogynous. The flower types of numerous commercial varieties have been worked out by Dr. A. B. Stout, of the New York Botanic Gardens. The value of this work to the orchardist is that an intermingling of the protandrous and protogynous types should result in a bigger fruit crop than the one type alone.

FAMILY CRUCIFERÆ (THE CRUCIFERS OR CABBAGE FAMILY).

A family of annual, biennial, or perennial herbs. Leaves simple, alternate, or, more rarely, opposite. Flowers mostly arranged in racemes. Sepals 4, petals 4, or in a few cases absent. Stamens 6, two shorter than the other four. Pistil or gynæcium simple. Fruit an elongated pod (often termed a siliqua) or short pod (often termed a silicule), bi-valved or indehiscent.

Cruciferæ is a large family, finding its greatest development in the temperate regions of the world. Its useful members include many vegetables, as the Cabbage (*Brassica oleracea*), Turnip (*Brassica Rapa*), Radish (*Raphanus sativus*), Cress (*Lepidium sativa*), Water Cress (*Nasturtium officinale*), &c. It contains many garden flowers, as Stocks (*Matthiola*), Wallflowers (*Cheiranthus*), &c. Some of the species are very common weeds of cultivation and pasture land in Queensland; most of them give a very objectionable odour and flavour to milk and cream. They are familiarly known as Mustard or Turnip Weeds.

FAMILY PASSIFLORACEÆ (THE PASSION FRUITS).

A family of climbers or, more rarely, trees. Leaves alternate, often with glands on the leaf-stalk. Flowers mostly hermaphrodite, sometimes unisexual. Sepals 5, free or partly united. Petals 5, rarely absent. A corona is present, usually composed of one or more rows of threadlike filaments, sometimes annular or composed of scales. Stamens 5 or more, ovary 1-celled, with several parietal placentas (see page 376) and numerous ovules. Fruit a berry (or, rarely, a capsule); seeds numerous, with a pitted surface.

Passifloraceæ is a family widely spread over the tropics and subtropics of the world. It includes the common Passion Fruit (*Passiflora edulis*), the Granadilla (*Passiflora quadrangularis*), the Banana Passion Fruit (*Tasconia mollisima*), and other species less frequently seen, as the Yellow or Sweet Granadilla (*Passiflora ligularis*) and the Sweet-cup (*Passiflora laurifolia*). Several native species are found in Queensland, the two commonest being *Passiflora Herbertiana* and *P. aurantiaca*, which contain a prussic-acid-yielding glucoside (see page 614), and may cause the death of cattle that eat heavily of them. The White Passion Vine (*Passiflora alba*) is very common in many localities, especially as secondary growth on cleared country, growing over old logs in fallen scrub and in the better-class forest country. In times when grass is scarce, particularly towards the end of spring and beginning of summer, the young shoots are eaten by stock. Repeated tests of the leaves of Queensland material for the presence of a prussic-acid-yielding glucoside have given negative results; so some other poisonous body must be the cause of the trouble experienced with this plant. Feeding experiments with this vine were carried out by the late Dr. Sydney Dodd, and his results published in the "Queensland Agricultural Journal" for February, 1910. The symptoms as described

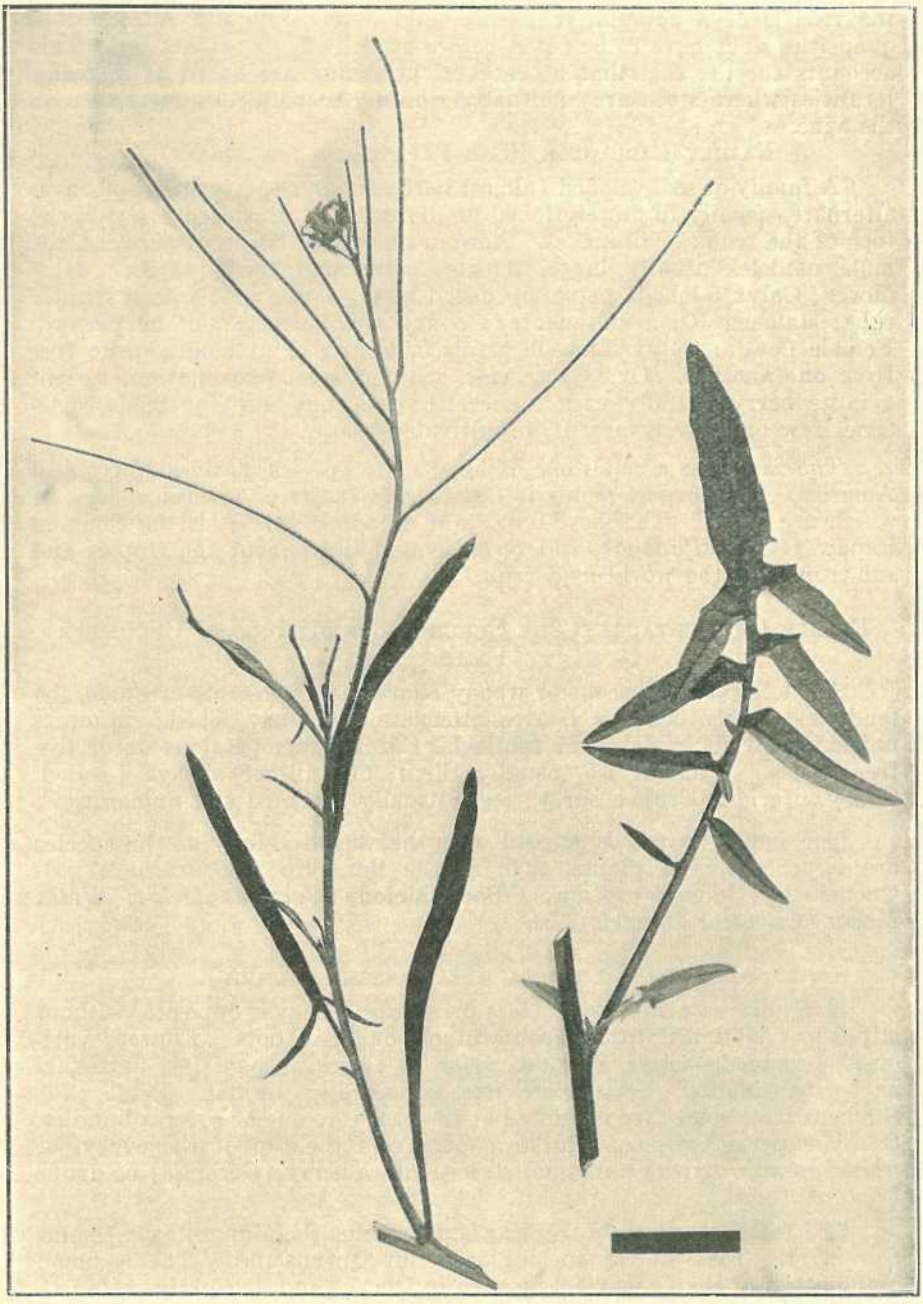

Plate 3.

TUMBLING MUSTARD (*Sisymbrium orientale*).—A plant of the Cabbage family or Cruciferæ.

by him are certainly not those of prussic acid poisoning, for a feature brought out by the investigation was that the poisonous property of the vine is of a cumulative nature, and evidently quite considerable quantities of it have to be eaten before any ill-effects are noticed. This accounts for the fact that no cases of poisoning are heard of in many localities where stock are habitually running in paddocks overrun with the vine.

FAMILY CARICACEÆ (THE PAPAW AND ITS ALLIES).

A family of soft-wooded (almost herbaceous) trees or shrubs. Leaves alternate, usually digitately lobed or divided and clustered towards the tops of the trunk or branches. Flowers unisexual, borne in panicles, the male panicles usually large, females small and few-flowered. Male flower: Calyx 5-lobed; petals 5, united in the lower part into a slender tube; stamens 10; a rudimentary ovary may or may not be present. Female flower: Calyx 5-lobed; petals 5, united or at length quite free from one another. Ovary superior, with parietal placentation. Fruit a large berry, usually with numerous seeds, but the ripe seeds sometimes few or entirely absent in cultivated plants.

The family is a small one of about fifty species, natives of tropical America. The largest genus is *Carica*, the fruits of several species of which are edible. The most important economic species is the common Papaw (*Carica Papaya*), widely cultivated throughout the tropics and sub-tropics of the world as a fruit.

FAMILY CUCURBITACEÆ (THE CUCURBITS OR MELON AND CUCUMBER FAMILY).

A family of herbaceous or woody climbers or prostrate creepers, the tendrils spirally coiled. Leaves alternate, variously lobed. Flowers unisexual. Calyx 5-lobed or toothed. Corolla gamopetalous or of five free petals. Stamens 1-5, usually three; one anther always 1-celled. Ovary inferior. Fruit a berry; seeds usually flattened and numerous.

The family is widely spread over the world. Many of the species are important crop plants, such as the Pumpkin (*Cucurbita Pepo*), Cucumber (*Cucumis sativus*), Rock Melon (*Cucumis Melo*), Water Melon (*Citrullus vulgaris*), &c.

FAMILY GUTTIFERÆ (MANGOSTEEN FAMILY).

Guttiferæ is a family of trees or shrubs. Leaves opposite, without stipules, sometimes with translucent oil or resin dots. Flowers variously arranged—single, in clusters, or in cymes or panicles; unisexual or hermaphrodite. Sepals 2-6, free or slightly united. Petals 2-6. Stamens numerous, free or united at the base into one or several bundles. Ovary superior, stigmas radiating out from the top of the ovary, or united; sessile or with a distinct style. Fruit a berry (*Garcinia*) or drupe (*Calophyllum*).

The family is entirely tropical and contains the Mangosteens (genus *Garcinia*). Five native species occur in Queensland. The common Mangosteen of the East, rarely grown in Queensland, is *Garcinia Mangostana*. An inferior species (*G. Xanthochymus*) is sometimes cultivated in North Queensland gardens. Another genus is *Calophyllum*, represented in Queensland by three species, one of which (*C. inophyllum*) is much grown as a street and esplanade tree in North Queensland. It is widely spread over the Indian, Malayan, and Pacific regions. It is

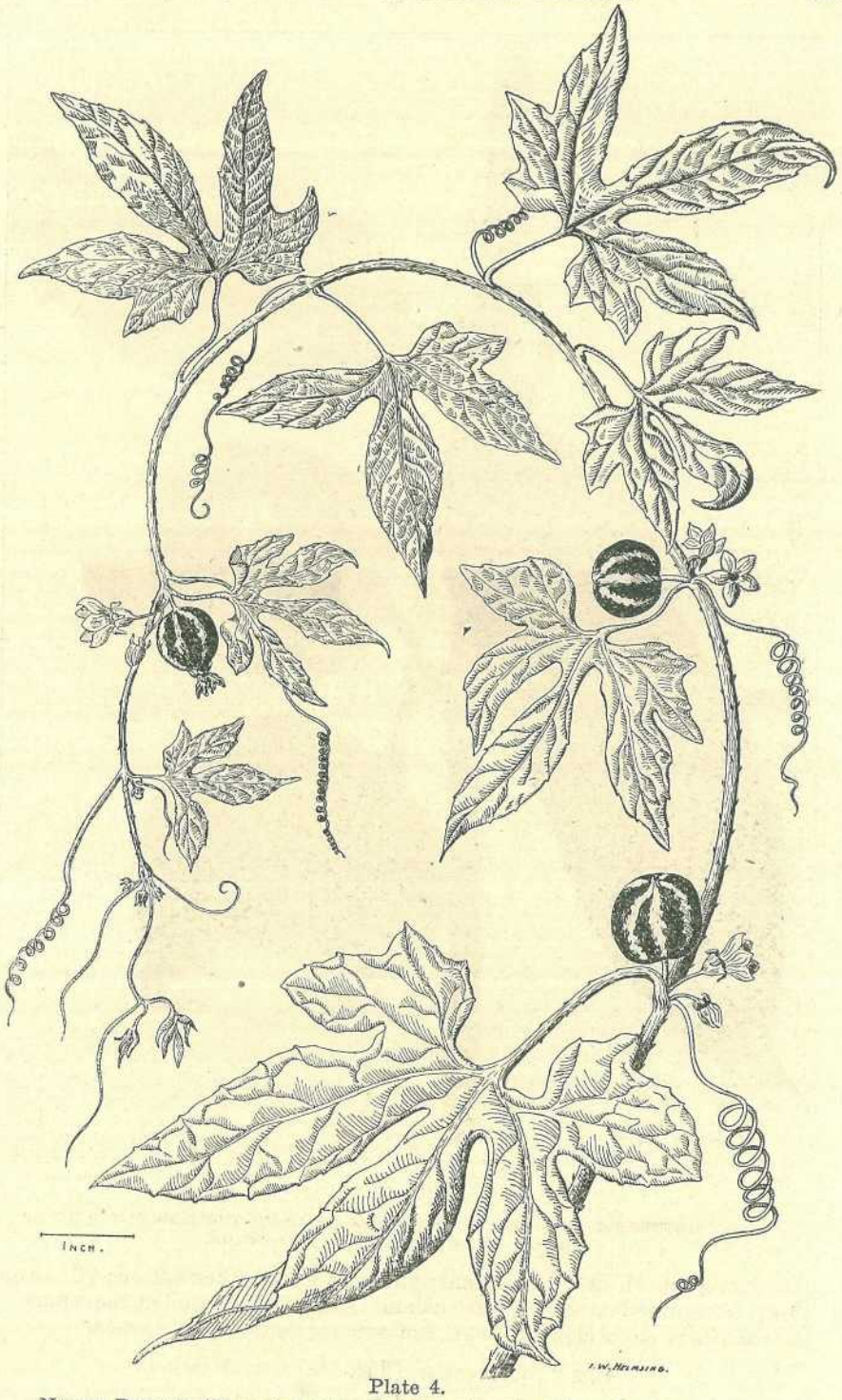

Plate 4.

NATIVE BRYONY (*Bryonia laciniosa*).—A native vine of the Family Cucurbitaceæ. The fruits are red with white wavy lines, and are poisonous.

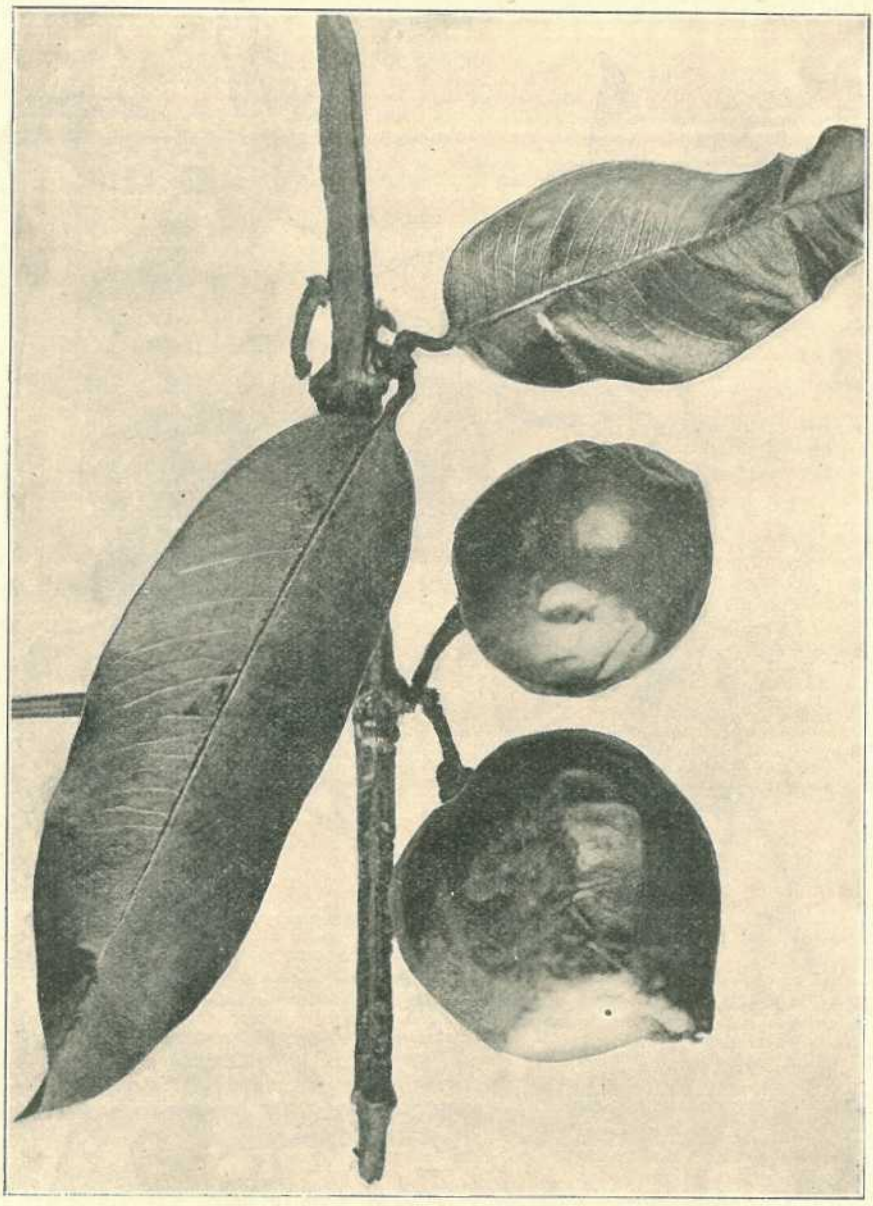

Plate 5.

FAMILY GUTTIFERÆ (*Garcinia Xanthochymus*).—An inferior mangosteen grown to a limited extent in North Queensland.

sometimes known as the Alexandrian Laurel. Another species (*C. costatum*) is confined to North Queensland. The timber under the name of *Calophyllum* is extensively used for general building purposes.

FAMILY MALVACEÆ (THE MALLOW FAMILY).

A family of herbs, shrubs, and trees, usually with a fibrous bark. Leaves alternate, stipulate, but the stipules sometimes soon falling and

only seen in the bud stage. Flowers mostly hermaphrodite, sometimes unisexual. Sepals 3-5, in some genera, such as *Hibiscus* and *Gossypium* (cotton), surrounded by a ring of bracteoles (called an epicalyx). Petals 5, free, but often joined at the base to the staminal column; stamens numerous, joined together in a staminal column; anthers 1-celled. Ovary 2-many-celled. Fruit a dry capsule or breaking up into cocci or mericarps (see Plate 170).

The family is widely distributed over the world. Some are very common farm weeds in Queensland— *e.g.*, "Sida retusa" (*Sida rhombifolia*), Button Mallow (*Modiola*), &c. Several are cultivated as ornamental shrubs, particularly members of the genera *Abutilon* and *Hibiscus*. Both these latter are well represented by native species in the Queensland flora. The bark of many yields a strong cordage. The most important economic genus is *Gossypium*, which includes the Cotton (*G. herbaceum*) and Sea Island Cotton (*G. barbadense*).

FAMILY STERCULIACEÆ.

A family of herbs, shrubs, or trees, very closely allied to the Mallows, differing chiefly in the 2-celled—not 1-celled anthers. The leaves are much lobed and divided or entire.

The calyx is 3-5 toothed or lobed. Petals 5, reduced to small scales or entirely absent. Ovary 2-5 celled, the carpels united or more or less distinct. Fruit either a capsule or composed of a number of distinct follicles as in *Sterculia* and *Brachychiton*.

The family is a fairly large one, finding its greatest development in the tropics. It is well represented in the Queensland flora, the largest genus being *Brachychiton*, which contains the Kurrajong (*B. populneum*), the Northern Kurrajong (*B. diversifolium*), the Bottle Tree (*B. rupestre*), Broad-leaved Bottle Tree (*B. australis*), the Flame Tree (*B. acerifolia*), and other trees. The genus is separated from *Sterculia* on very slender grounds, but as most recent works on the Australian flora retain it, I have followed suit. The most readily observable distinction is that the seeds and inside of the capsule are smooth in *Sterculia* and hairy in *Brachychiton*.

Sterculia quadrifida is very common, and is often known as Peanut Tree. The fruits are bright red when ripe, and the seeds a dull black with an edible kernel. The only other species of *Sterculia* in Queensland is *S. laurifolia*, a common tree in some of the North Queensland jungles or "scrubs."

FAMILY RUTACEÆ.

The family *Rutaceæ* consists of trees, shrubs, or, more rarely, herbs with simple or compound glandular-dotted leaves. The flowers are mostly regular and 4- or 5-merous. The ovary is superior, the carpels free or united. The fruit is various, being a berry, as in *Citrus*, a drupe, as in *Halfordia* or Saffron Heart, a samara, as in *Pentaceras*, the Bastard Crow's Ash, or a capsule, as in *Flindersia*, Crow's Ash, Maple, &c.

Rutaceæ is a very large family estimated to contain about 700 species widely spread over the world, mostly in tropical and sub-tropical countries. The family is strongly represented in Australia, and contains one of our most important genera of timber trees—namely, *Flindersia*. In the "Queensland Flora" and older works of Australian authors this genus is included in the *Meliaceæ*, but more modern authors have generally classed it along with *Rutaceæ*. Its glandular-dotted leaves and, on

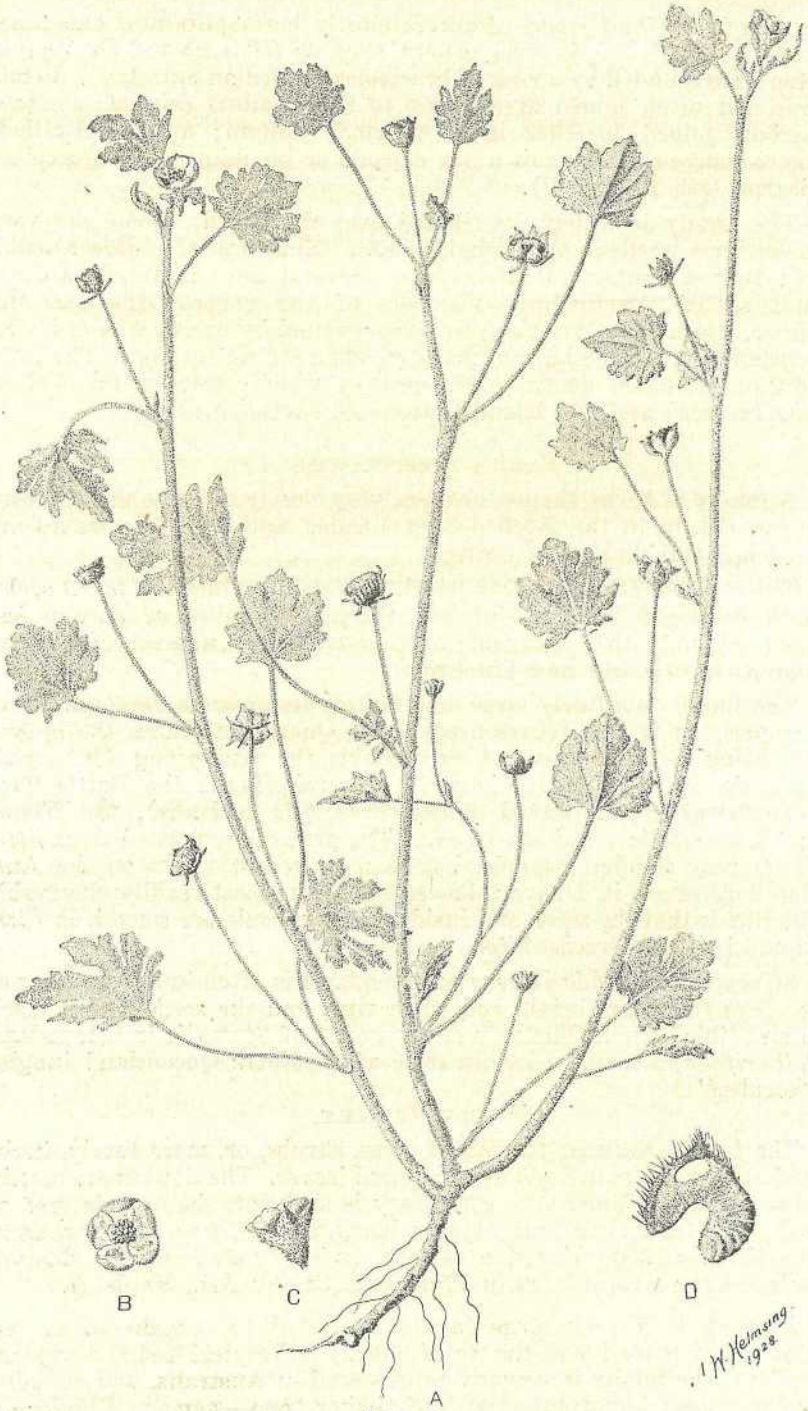

Plate 6.

BUTTON MALLOW (*Modiola caroliniana*).—A member of the Mallow family (Malvaceæ).

A. Plant about half natural size. B. Single flower (face view). C. Single flower (back view). D. Ripe carpel or mericarp containing seeds.

the whole, its timber structure place it in this family rather than in the *Meliaceæ*. In some respects the characters belong in part to both families, and perhaps a new family to receive it should be made.

The family contains the *Citrus* fruits, as the Orange (*Citrus aurantium* or *C. sinensis*), Lemon (*Citrus limonum*), Grape Fruit (*Citrus grandis*), Kumquat (*Fortunella japonica*), Citron (*Citrus medica*), &c. Several citrus fruits are natives of Queensland; they have been separated from *Citrus* proper by W. T. Swingle, an American botanist, under the generic name of *Microcitrus*, on the grounds of their dimorphic foliage (the leaves on juvenile plants being different from those on the adult), their small flowers with free—not united—stamens, and their few-celled fruits with stalked pulp vesicles. Four species have been described—the Native Orange (*M. australis*), the Finger Lime (*M. australassica*), the Russell River Lime (*M. inodora*), and Garraway's or the Peninsula Lime (*M. Garrawayi*). Another tree of the *Citrus* group, a native of Queensland and of New South Wales, is the so-called Desert or Western Lime (*Eremocitrus glauca*).

FAMILY ANACARDIACEÆ.

A family of trees or shrubs. Leaves mostly alternate, simple or compound. Flowers unisexual or hermaphrodite. Petals 3-7, sometimes absent. Stamens the same number as or twice the number of petals, rarely indefinite or reduced to one fertile, the remainder small and abortive. Ovary one to several celled. Fruit superior or semi-superior, usually a fleshy drupe, or in one or two genera dry or nearly dry and seated on a fleshy and much enlarged fruit-stalk or pedicel.

The family finds its greatest development in the tropics. It is represented in Queensland by seven native species. These include the Burdekin Plum (*Pleiogynium Solandri*), the Tar Tree (*Semecarpus australiensis*), Deep Yellowwood (*Rhodosphaera rhodanthema*), and North Queensland Bolly Gum (*Blepharocarya involucrigera*). Many of the species possess a blistering sap, as the Tar Tree and the North Queensland Bolly Gum. One of the worst offenders in this respect is the Poison Ivy (*Rhus toxicodendron*), an ornamental climber only rarely seen in Queensland gardens. This vine colours well in autumn in colder places, but, as many people are affected very badly by contact with it, it is unwise to plant it, especially as other vines are available. In plants causing skin irritation individual idiosyncracy enters largely into the degree of infection.

Of cultivated fruits the most important is the Mango (*Mangifera indica*), a native of India cultivated throughout the tropics and subtropics of the world. The Cashew Nut of the West Indies and tropical America is *Anacardium occidentale*. The pericarp contains a blistering, resinous, poisonous sap, but the kernel is edible, as is also the enlarged fruit stalk on which the fruit is seated.

FAMILY SAPINDACEÆ.

A family of trees, shrubs, or climbers, the climbing members sometimes herbaceous. Leaves alternate, mostly compound. Flowers unisexual or rarely hermaphrodite. Sepals 4 or 5, free or united into a toothed or lobed calyx. Petals as many as the sepals or calyx lobes, sometimes one less in number, and at times minute or entirely absent, frequently bearing scales on the inner face. Stamens usually 8. Ovary

superior, most commonly 3-celled. Fruit a capsule. Seeds usually with an arillus, which is sometimes showy and sometimes pulpy and edible.

The family is a large one, finding its greatest development in the tropics. It is well represented in the Queensland flora, particularly among the smaller or medium-sized trees of the rain-forests or jungles of the coastal belt. One of the most widely distributed native species is the Boonaree or Western Rosewood (*Heterodendron oleæfolium*), frequently cut as fodder during times of drought. It develops at times a prussic-acid-yielding glucoside, and on this account hungry stock should not be allowed to feed too heavily on the freshly cut foliage. Among the commonest forest shrubs are the various species of *Dodonæa*, generally known as Hop Bushes. Their dry, winged seed-capsules have been used as a substitute for hops. The bark, leaves, and pods of several *Sapindaceæ* possess a saponin, and for a short time a small industry was worked up in the collection of the bark of *Jagera pseudorhus*, a handsome native tree familiarly known as Foam Bark, as a substitute for Quillaja bark, imported for heading ales and stouts; the rather erratic distribution of the tree, however, prevented the continuance of the work. Quillaja bark itself is the product of *Quillaja saponaria*, a native of South America, and a member of the family *Rosaceæ*.

A feature of the seeds of several *Sapindaceæ* is the development of a large, fleshy aril (see page 385, plate 175), often of an acid or agreeable distinctive flavour. The best known is the Litchi (*Litchi chinensis*). Others less frequently seen away from the eastern tropics are the Rambutan (*Nephelium lappaceum*) and the Longan (*Euphoria Longana*). The seeds of the native Tamarinds (*Diploglottis* and *Arytera*) possess a very acid, watery pulp.

FAMILY VITACEÆ (GRAPE VINE FAMILY).

A family of woody climbers or rarely erect shrubs, stems often articulate (*i.e.*, easily broken or detached) at the nodes. Leaves alternate. Flowers small in racemes, panicles, or cymes opposite the leaves. Peduncles (or inflorescences?) often metamorphosed into tendrils. Calyx small, entire or 4-5-toothed or lobed. Petals 4-8. Stamens 4-5 opposite the petals. Ovary usually immersed in or surrounded by the disk. Fruit a berry, often with a watery pulp.

The family is a large one widely spread over the tropical and warm temperate regions of the world. It is represented by about twenty native species, one of which (*Leea sambucina*), is a large, straggling shrub common in shrubby hillsides near the sea. Some of the native species, both in the stems and leaves and fruits, contain needles of calcium oxalate, and cause considerable irritation when bitten or chewed. The common European grape is *Vitis vinifera*. The genus *Vitis* is particularly well developed in North America; the species which has been most improved is *Vitis labrusca*, which has also been hybridised to some extent with *V. vinifera*. Other American species that have been used for improvement and hybridisation are *V. æstivalis* and *V. rotundifolia* (Muscadine). A feature of American grapes is their resistance to phylloxera, which makes them of importance as stocks in many grape-growing areas.

FAMILY ROSACEÆ (ROSE FAMILY).

A family of trees, shrubs, or herbs. Leaves simple or compound, alternate. Flowers usually hermaphrodite. Calyx mostly enclosing the

ovary. Lobes 5. Petals 5. Stamens from twice as many as the petals to indefinite. Ovary of one to many carpels. Fruit various, frequently a drupe, as in the "stone" fruits—Peach, Plum, &c. The pome characteristic of "pomaceous" fruits—Apple, Pear, Quince, &c.—is formed from the enlargement of the torus or floral receptacle (see page 370), the carpels being embedded in the middle, each surrounded by its thin bony or leathery pericarp. The "hip" of the rose is composed of the hollowed and enlarged floral receptacle enclosing in this case a number of achenes (the true fruits). In the Strawberry (*Fragaria*) the floral receptacle enlarges and becomes fleshy after fertilization, the true fruit being the achenes embedded near the surface. The Blackberry, Raspberry, Loganberry, &c. (genus *Rubus*), possess flowers somewhat similar in structure to those of the Strawberry, but the floral receptacle, instead of becoming enlarged and fleshy, remains comparatively small; the carpels themselves, however, develop into small, succulent drupes (sometimes called "drupels").

Fruits such as the Apple, Rose hip, Strawberry, &c., in which parts other than the ovary itself go to form the fruit, are often termed false fruits. Other examples are the Fig, Pineapple, and Mulberry (see page 381). The Blackberry, Raspberry, &c., represent true fruits, as the parts which give succulence to the fruits is the fleshy pericarp of each little drupe or drupel.

The family *Rosaceæ* is a very large one widely spread over the world, but finding its greatest development in temperate regions. It includes many fruits, as the Apple (*Pyrus Malus*), Pear (*Pyrus communis*), Plum (*Prunus domestice*), Cherry (*Prunus cerasus*), Peach (*Prunus persica*), Almond (*Prunus amygdalus*), Quince (*Cydonia vulgaris*), Loquat (*Eriobotrya japonica*), Strawberry (*Fragaria vesca*), Blackberry (*Rubus fruticosus*), &c.

The family contains many of the common garden shrubs cultivated in Queensland—*e.g.*, Hawthorn (*Cratægus*), May (*Spiræa*), Indian Hawthorn (*Raphiolepsis*), *Photinia*, Rose (*Rosa*), &c.

It is poorly represented in Australia, the native Queensland members consisting of two trees—the Nonda Tree (*Parinarium Nonda*) and *Pygeum Turnerianum*, both of North Queensland, five species of *Rubus* (Native Raspberries or brambles), and two species of *Acæna* (Sheepburrs).

FAMILY LEGUMINOSÆ (THE LEGUMES).

The family *Leguminosæ* is characterised mostly by the fruit being a typical legume (see page 378). The plants composing it may be trees, shrubs, or herbs; the leaves vary from simple to bipinnate; the flowers regular to irregular (see pages 372-3); the petals are free or may be partly united; stamens few or many, free or variously united; the carpels are superior, and, except in one or two genera, are solitary; the fruit is a legume; the cotyledons are large and the seeds without endosperm. A feature of legumes is the development of bacterial root nodules. These bacteria that are present in the soil, and are particularly abundant in soils that have previously carried a leguminous crop, enter the tissues through the root-bark and set up the formation of the characteristic galls or nodules. By means of this bacterial association the plant is enabled to obtain nitrogen from the air, other plants not so affected having to rely for their supply of nitrogen upon nitrates and ammonia salts in the soil.

The family is of world-wide distribution. It is divided into three well-marked sub-families regarded by Hutchinson, the English botanist, in a recent work, as three distinct families:—

(1) *Mimosoideæ* (family *Mimosaceæ*);

(2) *Cæsalpinioideæ* (family *Cæsalpiniaceæ*);

(3) *Papilionatæ* (family *Papilionaceæ* or *Fabaceæ*).*

In the *Mimosoideæ* the leaves are mostly bipinnate, rarely simply pinnate, and in one genus (*Acacia*) reduced mostly in the adult plants to phyllodes (see page 228). The flowers are regular; petals valvate in the bud—often small; stamens as many as the petals, twice as many or indefinite, free or monadelphous.

In the sub-family *Cæsalpinoideæ* the leaves are bipinnate, simply pinnate, or rarely simple. The flowers are irregular or rarely regular; petals imbricate in the bud, the upper one never outside and usually quite inside, or in a few genera some or even all four of the lower petals wanting. Stamens usually 10, sometimes few, rarely indefinite, free or more or less united.

In the sub-family *Papilionatæ* the leaves are simple or simply pinnate; the flowers are very irregular; the petals are imbricate in the bud, the upper one on the outside. In this sub-family the upper and outer petal is called the standard or vexillum, the two side petals the wings, or alae, and the two lowermost petals form the keel or carina. Stamens usually 10, all free, monadelphous or diadelphous.

The indigenous flowering plants of Australia number approximately 10,000 species. The family *Leguminosæ* is numerically the largest family, containing approximately 1,100 species.

In the sub-family *Mimosoideæ* the most important genus is *Acacia*, which contains about 500 species widely spread over the tropics and sub-tropics of the world, and finding its greatest development in Australia, between 350 and 400 species occurring here. It is the largest genus of Australian flowering plants.

The Australian species belong to two groups—

(1) *Phyllodineæ*, in which the leaf function is performed by phyllodes, the true leaves dropping off at an early stage in the plant's development;

(2) *Bipinnatæ*, in which the leaves are all pinnate.

The first is by far the greater in Australia. The group is almost entirely Australian, only a very few being found elsewhere. A few are found in the Western Pacific, and one (*Acacia mangium*), common in North Australia, extends northward to the Malay Archipelago. One species (*Acacia Koa*—the source of the famous Koa wood) is a native of the Hawaiian Islands. A discussion on the development of the *Acacia* phyllode will be found on page 228.

* The usual practice is to base the name of the family on the first named genus in it. This is usually deviated from in certain families, such as the *Leguminosæ*, the *Umbelliferæ*, and the *Compositæ*, though even here some botanists prefer to use the names *Fabaceæ*, based on *Faba*, the Broad Bean, *Ammiaceæ*, based on *Ammi*, the Bishop's Weed, and *Asteraceæ*, based on *Aster*, respectively, for these three families.

One of the main features of Australian wattles from an economic standpoint is the importance of the bark of several species as a source of tannin. Australia, in the barks of its indigenous wattles, possesses one of the richest, if not the richest, source of tannin in the world. The use of wattle bark is on the increase, and in England the bark and the tan extract, along with other extracts, are largely taking the place of older tanning substances, such as oak bark, which were previously used.

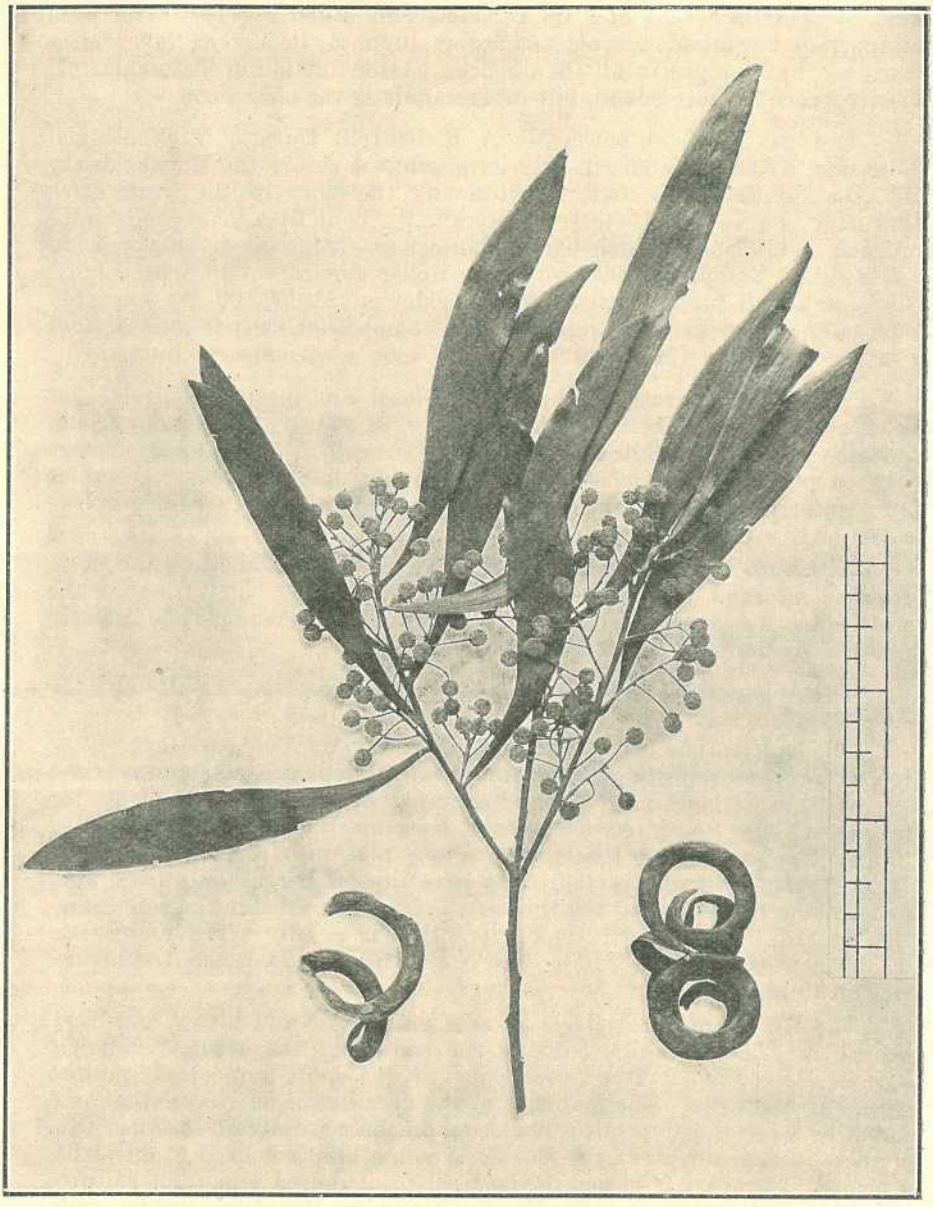

Plate 7.

BROAD-LEAVED SALLY WATTLE (*Acacia implexa*).—A common tree in coastal Queensland. It is a member of the Sub-family Mimosoideæ of the Leguminosæ.

The wattle yielding bark richest in tannin is the Golden Wattle of South Australia (*Acacia pycnantha*), commonly known in commerce as "pycnantha wattle." It is a native of South Australia, Victoria, and New South Wales. It has been introduced into Queensland at various times, but is not particularly suited for cultivation here on an extensive scale. It is mostly a shrubby species 12 to 14 feet high and a few inches in diameter. The next richest wattles in tannin content, but still more important from the actual amount of wattle bark used at the present time are the *Acacias* or wattles of the *decurrens* groups—*i.e., Acacia decurrens* and its varieties and allied species. The most important of these is *Acacia mollissima* (syn. *A. decurrens* var. *mollissima*), which occurs in all the Eastern States, including Tasmania. It is very rare in Queensland, but in Tasmania is the only form.

In speaking of tan barks, Mr. A. R. Penfold, Curator, Technological Museum, Sydney, stated recently in an address before the Royal Society of New South Wales that unfortunately the story of the wattle-bark industry is a very sad one for Australia. About fifty years ago South Africa established wattle-bark plantations from seed collected in Australia. To-day 300,000 acres are under plantation in that colony. Tan bark and tannin extract to the value of £1,000,000 are exported annually. Mine props bring in an additional £500,000 per annum, and wattle cultivation ranks fourth in the Union's agricultural industry.

The treeless, grassy highlands of Natal are specially suitable for wattle culture, and the tree can, therefore, be grown in rows and economically tended to, while the necessary bark sheds and appurtenances can be placed in the most advantageous position. Moreover, there is an abundance of cheap and efficient native labour available for employment on the plantations.

Although there is an import duty of £3 per ton, it does not seem to have afforded very great encouragement for the cultivation of the wattle in Australia. The prevailing rate of exchange has greatly assisted the industry during the past ten years.

The total production of tan barks in Australia is estimated at 27,000 tons.

The cultivation of wattle for the production of bark cannot be too strongly recommended, and, unless early steps are taken to retrieve the position, it looks as if the industry has passed to South Africa for all time. The South Africans have been studying the position very thoroughly, so much so that they are now planting from selected trees. It has been found that certain trees have thicker bark than others, and, as it has been shown that the thicker the bark the greater the concentration of tannin, it is perfectly obvious that it is only a matter of time when their plantations will consist solely of these selected trees very rich in tannin.

The timber of the wattles is, as a rule, hard and heavy, but very beautiful. The species producing the timber of the greatest value is *Acacia melanoxylon*, Blackwood, one of the most important cabinet woods in Australia. The majority of the species are natives of the open forest or interior parts, but a few occur in the coastal rain-forests. One of these is *Acacia Bakeri*, the Marble Wood, a light-coloured timber with a beautiful grain. It is now being used to a limited extent in railway carriage work. Some of the species occur on rain-forest edges very abundantly, sometimes almost as pure stands as secondary growth

after the forest or scrub has been cleared. Some of the species are gregarious, particularly in the interior parts, forming particular types of scrub, such as the Brigalow, Lancewood, Mulga, Gidgee or Gidyea, Yarran, and Bendee scrubs of Western and Northern Queensland. Boree (*Acacia homatophylla*) occurs sometimes as pure stands, but more often as individual trees or scattered clumps.

The majority of wattles are small trees, only a few producing mill logs; the woods of some, however, on account of their distinctive beauty, are in demand for the manufacture of small fancy articles. Some of the woods now used extensively are Mulga (*Acacia aneura*), Bendee (*Acacia* sp., perhaps a form of *A. aneura*), and Myall (*Acacia pendula*).

Albizzia is a genus of about fifty species widely spread over the tropics. It is closely allied to the bipinnate Acacias, but differs in the petals being united in the lower part. Of the six Australian species, one is found in Western Australia, the others in Queensland. The tree colloquially known as "Acacia" in the Queensland sugar-belt is a species of *Albizzia* (*A. procera*). Another species extensively planted in the Central-West and familiarly known as "Acacia" is *A. Lebbek*, a native of India.

Erythrophlœum Laboucheri, Red Ironwood or Poisonous Ironwood of North Queensland, is a tree of about 50 feet high with exceptionally hard, heavy wood. The leaves are extremely poisonous, and cause a good deal of trouble at times on this account among stock in North Queensland and the Northern Territory.

The sub-family *Cæsalpinioideæ* is not very well represented in the native flora. The largest genus is *Cassia*, some of the members of which are cultivated as garden trees and shrubs. Several are native and others are naturalised weeds. *C. fistula*, the Indian Laburnum, is very common in Queensland gardens, particularly in the coastal North. The long, cylindrical pods are familiarly known as Cascara Beans, and the sweetish pulp that surrounds the seeds is a mild purgative. It has no relation to the true Cascara of commerce, which is obtained from the bark of a North American tree (*Rhamnus Purshiana*). *Cassias*, on the whole, possess purgative properties, and the dried leaves of several are the familiar Senna leaves of commerce.

The genus *Bauhinia* is represented by several native species, very shapely trees, mostly natives of the inland parts of the State, and several rather showy, flowering, cultivated ones.

Belonging to this sub-family is the Tamarind (*Tamarindus indica*), a native of India extensively cultivated in North Queensland. Tamarind pulp is imported for use in the manufacture of sauces such as Worcestershire sauce.

Papilionateæ is a large sub-family represented in Australia by a number of plants found nowhere else, and many of which are among the brightest of our native flowering shrubs. Few of them reach tree size.

Castanospermum is a genus of several species containing the Bean Tree or Moreton Bay Chestnut (*C. australe*), a native of the rain-forests or vine scrubs of coastal Queensland and New South Wales. In more open country it is common along river and creek banks, usually associated with River Oak, River Tea-tree, and other typical riverside trees.

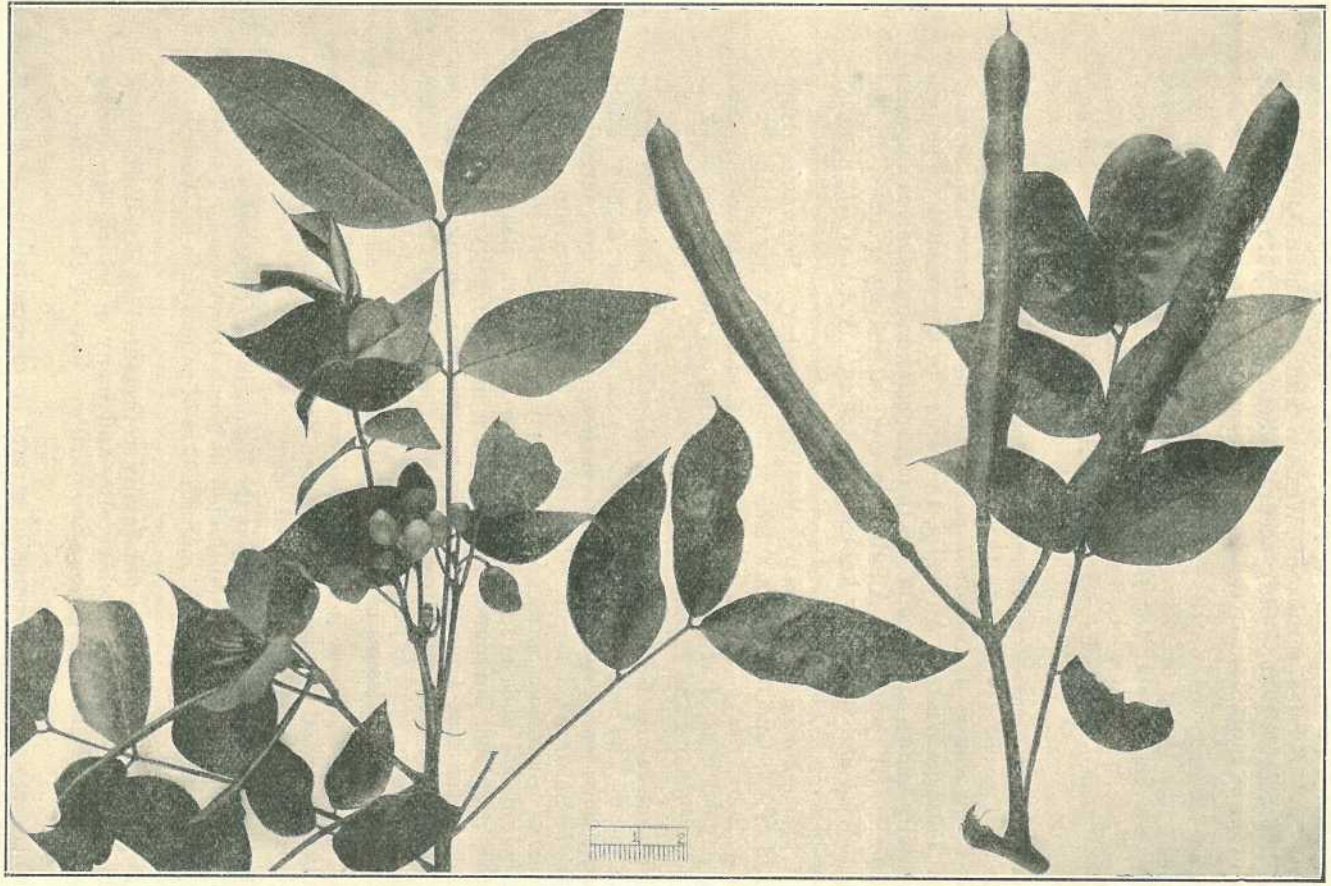

Plate 8.

ARSENIC BUSH (*Cassia laevigata*).—A native of tropical America now a common naturalised weed in most warm countries. It is a member of the Sub-family Cæsalpinioideæ of the Leguminosæ.

The timber is one of the most handsome of our cabinet woods, but, owing to its wide sapwood and the faulty nature of the large trees, it is rather less widely used than it might otherwise be. The seeds are poisonous to stock, causing severe gastro-enteritis. The sub-family contains some important vegetables, such as the Pea (*Pisum sativum*), French Bean (*Phaseolus vulgaris*), Lima Bean (*P. lunatus*), Soy Bean (*Glycine hispida*), Cowpea (*Vigna catjang*), Peanut (*Arachis hypogœa*), Broad Bean (*Faba vulgaris*), and the Lentil (*Lens esculentus*).

The genus also includes many valuable pasture plants, such as the clovers and trefoils, and numerous native herbs.

FAMILY MYRTACEÆ (THE MYRTLES).

Myrtaceæ is a very large family of trees and shrubs with fairly constant characters. The leaves are always simple, with an entire margin, and, examined under a lens through transmitted light, are seen to be pellucid-dotted. The flowers are hermaphrodite; the calyx-tube is usually more or less joined to the ovary; the lobes 3 or more; petals 4-6; stamens from the same number as the petals to very numerous. The ovary is usually inferior, but in a few species is half-superior or almost wholly superior. The fruit is a dry capsule or a one or several seeded berry. It is on this nature of the fruit that the family is divided into two sub-families, viz., sub-family *Leptospermoideæ* (capsular or dry-fruited forms) and sub-family *Mytoideæ* (berry-fruited forms).

The family contains nearly 3,000 species widely spread over the world, but finding its greatest development in tropical and sub-tropical countries. It is represented in Australia by nearly 1,000 species, and is numerically the second largest family of Australian flowering plants, the largest being Leguminosæ with approximately 1,100 species.

The most important genus economically in Australia and probably in the world is *Eucalyptus*. The Eucalypts of Australia, according to the latest monograph by W. F. Blakely, the leading authority on the genus, number a little over 600 species.

The Eucalypts comprise a very natural group with special botanical characteristics. The leaves of most species are dimorphic—*i.e.*, of two distinct types—(*a*) the leaves which occur on young trees and stump shoots, usually referred to as "sucker" leaves, though coppice leaves, I think, is a more correct term (Maiden, Blakely, and several other botanists refer to them as juvenile leaves); and (*b*) the leaves in the adult tree, usually referred to as secondary or adult leaves. The former often differ markedly from the adult forms, sometimes being much larger, sometimes much narrower, and less frequently show little differences from them. They are sometimes opposite and horizontally placed and supposed to represent the original type of Eucalyptus leaf, the vertically placed leaves on the older tree having arisen in response to the dry conditions that gradually became more prevalent in a good many parts of Australia.

Eucalyptus is very distinct in its floral character. The flowers are apetalous, and the calyx-lobes are welded together into a small lid or operculum which covers the essential parts of the flower in their young stages and falls off and exposes them on maturity. In one species common in Queensland—namely, the Spotted Gum (*Eucalyptus maculata*)—the operculum is double, the inner operculum being of fine

Plate 9.

VIGNA LANCEOLATA.—A Native legume common on Downs country. It represents a plant of the Sub-family Papilonatæ of Leguminosæ.

A. Part of plant. B. Calyx. C. Standard. D. A wing petal. E. A peel petal. F. Ovary. G. Seed. All figures natural size.

texture, and possibly representing a corolla. The ovary and calyx tube in which it is borne are welded together, and eventually develop into the capsule. The number of cells in the capsule varies from three to seven, and when ripe each cell opens at the top by a small valve.

The outstanding economic feature of the genus is the value of its timbers, Eucalyptus being the most important genus of hardwood trees in the world. On this account they have been largely planted in all warm and sub-tropical countries.

The extraction of the oil from the leaves is a very important industry in the Southern States, particularly Victoria and South-Eastern New South Wales. The industry has never assumed very large proportions in Queensland, probably due to the fact that the principal use of the oils is in pharmacy, and the cineol or eucalyptol content of the oils of our commoner species does not come up to the standards required by the British and United States Pharmacopœias, which set the standards at 55 per cent. and 70 per cent., respectively. This is very arbitrary, as it is not at all certain that cineol is the most important germicidal constituent in eucalyptus oils.

An important direction in which eucalyptus oils are employed is in perfumery for scenting soaps, barbers' requisites, &c. The most important species in this connection are those with a strong citron or lemon-scented oil, of which *Eucalyptus citriodora* (*E. maculata* var. *citriodora*) is the most important commercially. It is a remarkable fact that most of the Eucalypts and allied plants yielding citron or lemon-scented oils that occur in Australia are found in Queensland—for instance, Citron-scented Spotted Gum (*E. maculata* var. *citriodora*), the Lemon-scented Ironbark (*E. Staigeriana*), the Citron-scented Tea-trees (*Leptospermum citratum* and *L. Liversidgei*), and the Backhousia (*Backhousia citriodora*).

The name "gum-tree," as applied to Eucalypts generally originated from the amount of dark, gumlike matter that exudes from the tree or is found in cracks in the timber. On exposure to the air it becomes dry and brittle. Such plant juices are known technically as kinos. They are generally impregnated with dark colouring matters, and are used in medicine and in the dyeing and tanning industries.

Though the Eucalypts in themselves form a very natural genus of plants, many difficulties are presented in any attempt to arrange the species into natural groups possessing a number of characteristics in common. There have been various schemes of classification proposed by different botanists from time to time, each scheme being based primarily on one particular feature, such as barks, anthers, fruits, chemical constituents, &c. It necessarily means, however, that such schemes of classification are to a very large extent artificial, trees naturally closely allied being placed wide apart in the arrangement of the genus. The scheme of classification adopted by most botanists and followed by W. F. Blakely in his "Key to the Eucalypts" is based on anther characters, and was originally propounded by Bentham in the "Flora Australiensis." This is a system that, personally, I have found rather difficult to follow.

For field work, as far as Queensland species are concerned, the bark characters are the most serviceable upon which to group the species. Classification of the genus on the bark was first proposed by Baron von Mueller and later elaborated by J. H. Maiden.

The Queensland species can be divided up into five groups—(1) Smooth-barked Trees or Gums proper, (2) Boxes, (3) Stringybarks, (4) Ironbarks, (5) Bloodwoods. To these we can add a further group —the Mallees and Marlocks—based on habit, and not on bark characters.

In the first group (the Smooth-bark Trees or Gums) the trunk is normally smooth, the bark coming off in scales or strips, leaving a clean, smooth barrel; the bark is commonly persistent at the base of the trunk. In this group are included the various Blue Gums, Grey Gums, Red Gums, White Gums, &c. Among the representative species are the Queensland Blue Gum or Forest Red Gum (New South Wales) (*E. tereticornis*), Flooded Gums (*E. saligna* and *E. grandis*), Grey Gums (*E. propinqua* and *E. punctata*). Scribbly Gum (*E. micrantha*), the River Red Gum (*E. rostrata*), &c.

The second group (Boxes) are characterised by having a dark-grey bark, more or less fibrous and much interlocked. The common and most widely distributed group of this species in Queensland is the Bimbil Box (*E. populifolia*). Another species very common is Gum-topped Box (*E. hemiphloia*), characterised by having typical box bark on the trunk, branches and branchlets smooth, and the shed bark often hanging down in long ribbons from the forks. The various bark groups run into one another—*e.g.*, it is hard to know whether the Yellow Box of the Darling Downs (*E. melliodora*) should be placed in the Boxes or Gums proper.

The third group (Stringybarks) possess a very fibrous bark, ageing to grey and often more or less blackened by fire. Representative species are Red Stringybark (*E. resinifera*), Yellow Stringybark (*E. acmenioides*), with its variety *carnea* and allied species *E. umbra*, White Stringybark (*E. eugenioides*), &c. This is an ill-defined group, and includes the Tallowwood (*E. microcorys*), the Rough Stringybark (*E. Baileyana*), and some others with not particularly fibrous barks.

The fourth group (Ironbarks) are trees with a hard, furrowed, black or dark-grey, persistent bark, rather friable, and the cracks often carrying a dark-red kino or "gum." Representative species are Silver-leaved Ironbark (*E. melanophloia*), Broad-leaved Ironbark (*E. siderophloia*), Grey Ironbark (*E. paniculata*), Narrow-leaved Ironbark (*E. crebra*), and Red Ironbark or Mugga (*E. sideroxylon*).

The fifth group (Bloodwoods) possesses a persistent bark, commonly inclined to be spongy and friable, and roughly and irregularly tessellated; outer layers lemellar, inner layers rather fibrous. This group includes the common Red Bloodwood (*E. corymbosa*), Western Bloodwood (*E. terminalis*), the White Bloodwood (*E. trachyphloia*), the Northern Bloodwood (*E. dichromophloia*), and a number of trees known in Western and Northern Queensland as Yellow Jackets (*E. Bloxsomei, E. peltata,* and others).

The sixth group, comprising the Marlocks and Mallees, is very poorly represented in Queensland, but is well developed in the Southern States and Western Australia. Mallees are of a shrubby growth and typically have a large, woody stock from which arises a number of stems all about the same height and thickness. They are frequently gregarious, and occur in the form of Mallee scrubs. Much Mallee scrub has been cleared for farming purposes, particularly wheatgrowing, in Victoria. Marlocks are not represented in Queensland, but are fairly common in Western Australia, and are distinguished from Mallees in

having a much reduced woody stock and only a single stem. They are common on the sand plain country of Western Australia, but it is difficult sometimes to distinguish between the two groups.

Several other genera of Myrtaceæ, though unimportant as timber trees compared with *Eucalyptus,* are very common in the open forests, and some in the rain-forests or jungles of the State.

Angophora is closely allied to Eucalyptus, differing principally in the presence of petals in the flower. The two commonest and most widely spread are those trees known as Apple Trees (*A. subvelutina* and *A. intermedia*).

Tristania is also allied to Eucalyptus, but the leaves are mostly broader and horizontally placed. It is distinguished principally from both *Angophora* and *Eucalyptus* in the stamens, which are united into five bundles. Important species are the Swamp Mahogany (*T. suaveolens*) and Brush Box (*T. conferta*).

Syncarpia is characterised by the flowers being in heads. Three species occur in Queensland. The commonest and best known is *S. laurifolia,* the common Turpentine, which extends from a little south of Sydney, in New South Wales, to some distance north of Cairns, North Queensland.

Xanthostemon is a genus of few species scattered throughout the Malay Archipelago, New Guinea, and Australia. Several are found in Queensland, and most of them are known as Penda. The most important is *X. pubescens,* the Red Penda or Atherton Penda, used for house-framing and flooring under cover. Exposed to the weather its life is comparatively short, varying from five to ten years. The characteristic feature of the genus botanically is the presence of a half-superior or almost wholly superior ovary—an unusual condition in *Myrtaceæ.*

Melaleuca is a widely spread genus in the Malayan Archipelago, Australia, and New Caledonia, but finding by far its greatest development in Australia. Species of *Melaleuca* are usually called Tea-trees in Queensland, though in the Southern and Western States the vernacular is also applied to several trees and shrubs of allied genera. The name Tea-tree is due to the fact that Dr. Anderson, who was the surgeon and naturalist on Cook's third voyage, mistook a species of *Leptospermum* for a North American plant which was then being used as a substitute for ordinary tea. Cook used the leaves of the Australian plant, and the beverage was found, though only moderately palatable, quite useful for keeping down scurvy. The spelling "Ti" should not be adopted.

Of recent years at least two species of *Melaleuca—M. alternifolia* and *M. linarifolia*—have come prominently into notice, due to the high germicidal value of their essential oils.

The fleshy-fruited *Myrtaceæ* are mostly found in the rain-forests and along creeks and rivers. The largest genus is *Eugenia,* which includes the common Lillipilli (*E. Smithii*) and the Creek Cherry (*E. paniculata*). Several of the *Eugenias* attain the size of very large trees, and are known as Water Gums. One of these (*E. gustavoides*) is one of the principal building timbers of the Atherton Tableland. The name "Water Gum" is one rather loosely used in Queensland for a number of Myrtaceous trees, being applied to species of *Tristania* and *Agonis.*

A fruit of an evil reputation in North Queensland is the Finger Cherry (*Rhodomyrtus macrocarpa*), reputed to have caused blindness on occasions to persons who have eaten freely of them. At other times fruits seem to have been eaten without any ill-effects following.

Of other genera of *Myrtaceæ*, very few are of interest to the farmer and pastoralist. Some contain edible fruits, the principal genus being *Psidium*, which includes the Guavas. The two commonest in cultivation in Queensland are the common Guava (*P. guajava*) and the Cherry Guava (*P. cattleianum*). Both are natives of tropical America. The former has become quite naturalised in many tropical and sub-tropical countries, including much of coastal Queensland.

Allied to the Guavas is the *Feijoa* (*Feijoa Sellowiana*), a native of the Argentine; it grows well in Queensland, but fruits well only in the cooler parts of the State, such as about Toowoomba, &c. On the coast conditions do not seem to suit it, and, though it grows well enough, ripe fruit are rarely set.

The genus *Eugenia*, already referred to, includes some important fruits. The commonest in Queensland is the Brazilian Cherry (*E. uniflora*). Others less frequently seen are the Rose Apple (*E. jambos*) and the Malay Apple (*E. malaccensis*).

Family Umbelliferæ.

A family of herbs, often aromatic, occasionally with a tendency to be slightly woody or shrubby. Leaves alternate, often much cut and divided; the petiole or leaf-stalk usually dilated into a sheathing base. Flowers in simple or compound umbels. Calyx tube adnate to the ovary, the limb forming a rim around the summit, or 5-toothed or quite inconspicuous. Petals 5. Stamens 5. Ovary inferior, 2-celled. Styles 2. Fruit usually separating into two 1-seeded nuts or carpels called mericarps, leaving a persistent central axis—the carpophore (see Plate 170).

The family is a large one widely spread over the world, but finding its greatest development in temperate regions. It includes a number of vegetables and herbs, as the Celery (*Apium graveolens*), Carrot (*Daucus carota*), Parsnip (*Peucedanum sativum*), &c. The Fennel (*Fœniculum vulgare*) is a common farm weed in Queensland, particularly on the Darling Downs. The native species are few in number; a couple—*e.g.*, *Apium leptophyllum* and *Daucus brachiatus*—are common farm and pasture weeds. They mostly have very insignificant flowers, an exception being the genus *Actinotus* (which includes the Flannel Flower (*A. Helianthi*)) and its allies; their showy character is due to an involucre of woolly bracts (see Plate 155).

[TO BE CONCLUDED.]

Cheese Starters.

E. B. RICE, Dairy Research Laboratory.

THE need for vigorous starters for the manufacture of cheese is now appreciated by all cheesemakers, but there is a lack of knowledge of the scientific principles pertaining to their propagation and functions. It is hoped that this paper will serve to enlighten cheesemakers upon some of the more important aspects of the problem.

Definition.

A cheese starter is a culture of living micro-organisms which is used for the purpose of bringing about certain changes during the manufacture or ripening of the cheese. Different species of micro-organisms are used for different purposes in the manufacture of the many varieties of cheese; such as moulds for the blue-veined cheeses, propionic acid bacteria for ensuring eye-formation in Gruyere cheese, and for the purpose of cheddar cheese manufacture, which is almost the only variety produced in quantity in Queensland, lactic acid bacteria are propagated in milk and added to the milk in the vat.

Classification of Starters.

Starters may be broadly grouped as follows:—

1. Natural.
2. Commercial.

Natural Starters.—The usual procedure followed in the preparation of a natural starter is to choose the milk from some dairyman who is known to take special care in its production and allow the selected milk to sour spontaneously. Starters prepared in this manner have been discarded in most of the leading dairying countries, as their use can only be attended with results that are uncertain. The preparation of starter cultures is now confined to laboratories which specialise in the work.

Commercial Starters.—These are supplied in powder or liquid form, or on what is known as an agar slant. Directions are usually furnished by the laboratory from which they are obtained as to the manner in which large numbers of actively growing organisms are to be built up from the culture. Such instructions should be strictly adhered to. Milk is the usual medium for the propagation of the starter in a factory. Too much emphasis cannot be stressed upon the necessity for using only the best quality milk and observing the utmost care and cleanliness in all operations connected with starter making.

It was the custom formerly to include other bacteria besides the lactic acid bacteria in the starters for cheddar cheese, and these bacteria are still included in the starters supplied by some commercial laboratories. Experience has, however, indicated that although these associated bacteria are desirable in starters for butter manufacture (starter-ripened butter is seldom made in Queensland owing to its inferior keeping quality), their presence is not required in a cheese culture. The particular species of bacterium contained in the starters which are now being supplied by the Dairy Research Laboratory is known as *Streptococcus cremoris,* strains of which are used in starters produced by all the leading dairying institutes. The strain propagated in this laboratory possesses a strong proteolytic power which is considered to

have an important bearing on the ripening of the cheese. The organisms are cultured daily in the laboratory in sterilised skim milk and are transferred to a bottle of sterilised milk prior to dispatch to a factory. This procedure ensures that the starter is in a vigorous condition and enables it to be used immediately for inoculating mother starter in the factory rather than having to subculture for several days before use, as frequently happens with some cultures.

Functions of the Starter.

In the manufacture of cheddar cheese the bacteria are cultivated in the milk with a view to bringing about the development of acid prior and subsequent to the addition of the rennet, as acid production is essential before the further changes in the milk constituents can take place. In factories where pasteuration of the milk is carried out, it is necessary to use a starter to inoculate the pasteurised milk with the desired acid-forming bacteria, and even where milk of comparatively high acidity is received and manufactured without pasteurisation the addition of a small quantity of a good starter is beneficial, as it tends to suppress the undesirable bacteria in the raw milk. When the rennet is added to the milk there must be large numbers of bacteria present, and during the coagulation most of the bacteria are incorporated in the curd. Further growth of these bacteria goes on during the manipulations in the vat and in the early stages of ripening of the green cheese.

The effects of the acidity developed by the starter are fivefold—

(1) To ripen the milk. Ripening the milk favours the coagulation when rennet is added. If the milk were of too low acidity it would curdle slowly with rennet and the manufacturing period would be prolonged.

(2) It favours the expulsion of the whey. The bacteria which are trapped in the curd cause acidity to develop, the curd shrinks and the whey is expelled.

(3) It favours the fusing of the curd particles (matting). This gives a mellow body and texture to the cheese.

(4) It has a protective action against putrefaction. The putrefactive bacteria, being susceptible to acidity, will be restrained in the acid medium, but would quickly spoil the cheese if acid were not present to check their activities.

(5) It favours the action of the pepsin present in the rennet extract. Rennet extract not only has a curdling action due to the enzyme rennin, but also a digestive effect in the presence of acid owing to another enzyme known as pepsin. The pepsin commences to break down the indigestible curd in the vat and continues its action in the ripening room until there is produced a nutritious matured article.

Vitality of Starters.

A most important property which must be possessed by a good starter organism is the ability to produce acidity steadily throughout the making operations. Often a starter will commence to develop acid when it is first introduced into the vat, but fails to maintain its virility when the "cooking" and cheddaring stages are reached. During the "cooking" the temperature of the milk is raised to 100°F., and in extreme cases to 104°F., temperatures which are higher than the optimum for

growth of the lactic acid batceria used in the starter, while in cheddaring the curd is comparatively dry, which is unfavourable for the best development of the bacteria. Unless the vitality of the starter is good there is the possibility of its becoming devitalised in these operations and causing much annoyance through failure to continue regularly to increase the acidity.

Loss of vitality by starters has received much study in recent years. Singleton states that getting starters constantly over-ripe is a means of decreasing their vigour (1). Several workers have referred to the action of certain bacteria in the milk retarding the growth of the starter bacteria (3), (10). The milk itself has also been blamed for possessing some obscure abnormality, but in most factories plenty of milk can usually be found which will make good starter (2). Milk from sick animals should, of course, never be used (3). Mammitis milk is a frequent source of trouble in the preparation of starters (2).

A test for the vitality of starters which was developed in New Zealand is applied constantly to the starter organisms kept in this laboratory and gives a good indication of how the starter will behave in the cheese vat (4).

Failure of Starters.

The sudden failure of a starter or the slow development of acidity, which prolongs the period of manufacture, are two common problems which confront the cheesemaker, and are often traced to the following causes:—

(1) *Mammitis Milk.*—Milk from animals suffering from disorders of the udder is commonly responsible for slow development of acidity in the vat. Recently the services of this laboratory were sought by a factory which has had trouble for months. Microscopical examination of the milk from each individual supplier indicated that no less than five suppliers were sending in mammitis milk. With the rejection of the milk from affected beasts the batch worked normally on the following day.

(2) *Non-acid Milk.*—Certain organisms produce an inhibitory substance which retards the growth of the added starter bacteria (5), (6), (7). Managers who suspect this, or mammitis milk, to be the reason for starter failures are advised to communicate with the Cheese Instructor or the Dairy Bacteriologist now stationed at the Toowoomba branch laboratory, who will endeavour to visit the factory, examine the milk received to detect the supply which is causing the trouble, and give instructions to the farmer concerned.

(3) Recent work at the New Zealand Dairy Research Institute has shown that a phenomenon known as bacteriophage is probably a most important factor in the sudden failure of starters. The bacteriophage may be described simply as a destructive parasite of bacteria. Up to the present no sure method of preventing the destruction of starters by the action of the phage has been found. The indications are that the bacteriophage originates in the cultures themselves and that its development is conditioned by an unknown factor in certain milk supplies (11), (12).

Purity of Starter.—Factory managers desirous of knowing the state of purity of their starter could arrange also for a sterilised bottle to be sent to them in which to return a sample of the starter for bacteriological examination.

Contamination of Starters.

A badly contaminated starter may often be quite active in the vat and show no abnormality in flavour or aroma. The activity may even be due to the contaminating organisms which, by their action on the milk, render it a more favourable nutriment for the starter bacteria. However, the undesirable effects of using a contaminated starter, although not apparent in the vat, become evident in the matured cheese and cause it to be placed in an inferior grade. The following quotation expresses aptly the risk involved in the use of a bad starter:—"A contaminated starter which goes well in the vats gives a false sense of security, for although the green cheese may appear satisfactory, no one can say what off-flavours may develop with maturity. On the other hand, a pure starter which loses its vitality gives rise to abnormal conditions in the vat for a day or two, but the cheesemaker cannot fail to realise the trouble and take immediate steps to rectify it. However, some factory managers who take special care to avoid contaminating their starters experience more than their share of trouble. This is partly because a pure culture is more sensitive than a contaminated one to slight changes of conditions, and so will more readily 'go off.' Such changes of conditions are chiefly three—(*a*) Changes in the milk; (*b*) inoculation with varying amounts of starter; (*c*) variations in temperature of starter milk—in cold weather sufficient acidity may not develop, while in hot weather the reverse may happen" (2).

Examination of starters at factories frequently shows them to be contaminated with yeasts and moulds, which grow quite well in an acid medium, and so the contamination becomes progressively worse as times goes on.

Many bacteria which enter the starter will die out on account of the inhibitive effect of the acid medium, but it is possible to reinfect the starter from day to day by some mistake, such as dipping some of the starter out of the bulk starter with an unsterilised spoon or other utensil, or inserting in it an unsterilised thermometer or stirrer. Some managers place the starter can in the cheese ripening room, because of the more even temperature to be secured there, but this practice is to be condemned because mould spores, which are universally present in these rooms, are sure to contaminate the starter; as has been mentioned, these organisms grow in the acid medium and are detrimental to the quality of the matured cheese. The cheesemaking room is also an unsuitable place in which to allow starter to ripen on account of the high temperatures and the risk of contamination from splashes of water and other sources.

Preparation and Care of Starters.

The length of time that a starter can be kept in a factory without obtaining a fresh culture from a laboratory will depend upon the care which is given to its preparation and the method by which it is carried on from day to day. Some factories have a standing order to be supplied with a new starter fortnightly, some monthly, and some three-monthly, while other factories only procure a fresh culture when that in use shows obvious signs of deterioration. In New South Wales, where the method of carrying starters in the factories closely resembles bacteriological technique, some factories have kept a starter in an uncontaminated condition for years (8).

The cultures are sent out from this laboratory in sterilised milk in 4-oz. medicine bottles. Immediately upon receipt of the package half a teaspoonful of culture should be inoculated into about a pint of pasteurised milk in a bottle, thermos flask, or other suitable container, the milk being pasteurised in the container, so that the most favourable conditions possible are provided for the starter organisms. The distance of most factories from Brisbane is over 100 miles, transport is rather slow, and temperatures in the warmer weather are relatively high; hence the culture will generally have coagulated by the time it reaches the factory. When the milk coagulates there is no further growth of the lactic acid bacteria and they gradually die out, so the first inoculation from a newly acquired laboratory culture should be rather heavy because its vigour has diminished, but after several propagations an active starter should be secured.

Milk for Starters.

Only the best quality milk should be used for the cultivation of starter bacteria. Mixed milk from a herd is preferable to that from a single cow, because certain cows give milk which hinders the growth of starter bacteria. Knudsen, one of the foremost authorities on the subject, also states that milk for starters should be rich in total solids ([3]). Managers can check the total solids of their milk by indirect estimation from the lactometer reading and percentage of fat, according to the following formula:—

Total solids = $\frac{1}{4}$ Quevenne lactometer reading x 1·2 fat plus 0·14.

The milk should also be of high initial acidity, as mammitis milk frequently is of low acidity. It is important to make the acidity test soon after the milk is produced in order to avoid the risk of slight souring creating a false impression.

Preparation of Mother Starter.

Much better results would be achieved in many factories by keeping a mother starter. It is well understood that cheesemakers are fully occupied by their duties, but the extra time required to do this work would be quite inconsiderable and it would assist to prevent the carrying over of a fault which may develop in the bulk starter on any day. In this connection I quote from a letter received from one manager—"We are getting much more satisfactory results than last season, and any trouble in the bulk starter now occurs for one day instead of being carried forward every day." Utensils which are used to hold the mother starter include glass jars, thermos flasks, and so on. They should be of about 1½ to 2 pints capacity, and about 1 pint of milk should be added to them, so as to leave ample space above the surface of the milk in the event of splashing taking place during pasteurisation.

One method of pasteurising is to place the vessel containing the milk in a saucepan, add water to the saucepan till the surface of the water is level with that of the milk—then heat until the water boils and hold at this temperature for twenty minutes. The milk is cooled to about 70° Fahr. before the culture is added, the cooling being allowed to take place slowly if the vessel is of glass in order to save it from cracking. A few drops of starter only are needed to inoculate the milk—0·5 cc. should be ample. A good way to do this is to use a narrow hollow glass tube or a straight-sided 2 cc. pipette, which has been sterilised in boiling water or steam, for transferring from the coagulated culture into the pasteurised milk.

A much better method of preparing mother starter and which eliminates much of the risk of contamination is to pasteurise the milk in a steamer. An account of the method used at Gatton College has been given to me by Mr. R. R. Keats, Dairy Instructor at the College, and is as follows (9) :—

A steam steriliser was made at the College for use in connection with the propagation of pure cultures and mother starter. The materials used in its construction were an 8-gallon petrol drum, some plain galvanised iron, rivets, some ½-inch piping, and three ½-inch back nuts. The design is simple, and for those who wish to construct the steriliser the following details are given:—

First cut the top from the petrol drum. Two holes are then cut in the bottom sufficiently large to admit ½-inch steam piping (approximately ¾-inch diameter), one in the centre and the other nearer the side. Over the latter hole on the bottom of the drum is sweated one of the back nuts into which is fitted a short piece of piping. Another piece of piping 2½ inches long with a thread 1¼ inches long and fitted with one back nut is passed through the centre hole, thread first, and the other back nut screwed on the outside to make secure. Eight right-angle supports are made from ¾-inch wide strips of iron cut from the top of the can, four of these being riveted to the inside of the can, at equal distance apart and 3 inches from the bottom, the other four being similarly fixed 11½ inches from the bottom. A disc of galvanised iron 11½ inches in diameter is cut and perforated with a number of ½-inch diameter holes. To the centre of the bottom of this disc or platform

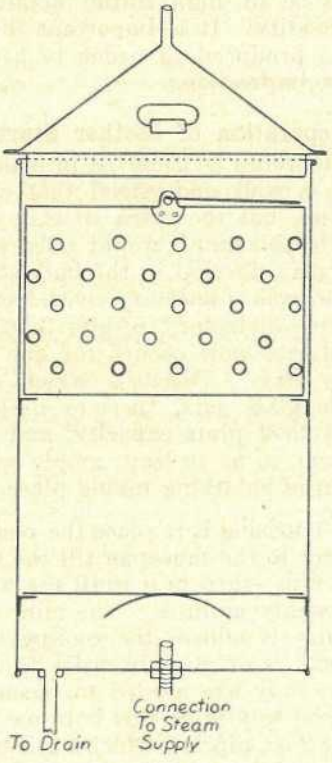

Plate 10.
Steam Steriliser, Q.A.H.S. & C. Scale, ⅛ inch to 1 inch.

is riveted a steam baffle plate made from the top of the drum 5 inches diameter and made saucer-shaped. The top container consists of a bucket, made from galvanised iron, perforated with ¼-inch diameter holes on the sides and bottom and provided with a handle for removing it from the steriliser. Its measurements are 11½ inches diameter and 8 inches deep. The lid, made from galvanised iron, is conical in shape, fitted with a ½-inch pipe at the top for the escape of steam, also two wire handles. The steriliser is mounted on an iron bracket attached to the wall and is connected with the steam supply, to the fitting at the centre of the bottom of the drum. (*See* Plate 10.)

Operation.—Glass jars, or test tubes of milk, flasks, &c., are placed in the steriliser, either on the bottom platform or in the top container and the lid placed in position. The draining valve at the bottom is opened slightly and any condensed steam water allowed to drain off, including any from the steam inlet pipe which is also opened slightly. The correct amount of opening may then be given to the steam inlet valve and steam admitted to the chamber. The escaping steam should just be blowing slightly from the escape pipe in the lid when properly adjusted. Before removing the lid from the sterliser turn off the steam supply and allow if possible fifteen to twenty minutes to elapse before opening, to avoid cracking of glassware due to a possible sudden drop in temperature. Keep the draining valve slightly open during sterilisation.

After the addition of the drops of culture to the milk, mix by gentle shaking, and incubate at 70° Fahr. It is important to maintain a uniform temperature during incubation. The milk should be coagulated in from eighteen to twenty hours, and the coagulated mother starter is used for inoculating the larger quantity of pasteurised milk to be used for the bulk starter on the following day. By careful daily observation of temperature, number of drops of culture added, and the time taken to coagulate, the cheesemaker can regulate conditions so that the mother starter is just firm by the time it is ready to use for making bulk starter.

Avoid Enamelled Billycans.

The use of enamelled billycans to hold mother starter, although very common, is considered unwise, because of the ease with which the enamel becomes chipped or scratched, leaving crevices which will harbour undesirable types of bacteria unless rigorous sterilisation is carried out.

Preparation of Bulk Starter.

With the large quantity of milk required for this purpose, heating and cooling are preferably done in a vessel through which steam and water from the factory supply can be circulated. The quantity of milk which will be needed will vary according to the volume of milk treated at the factory. Place the calculated amount of milk in the starter can, which should be fitted with a metal lid, fill the outer vessel with water, and raise the temperature of the milk to 180° Fahr. by injecting steam into the water through the steam inlet valve, keep at this temperature for one hour longer, and then cool to 70° Fahr. by shutting off the steam, opening the water inlet valve and passing cold water through until the desired temperature is attained. Now inoculate with the mother starter, which should be just firmly coagulated. The usual quantity found necessary is about three-quarters of a fluid ounce per gallon of milk. On the following morning when this milk has coagulated it will be ready to add to the cheese vat.

As with the mother starter, conditions should be regulated to have the bulk starter just firm when ready for use, but should it be necessary to hold it for some time, it should be placed in cold water at 50° Fahr. to prevent the attenuation of the bacteria which takes place after coagulation of the milk.

Mr. Keats has given me the following description of the method of pasteurising milk for the bulk starter at Gatton College:—

"To pasteurise milk for the making of bulk starter, a special vat and can is used, in which the milk is both heated and cooled. For college purposes a 5-gallon can is sufficient, but, of course, a larger outfit may be constructed on similar lines if desired. The can is made from stainless steel, has a rounded base and no seams, all joins having been electric welded. It is provided with a conical-shaped lid. The heating vat is constructed of heavy-gauge galvanised iron, has an overflow pipe near the top, and is fitted with a perforated pipe at the bottom which is connected outside to the steam and water supply.

"*Operation.*—The can containing the milk is placed in the vat, and the supply of water turned on until it flows through the overflow pipe. The water supply is now turned off and steam admitted to heat the water and thus heat the milk. A temperature of 180 to 185° Fahr. is held in the milk for a period of one hour, the steam supply being regulated to obtain this result. The water supply tap is now opened and cold water allowed to flow into the vat slowly until the milk is cooled.

"Although the heating vat, which was made by the college plumber, has been replaced three times owing to leaks caused by rust formation, the starter can which has been in use for eight years has retained its new appearance owing to the quality of the stainless steel used in its construction, even though abrasives, such as steel wool, are frequently

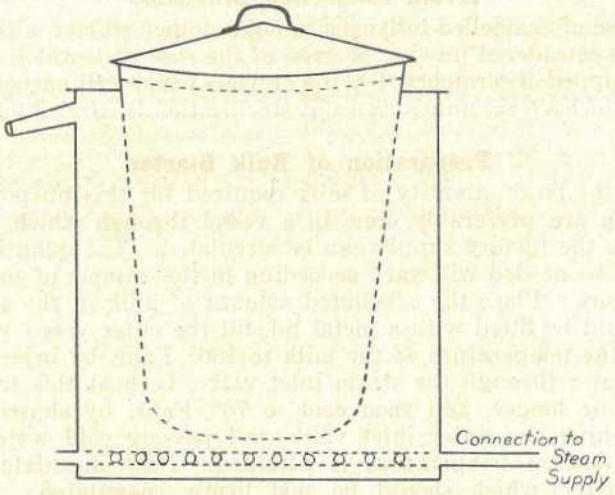

Plate 11.

Starter Milk Pasteuriser, Q.A.H.S. & C. Scale, ⅛ inch to 1 inch.

used to remove the film of casein which forms on the inside of the can. Usually, heavily enamelled buckets or billycans are used to 'set' the starter, but on frequent occasions the steel can has been used, with no apparent detrimental effect on the quality of the starter." (*See* Plate 11.)

Adding the Starter to the Vat.

For the manufacture of cheddar cheese from pasteurised milk about 1 to 1¼ per cent. of starter needs to be added to the vat. The quantity of starter to use for unpasteurised milk will, of course, depend upon the acidity of the milk. When unpasteurised milk is used for cheesemaking, the addition of some starter, by introducing large numbers of lactic acid bacteria of vigorous type, will assist to overcome undesirable fermentations, thereby improving the flavour and texture of the cheese. Care should be taken not to add too much starter; it is far better to add the quantity just stated, and if trial shows this to be insufficient, a little more can be used, but the addition of too much starter should be avoided. The starter should always be strained through cheesecloth as it is being added to the vat to ensure that lumpy particles do not get into the vat.

Examination of Starter.

The characteristics of a good starter are—

(1) A clean, acid flavour. The acid produced by *Streptococcus cremoris* alone may seem somewhat sharp to anyone unaccustomed to it, because of the absence of the associative organisms which give a milder flavour and fuller aroma to starters in which they are grown in association with *Streptococcus cremoris.*

(2) The coagulation should be smooth, free from whey and gas pockets. As the strain of *Streptococcus cremoris* propagated in this laboratory has strong proteolytic power it may digest the curd with extrusion of some whey and also produce a slight quantity of gas, if left standing after coagulation.

(3) If broken up it should be of a smooth, creamy texture, entirely free from curdiness.

(4) The acidity at the time of use should be between 0·65 and 0·75 per cent., and should not exceed 0·85 per cent.

Defects in Starters.

Malty Flavour.—A malty flavour sometimes is noticeable in starters, and will be conveyed to the cheese. It is due to a variety of *Streptococcus lactis,* which appears to gain the ascendancy at times. The defect cannot be remedied in the factory and the only course is to discard the starter.

Ropy Starter.—A ropy or slimy condition may suddenly appear in a starter and it may just as suddenly disappear. If it persists it will increase in intensity and the starter will have to be replaced. The condition appears to be associated with the absorption of oxygen from the air during the cooling of the milk after pasteurisation, as heating and cooling the milk in a narrow-necked vessel will overcome the fault. Continual inoculation from the surface of the starter will also induce this defect.

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CEREAL SEED TREATMENT.

Bunt and flag smut of wheat are two diseases which in the past have caused serious loss to wheatgrowers. In recent years the percentage of the total crop of this State, which has been affected adversely by these diseases is, fortunately, quite low. However, there occur instances of heavy individual loss, usually attributable to neglect of seed treatment. Seed from a source known to be free from flag smut and bunt (also known as ball smut) needs no treatment. All other wheat seed should be given a protective coat of fungicidal dust. The dust used most widely is copper carbonate, and this is quite effective in dealing with lightly contaminated seed. Seed which carries so many spores that it is noticeably dark should not be used, although it can, if necessary, be freed from infection by the old-fashioned wet treatment with bluestone. A recent development in seed treatment is the use of mercury dusts to replace the copper. The mercury dusts are somewhat more effective, and have superior physical properties; that is to say, they adhere to the seed better and do not fly in the air and do not tend to clog the drill, as does the copper carbonate. The copper dust, on the other hand, is less poisonous to animals and is cheaper. With reasonable care in keeping seed wheat separate from that used for feed, the poisonous nature of a dust should not be attended by any untoward results, and the cost of even the more expensive material amounts to only a few pence per acre. The mercury dust at present being marketed in Queensland is one of the most effective, and is known as Ceresan.

In the case of barley and oats serious difficulty has been encountered in this State in recent years in growing clean crops on account of the high percentage of smut present. This has been due largely to the fact that bluestone and copper carbonate fail to control these diseases. One of the older wet treatments —namely, that with formalin—is effective if applied correctly. Recent experiments have shown that a dust treatment is available for barley and oats. Ceresan and certain other mercury dusts will control the smuts of these two crops. Either the formalin wet treatment or the mercury dust dry treatment is also effective in the control of the covered smut of prairie grass. When Ceresan is used in the control of any of the above diseases it should be applied to the seed at the rate of 2 oz. per bushel.

New Highways in Queensland.

[*Continued from page* 829, *December*, 1936.]

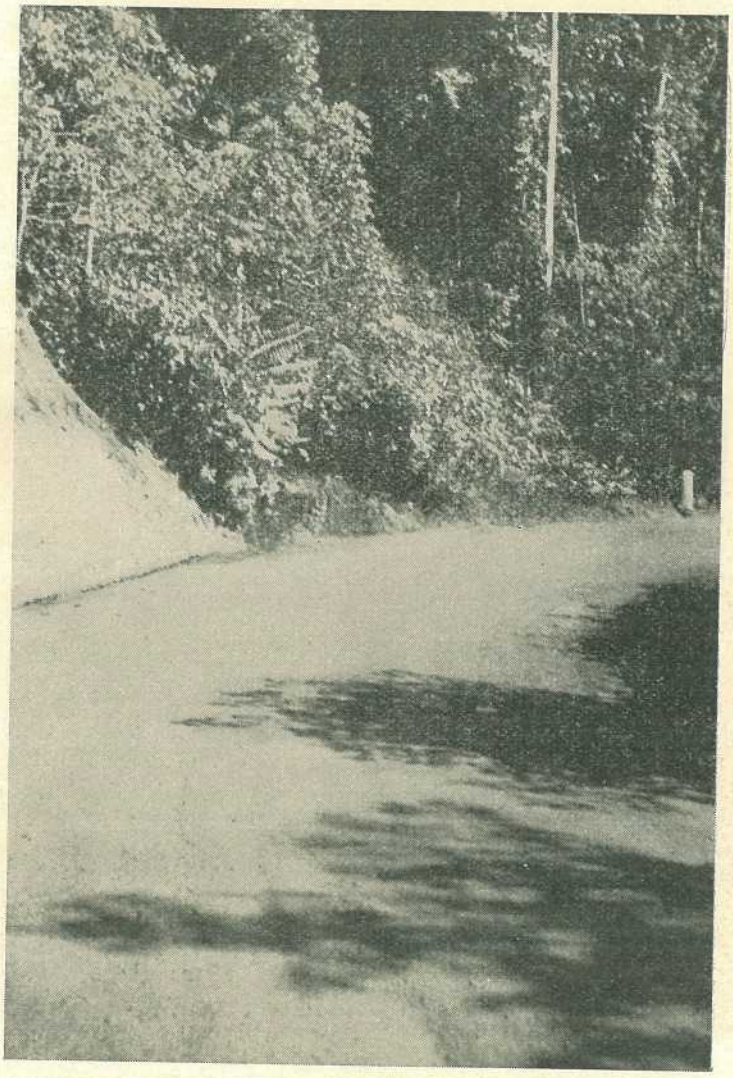

Plate 12.
A curve in the new road through the rich jungle lands of Palmerston, connecting Millaa Millaa with Innisfail.

Plate 13.

THE ROAD TO EIMEO.—A new highway giving easy access to a beautiful seaside resort near Mackay, and serving a rich cane-growing district.

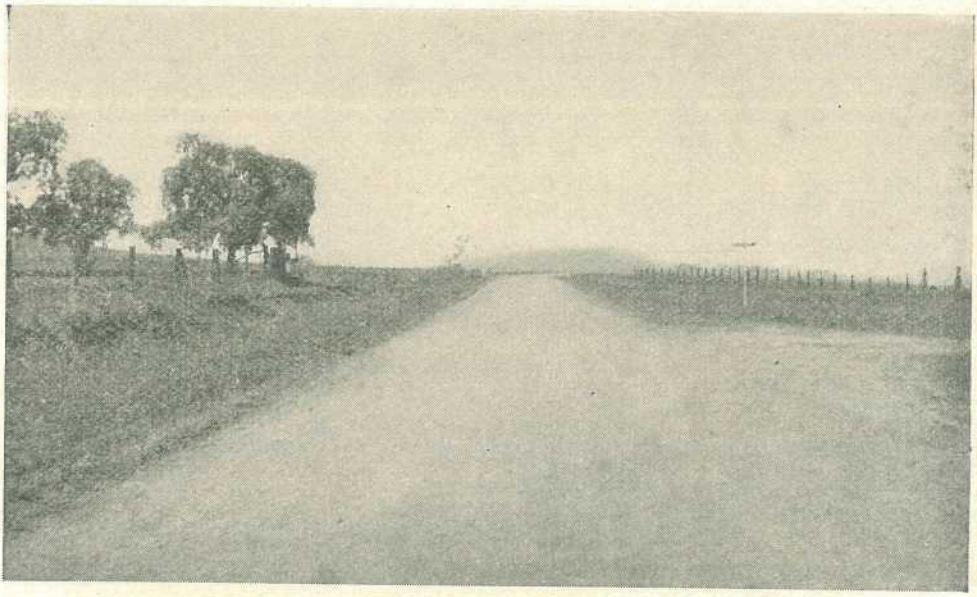

Plate 14.
A bitumen-paved section of the Toowoomba-Warwick Road, Darling Downs.

Plate 15.
Through the rich grasslands of the Dawson River country. The road connecting Theodore with the Cracow Gold Mines.

Plate 16.
This multiple span log drain topped culvert over Reedy Creek, in the Kingaroy District, has replaced an old sandy crossing.

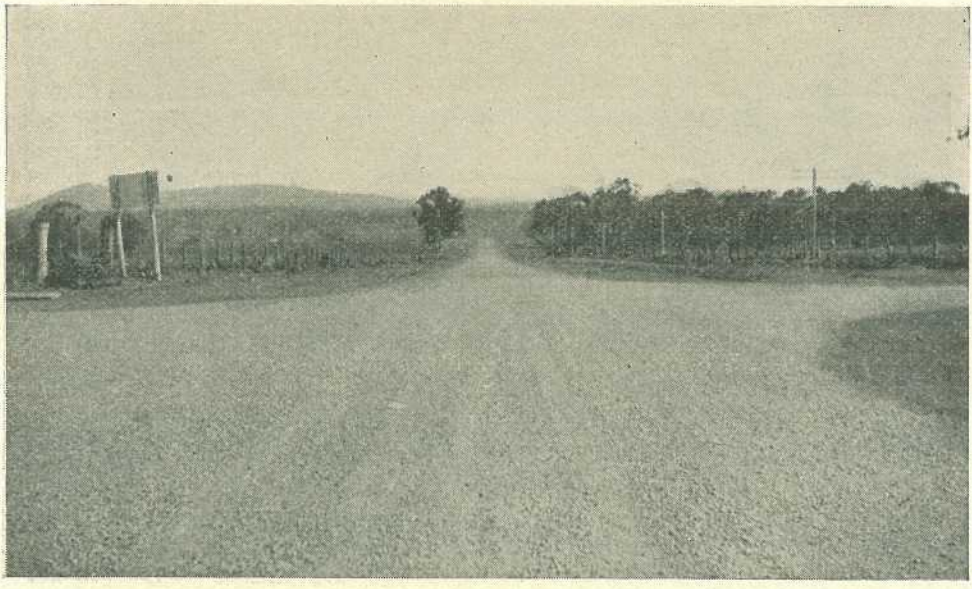

Plate 17.
This bitumen-sprayed paved roadway leads from the Lockyer to the Southern Darling Downs.

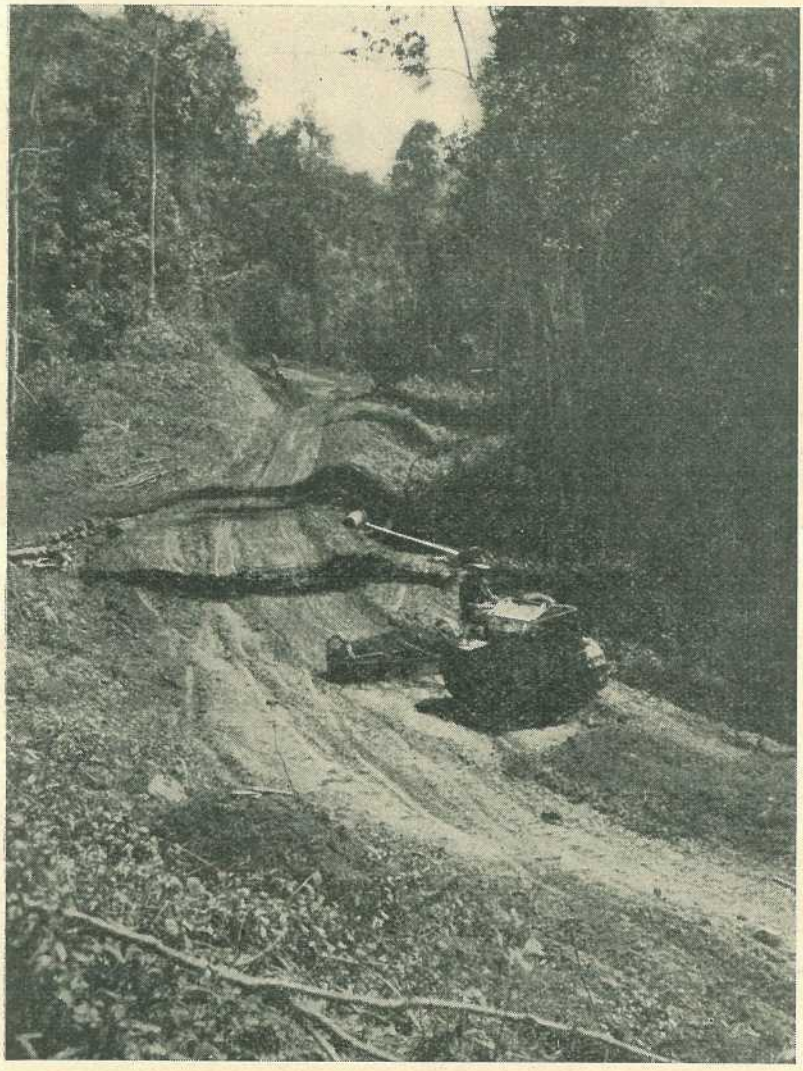

Plate 18.
Calen-Kungurri Road—Pioneer Shire—under construction. This will provide a link with canegrowing areas west of the main railway line.

Plate 19.
Rockfill crossing over a lagoon near Helidon on the Brisbane-Toowoomba Highway before and after construction.

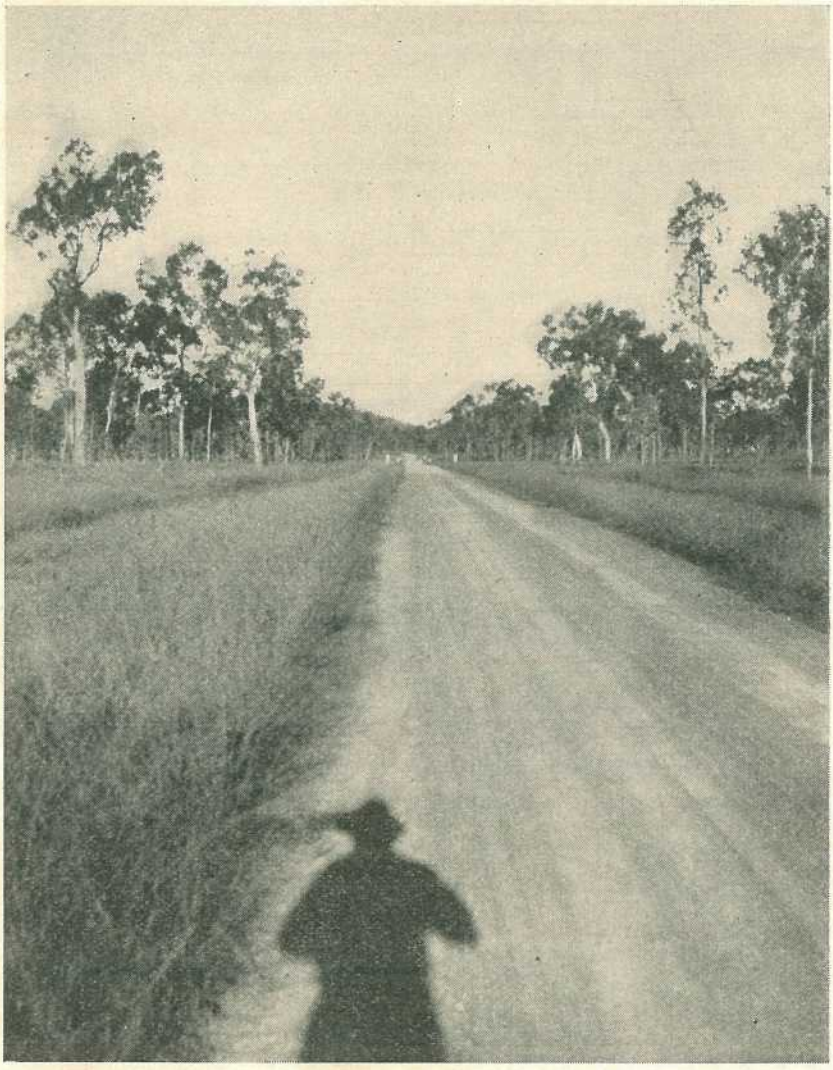

Plate 20.
Townsville-Moongobulla section of the Mount Spec Road, North Queensland.

Plate 21.
The first of the foothills come into sight on the road to Mount Spec.

DECEMBER weather was unsettled throughout, with scattered storms and fair relief rains in many districts. The heavier falls were received from 12th December to the 17th December, replenishing water supplies and providing heartening relief over a large area of the Darling Downs and South-West. No steady general rains have been received, however, and many districts are still in urgent need of soaking showers. Pastures have responded rapidly wherever rain has been heavy enough, and many farmers have been able to plant maize and general summer fodder crops.

Wheat.

Seasonal experience indicates the necessity for improved cultural methods if the average yield is to be maintained. Reports show that although the season proved unfavourable, payable crops were harvested in every instance where the land was ploughed early and kept clean until the sowing period.

The spread of black oats is a matter of concern, indicating the desirability of long fallows combined with the growth of purely grazing crops in rotation with wheat.

The entire crop, apart from seed and feed requirements, has been sold to Queensland millers at a satisfactory price, growers having received payments covering the first advance of 3s. 6d. per bushel for Q1 wheat. Although farmers are compensated for lower yields by the rise in world wheat prices, the State as a whole will lose, owing to the necessity of importing approximately 3,000,000 bushels of Southern wheat to supplement local supplies.

Fodder Conservation.

The recurring periods of under-average rainfall, resulting in a serious decline in production, directs attention to the lack of any general provision against prolonged dry periods. Many farmers will, doubtless, adopt a more active policy of conservation in the future, both for use during dry spells and for normal winter and spring supplies, thereby maintaining production at a high level and keeping their stock in good condition throughout the year. An object lesson is provided by the coastal fodder conservation competition conducted by the New South

Wales Department of Agriculture. The fodder conserved is judged on suitability, quality, location, protection, economy, carrying capacity, and surplus. The winner of the North Coast championship, where droughty conditions similar to those obtaining in Southern Queensland have prevailed, had conserved 110 tons of chaffed maize and sorghum silage and 56 tons of lucerne hay. Although no grain was stored the fodder conserved was sufficient to feed ninety-three head of cattle for the stipulated period, notwithstanding the fact that the natural carrying capacity of the 115-acre property was assessed at thirty-one head. The crops cultivated on this farm included 20 acres lucerne, 18 acres maize and sorghum for fodder, 16 acres of oats, and 2 acres of pasture grasses.

Although the practice of fodder conservation has greatly increased during recent years, the total bulk of such fodder is still insignificant compared with the total number of stock carried throughout the coastal areas of New South Wales. In Queensland, practice in this connection lags considerably behind that of the Southern States. In New South Wales approximately 400 concrete tower silos have been erected during recent years, mainly for normal winter feed, the general practice being to store fodder intended as a drought reserve in trench silos which can be excavated cheaply as crops become available.

Tobacco.

The vital stage in tobacco seedling production occurs during the early period of growth, while the plants are small and possess a poorly developed root system. It is essential that abundant water be supplied, and that the beds never be allowed to dry out. The quantity of water required and the frequency of waterings will depend on climatic conditions. Under dry conditions, it may be necessary to water as often as three times a day during the first few weeks. As the plants grow and the root system extends, watering may be reduced to once daily. From the time of germination onwards it is necessary to protect young seedlings from the hot rays of the sun to an extent dependant on local conditions. The type of cover used would be determined by the subsequent precautions to be adopted against disease and insect attack.

Seedlings should always maintain a vigorous growth, and should there appear to be a serious retardation of growth at any time the application of a solution of nitrate of soda in water at the rate of ½ oz. per 4 gallons will, in most instances, sufficiently quicken growth. On the other hand, it is inadvisable to apply nitrogenous manures too liberally, or there would be a tendency to "soft seedlings," which will later be difficult to "harden off."

"Hardening off" should be a gradual rather than a sudden process, and the plants should be allowed an increasing amount of sunlight in the mornings and afternoons, until they can stand full sun during the whole of the day. The tendency of some growers to retard seriously the growth of seedlings is to be deplored. Very often it is found that when the plants reach a stage suitable for planting out weather conditions are such that planting in the field cannot be commenced with any degree of safety. Rather than retard the growth of these plants until planting-out can commence, it is preferable to have another series of slightly younger seedlings which can be utilised and the originals destroyed. The adoption of such a procedure would ensure a quantity of seedlings "hardened off," but at the same time in reasonably vigorous growth. Such seedlings are then able to make a rapid recovery from the shock of transplantation, and to make quick growth in the field.

Cotton.

Planting rains were experienced over many sections of the cotton-growing districts during the month, but owing to the lateness of arrival and the light nature of the rainfall in some sections an appreciable acreage will not be planted to cotton this season. This applies more particularly to the fertile alluvial soils of the older cultivations, where the experiences of past seasons have indicated that late plantings of this crop cannot be relied upon to produce profitable yields, especially in seasons experiencing wet conditions during January and February.

In the districts where the early rainfall allowed the crops to be started off in the normal planting season excellent progress has been made, and the most forward plants are flowering and setting a good load of squares and bolls. The general condition of the crop is, therefore, very mixed, and the nature of the season for the next three months will have a marked effect on the yield obtained. Fortunately, an increased area of the quicker-maturing varieties has been planted this season, which should help overcome the delayed start to a marked extent.

Sugar.

All cane areas from Mackay north received excellent rains during December, so that the crop in those parts is now making rapid progress.

Though relief rains have been received in the Southern districts, they are altogether too light to promote rapid growth, and a good downpour is necessary to assure the 1937 crop.

CROWN LAND FOR GRAZING HOMESTEAD SELECTION. CUNNAMULLA DISTRICT.

174,931 ACRES OF SHEEP LAND—PART OF THURRULGOONIA RESUMPTION.

This land has been surveyed as portions 5, parish of Cotton, 1 and 2, parish of Magie, and 1 and 2, parish of Kumbogan, and will be open for Grazing Homestead Selection at the Land Office, Cunnamulla, on Monday, 8th March, 1937, at 11 a.m.

Each selection will be for a term of 28 years.

The annual rentals for the first period of 7 years are from 1d. to 2¾d. per acre.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of 3 years.

The blocks are all good woolgrowing country and are artificially watered by bore drains, but more water may be required.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane; the Land Agent, Cunnamulla; and the Government Tourist Bureaux, Sydney and Melbourne.

THE INFLUENCE OF FEEDING ON BUTTER-FAT.

F. C. COLEMAN, Inspector of Dairies.

VERY many dairymen hold strong convictions that certain feeds will increase the butter fat percentage of their cows. While it is perfectly true that a change from, say, ordinary grazing to special and extra feeds of balanced rations will result in a larger quantity of butter fat produced, this will have been brought about by an increase in the quantity of milk and not by any increase in the fat percentage. Butter fat percentage is an hereditary factor; a cow is a 4·2 per cent. cow or a 6 per cent. cow, according to her inheritance, and the manner of feeding will not alter the average percentage.

Many experiments have been carried out to determine the possibility of increasing the fat percentage by special feeding, particularly with feeds rich in fats, but the deductions were that if occasionally the fat content has been slightly increased over a very short period the milk quickly returns to its normal composition.

Experience shows that although a cow's butter fat percentage will vary at both milkings during the day, and also from day to day, due largely to uneven periods between milking, yet it is a constant factor taken over a long period.

It can be said that stock which are always well fed and in good condition will maintain their fat percentage at the normal level, as compared with cattle running on overstocked country and which are underfed and in poor condition; and whose tests would, consequently, be lowered. This is due to the fact that cows in poor condition use up some of their body fat to maintain the quantity in their milk, but eventually they become incapable of doing this, and although probably only giving very small quantities of milk, there will be a decrease in the fat percentage.

An increase in the butter fat percentage of the milk of a herd would probably be brought about by the use of bulls from dams noted for their high production tests. It is well known to those who study

the herd books that there are families in each breed noted for their low tests, and also those noted for their high tests, and it is from the high production testing families that a bull could be carefully selected for the object in view.

MAT GRASS A MENACE TO PASPALUM PASTURES.

W. D. FRANCIS, Assistant Botanist.

IN the past five years mat grass or carpet grass has become a serious menace to the better class paspalum pastures of South Queensland dairy farms. In several localities this inferior grass has already established itself in the paspalum pastures with detrimental effects.

There are two different races or varieties of mat grass. One variety has flat, broad leaves, and in general the plant is pressed fairly closely to the ground. The other has narrower leaves, and develops upright shoots which bear leaves and seed heads. The broad-leaved variety is apparently the better variety from the aspect of palatability, as it is eaten much more frequently by stock than is the narrow-leaved kind. The broad-leaved variety is more often found in flats. The narrow-leaved kind is most frequently found on hills. In most instances the narrow-leaved variety is the greater menace to the paspalum pastures. Both varieties develop a slender seed-bearing stalk which carries two or three narrow spikes of very fine seeds.

Matgrass or carpet grass is a native of the Southern United States (North Carolina to Florida, Texas, and Arkansas) and tropical America.

Dairy farmers whose herds are maintained by paspalum pastures should keep a close watch to prevent this deleterious grass from gaining a hold on their pastures. In most districts mat or carpet grass is well known, at least to some of the farmers. In all cases where a strange grass with a vigorous habit has made its appearance investigation should be made. Precautionary measures are especially necessary if the grass is avoided by stock. When local farmers are in doubt, specimens of the suspected grass should be sent direct to the Government Botanist, Botanic Gardens, Brisbane, for advice. In these cases it is always desirable, where possible, to include material which bears seed-heads.

As soon as mat or carpet grass is found to have established itself on a farm immediate and effective measures should be taken to destroy it. For this purpose digging out and burning are recommended. Then a close watch must be maintained for the appearance of the young plants developing from seed in the ground. These fresh plants should be rigorously destroyed before they develop seed-heads, which will continue the menace of this inferior grass.

WHY CREAM TESTS VARY.

E. B. RICE, Assistant to Analyst, Dairy Research Laboratory.

MANY dairy farmers who receive factory returns showing variations in the fat tests of their cream are inclined to wonder why they can occur. Because, apparently, the cream is produced under similar conditions from day to day they cannot understand how there can be any variation in the tests. In reality, variations are bound to occur, and should the returns be always the same it points to something wrong with the testing.

Conditions under which the milk is separated lead to changes in the cream tests, and are chiefly to be accounted for by the following factors:—

1. Speed at which the separator is run.
2. Rate of inflow of milk.
3. Richness of milk.
4. Temperature of the milk.
5. Quantity of skim milk or water used to flush the bowl.
6. Smoothness of running.

To discuss these points in their order:—

1. The separator should always be run at the speed directed by the maker to obtain maximum efficiency. It is better to turn at too high a rate than too slow, for, in the latter case, the fat loss in the skim milk is increased in proportion to the decrease in the number of revolutions below the recommended speed. Turning at too high a speed gives a richer testing cream, but may be injurious to the mechanism of the machine.

2. The level of the milk in the bowl is controlled automatically by the milk float, and it is necessary that the milk be allowed to enter the bowl freely during separation. If the flow be partly shut off a higher testing cream will result, but an over supply to the bowl will lower the test, and, what is more important, excessive fat loss will occur, with a consequent reduction in the farmer's income. Therefore, in order to obtain best results, see that regularity of inflow is maintained.

3. The daily variation in the fat content of the mixed milk from a herd is sometimes appreciable. This affects the test of the cream supplied; but is without influence on the quantity, provided other conditions are similar from day to day. For example, in the cream obtained from 100 lb. of milk with a fat test of 4 per cent. there are 4 lb. of butter fat; while in the cream from 100 lb. of milk obtained from a herd giving milk with an average fat content of 5 per cent. there are 5 lb. of butter fat, although the same quantity of cream is yielded in each case, if all other conditions are identical.

4. As it comes from the cow, milk is at the best temperature to be separated; being near 90 degrees Fahrenheit it is less viscous than at lower temperatures, so runs easily through the separator, and more perfect separation of the fat results. At lower temperatures, due to the viscosity of the milk, separation becomes more difficult, with greater fat losses, and, in fact, it is doubtful if any machine will do good work if the milk is below 80 degrees Fahrenheit.

5. The quantity of skim milk or water used to flush the bowl usually varies considerably from day to day, and may be responsible for a variation in the test of 2 to 5 per cent., depending on the quantity of cream.

6. Vibration causes the skim milk and cream to be shaken together, so that they do not find their way to their respective outlets. Fat losses are increased then by the escape of fat globules through the skim milk outlet.

Other factors which influence the fat losses are the cleaning of the separator and the condition of the milk, but these should not cause any difficulty where a proper appreciation of the need for hygienic methods in the production of such perishable commodities as dairy produce is realised.

MARKETING BANANAS.

J. H. GREGORY, Instructor in Fruit Packing.

WITH the commencement of the deciduous fruit season, banana growers are again faced with the low-price period, and are striving to obtain the best price possible for their fruit. A visit to many plantations reveals practices the ill effects of which are seldom seen or even realised by the grower but which help to render fruit unattractive when the case is opened in the market, and in this way help bring a lower return than might otherwise have been received. The following suggestions are offered with a view to assisting growers to market fruit of an attractive appearance.

During the present hot weather bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for marketing, and the pulp is eventually reduced to a soft, boiled condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered thoroughly, even from the early morning sun, while waiting to be carried or wired to the packing shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, though a better plan is to carry it straight into the shed or to the end of the wire and there place it in an upright position on bags or trash with the stalk leaning against a rail provided for the purpose. In this manner only a minimum number of fruit will be damaged.

On being dehanded the fruit should be allowed to drain for a few hours. Packing immediately after dehanding sweats the fruit in the case and renders bruising much easier. Care should be exercised to ensure that fruit which is "sprung" or in the early stages of ripening is not packed, as this will quickly be reduced to pulp and be most unsightly in a case of otherwise sound bananas. No fruit should be packed for Southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and fairly narrow type.

There is a right and wrong way to separate the hands into singles. Tearing the bananas apart endways often peels part of the skin from the fruit and also bruises the stem, thus setting up an entrance for organisms responsible for black-end. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be packed on their sides in a cool, shady position to await transport to rail or market.

MARKETING PASSION FRUIT.

J. H. GREGORY, Instructor in Fruit Packing.

WITH the advent of warmer weather passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines as fallen fruit quickly becomes crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit, there is, however, a good market for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby greatly enhancing its general appearance.

Citrus Culture in Queensland.

R. L. PREST, Instructor in Fruit Culture.

[*Continued from p. 812, December, 1936.*]

PRUNING OF CITRUS TREES.

IN Queensland there is a wide divergence of opinion on the subject of citrus pruning, which is probably due to the influence of individual pruners who have developed certain systems which they believed suited their trees.

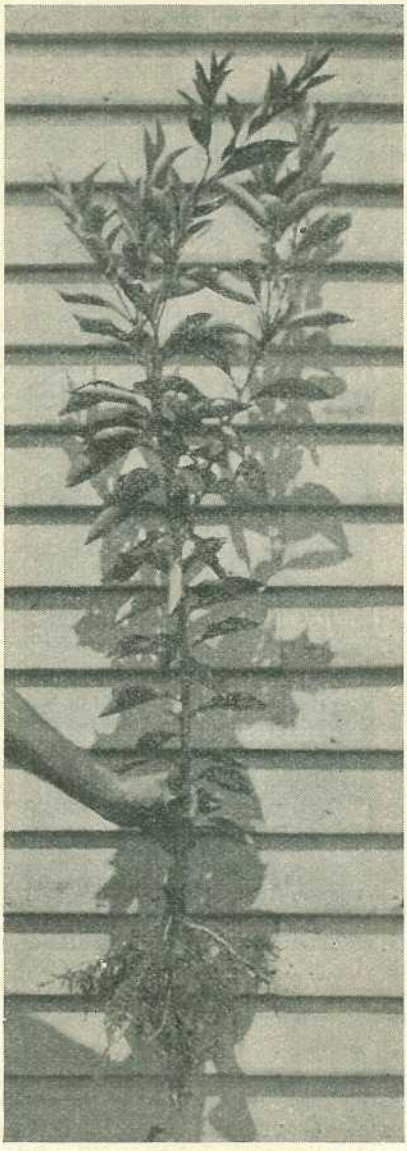

Plate 22.
A desirable type of nursery tree.

Pruning has, as a consequence, generally developed into a mechanical procedure rather than one based on an understanding of principles involved.

In general terms the method of pruning depends on—

(*a*) The age of the tree.

(*b*) The variety of the tree.

(*c*) The type of tree (whether vegetative or fruiting).

(*d*) Soil and cultural conditions.

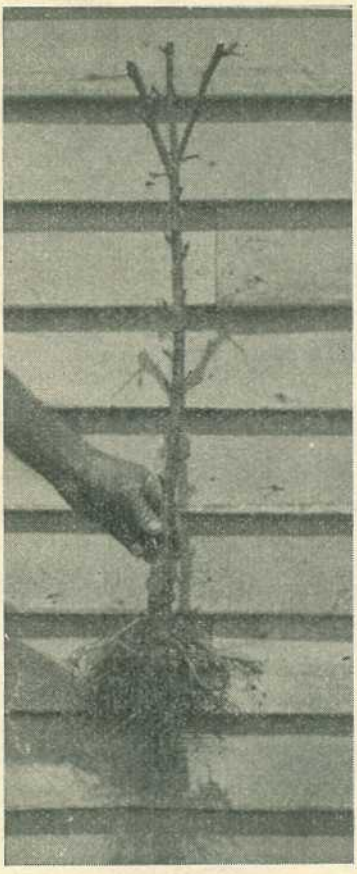

Plate 23.

The nursery tree shown in Plate 22 prepared for planting.

The main objects in pruning may be classified as follows:—The training of young trees; the removal of undesirable limbs; the modification of form to meet economical and cultural requirements and to counteract unfavourable climatic conditions; the removal of injured and worn out parts; the renewal of old and decadent trees.

PREPARATION OF NURSERY TREES FOR PLANTING.

The present day tendency of nurserymen is towards the practice of sending out trees carrying large heads, and in some instances shaping their prior despatch. The former method is best, as the planter is better able to shape the trees as he desires them. The latter is of little benefit owing to damage which may be sustained to some of the branches during transit.

The rooting system should be well washed prior to planting in order to remove any of the mud puddle which may be adhering thereto. Bruised and broken roots require to be shortened, and the head of the tree should be shortened and shaped to develop evenly.

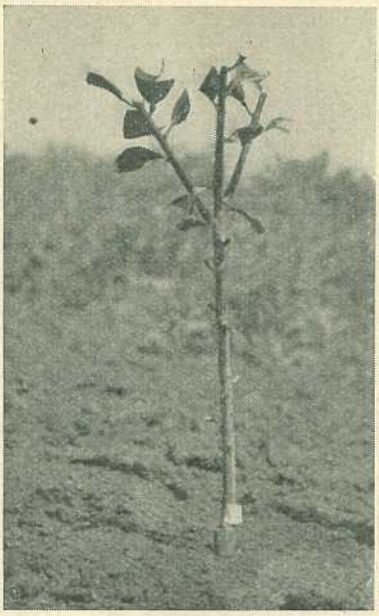

Plate 24.

A newly-planted tree. Note that the union of the stock and scion is well above ground level.

TRAINING YOUNG TREES.

The pruning of young trees in the orchard should be confined to the removal of adventitious shoots from the stem, and the checking of excessively vigorous growths from the main arms.

It will be noted from Plates 23 and 24 that three main arms have been left on which to build the future tree. Two secondary arms only should be permitted to grow from the ends of each of these main arms in order to develop a strong and well-shaped top. Other secondary arms will grow but should be removed. Undesirable shoots which grow all along the main arms, and which obviously are out of place, would by their continued growth weaken the framework of the tree and should be cut away. In instances where awkwardly-shaped trees are received from the nursery it is often possible to train a shoot which ordinarily

would be out of place to develop and fill up a gap. Such training involves shortening back the required shoot at some dormant period of growth to a bud pointing in the direction it is desired the shoot should grow. Remember that a shoot can be trained in any direction by cutting back to a bud pointing in that direction. Long weak limbs that do not show a tendency to branch should be headed back generally to the limit of the other growths, so that the tree will grow strong, compact, and symmetrical. The top should not be allowed to become too dense; on the other hand it should not be kept so open as to permit the sun scalding the main limbs and branches.

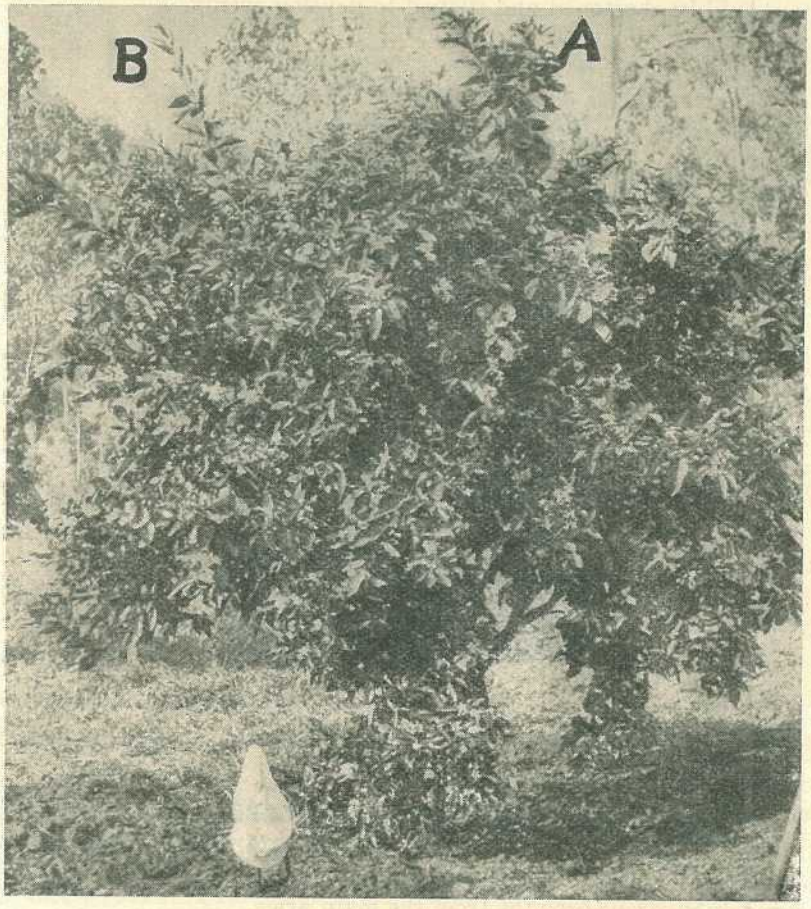

Plate 25.
Four-year-old Valencia Late.

It is worthy of note that where special bud-selected trees have been planted, they have consistently grown into shapely desirable trees and require very little attention from the pruner.

Plate 25 illustrates a young Valencia Late tree showing growth typical of this variety. This tree requires little pruning beyond the removal of any misplaced or excessively vigorous limbs such as those

at the top marked A and B, which can be cut right back to their source. Any dead twigs and crowded foliage would naturally require to be removed.

Plate 27 illustrates a four-year-old Washington Navel and shows typical sucker growths, the treatment of which is sometimes apt to puzzle the pruner.

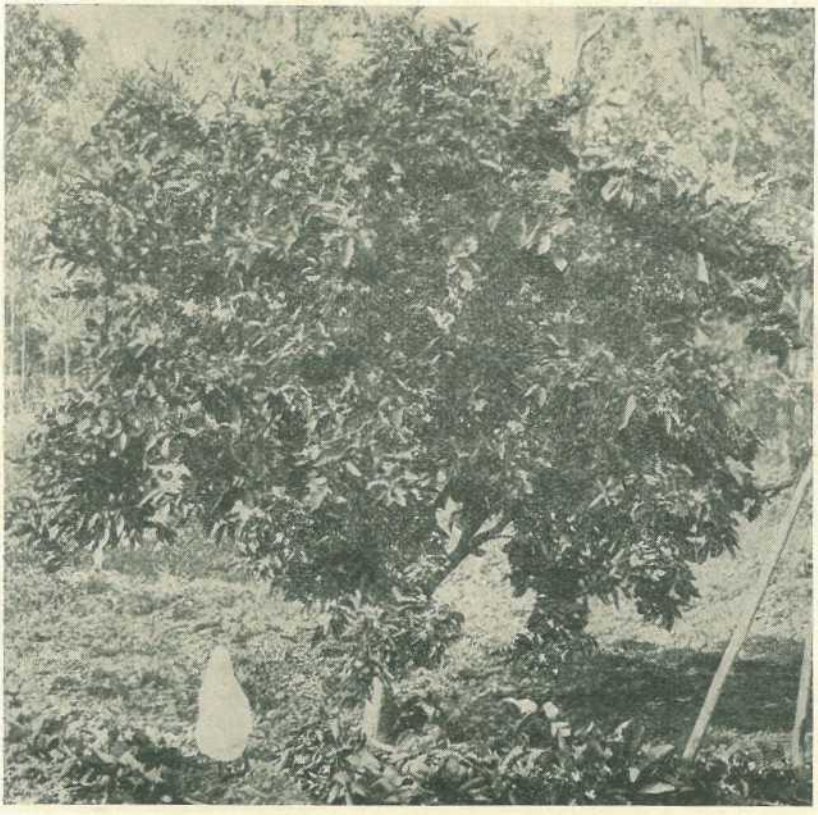

Plate 26.
The tree in Plate 25 after pruning. Note that the excessively vigorous limbs marked "A" and "B" have been removed.

As a rule such sucker growths may be considered parasitic, but they do not necessarily remain so, for in many instances they later produce bloom and fruit of normal fulness. Generally in practice it is a good plan to remove such growths, remembering that the fact that they can be curbed and induced to fruit makes it possible at times to utilise them for replacing broken and damaged limbs.

Provided that a well-developed framework has been maintained, young well-grown citrus trees should come into profitable bearing at an age of between four and six years. During the first years of bearing pruning should be directed towards the removal of suckers and decadent first-fruiting shoots. Where pruning operations have been diligently carried out on young trees, they require very little pruning during several following years, though they should be gone through annually and suckers and dead wood removed.

There is no doubt that the low production in the case of many old but well cared for orchards is due to the lack of vigorous healthy fruiting wood. This condition points to the necessity for a periodical renewal of fruiting wood, which can be best accomplished by thinning out and at the same time shortening back terminal growths and twigs. The cuts should be made right back to strong new growths, removing weak shoots and those that have borne fruits. The thinning leaves space for the necessary subdivision, whilst the shortening back tends to force into growth dormant buds from behind, stops the excessive growth of any branches, and at the same time renews supplies of

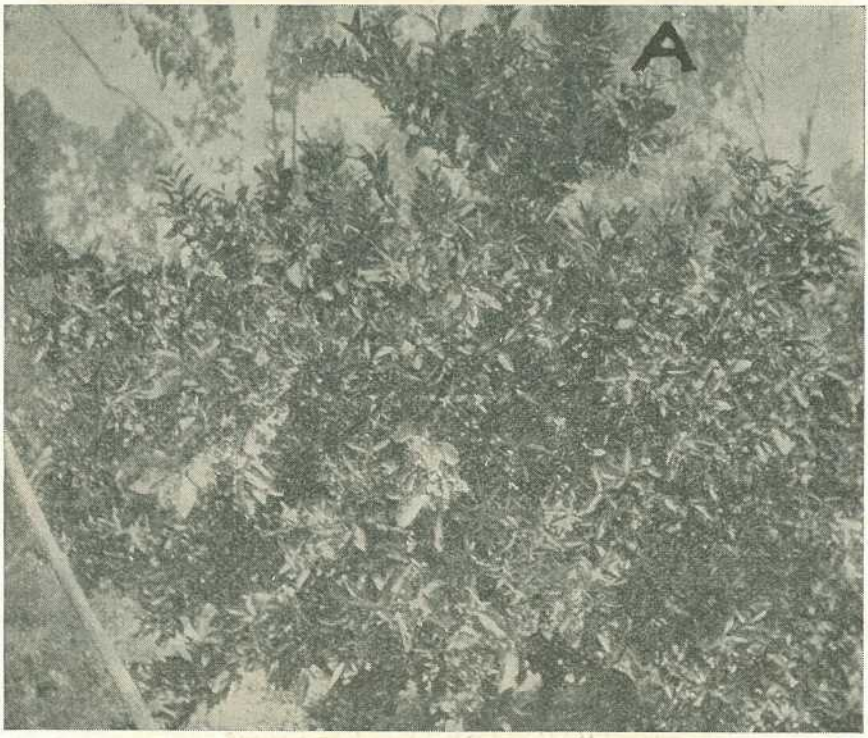

Plate 27.
Four-year-old Washington Navel, showing typical sucker growths.

fruiting wood. Where crowding is evident, the removal of entire branches is at times desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots from behind the outside ring of foliage. These shoots make new fruiting wood. Any excessive growth of suckers or water sprouts arising from well inside the tree following heavy pruning require to be cut away or they will absorb a lot of the vigour of the tree and crowd the centre.

In older trees where vitality has been impaired, provision will require to be made for the renewal of old crowded and decadent limbs. In such instances pruning is of a much heavier nature, requiring the removal of entire branches. Such branches should be cut right back to

their source of origin, so that the sap is readily diverted to the remaining limbs, encouraging new fruiting wood. Under no circumstances whatsoever should stubbing be resorted to. In instances where it is necessary to replace the larger limbs the work requires to be done gradually over two or more years to avoid excessive suckering.

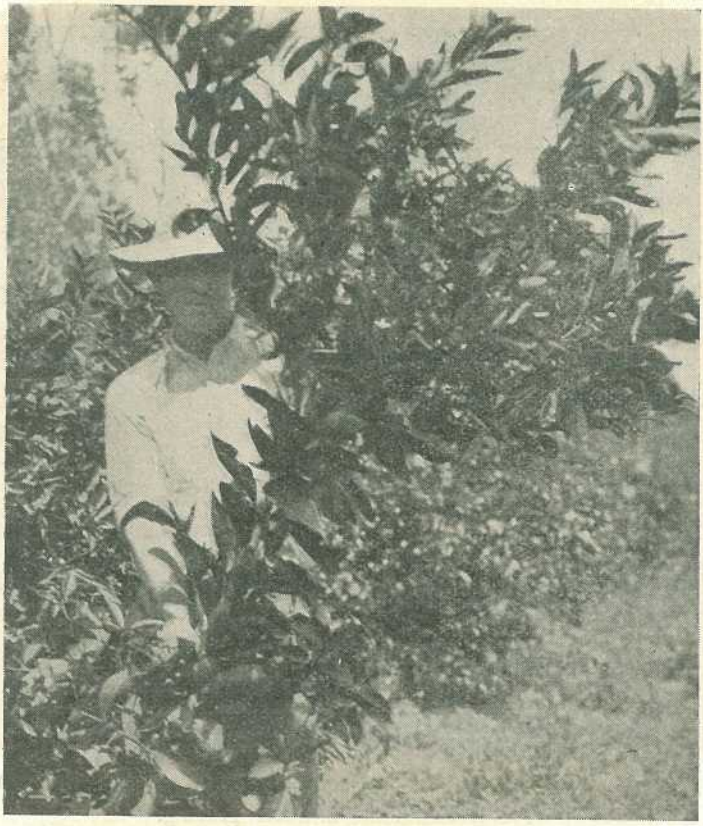

Plate 28.

Sucker, marked A at the top of tree shown in Plate 27, after removal.

Lower branches of the trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances; in most instances knee-high will prove to be satisfactory.

In Queensland the regular thinning and pruning of bearing trees is definitely necessary. Frequent and regular treatment tends to preserve as nearly as possible the balance between the root system and aerial portions of the tree, assists in the control of economical and cultural requirements and counteracting unfavourable climatic conditions.

MANDARINS.

The majority of mandarins when not systematically trained and pruned are often merely shrubs, not trees. They naturally grow very densely, and unless regularly thinned out and shortened back after the fruit has been harvested the massed twigs become so dense that many perish and the remainder are so weakened that only small inferior fruits are produced.

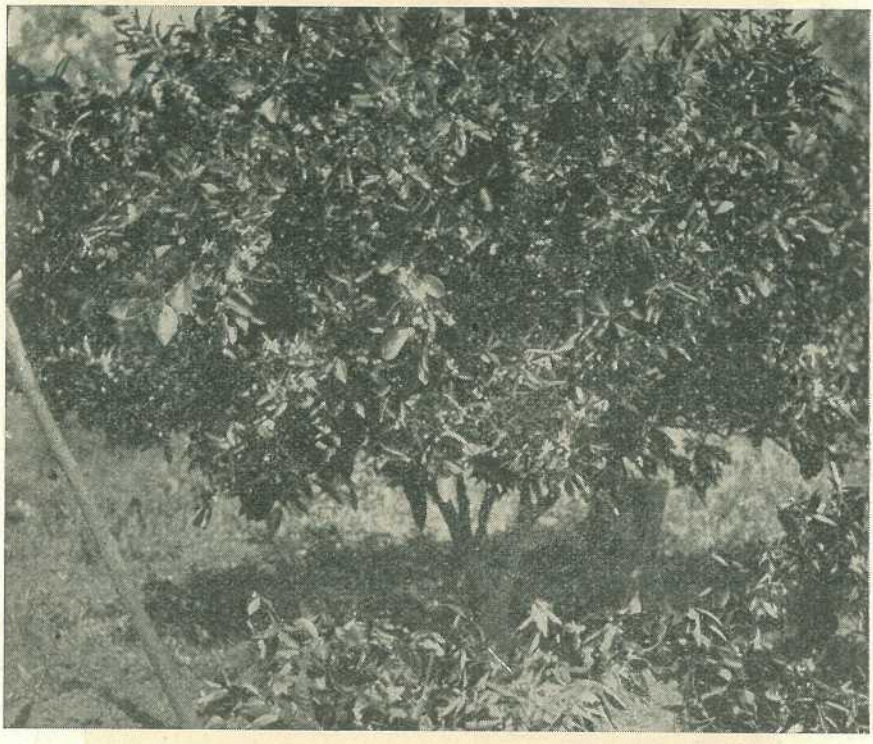

Plate 29.
The tree in Plate 27 after pruning.

The treatment at planting is identical with that of the orange. After the first season from planting numerous vigorous upright shoots arise from the head of the tree. While small these should be thinned, leaving only those which will assist in building a desirable framework. These should be carefully watched, and where the growth becomes too lengthy, shortened in to a lateral growth, and where laterals are not present headed back to the limits of the other growths. Heading back and thinning may be done when the growths have hardened, not when they are soft and growing rapidly. It is possible to check excessive growths by pinching out an inch or so of the tips.

The densely-growing habit of the mandarin, leading to a profusion of weak shoots, is responsible for overbearing and resultant small and inferior fruits at an early age. Providing that a well-developed framework has been maintained, young well-grown mandarin trees may be permitted to bear at four years of age. The annual pruning of bearing

mandarin trees requires the same regular and close attention as in training and forming young trees. The dense growths and crowded branches require to be well thinned out and shortened back to vigorous laterals of current season growth, removing weak twigs and where

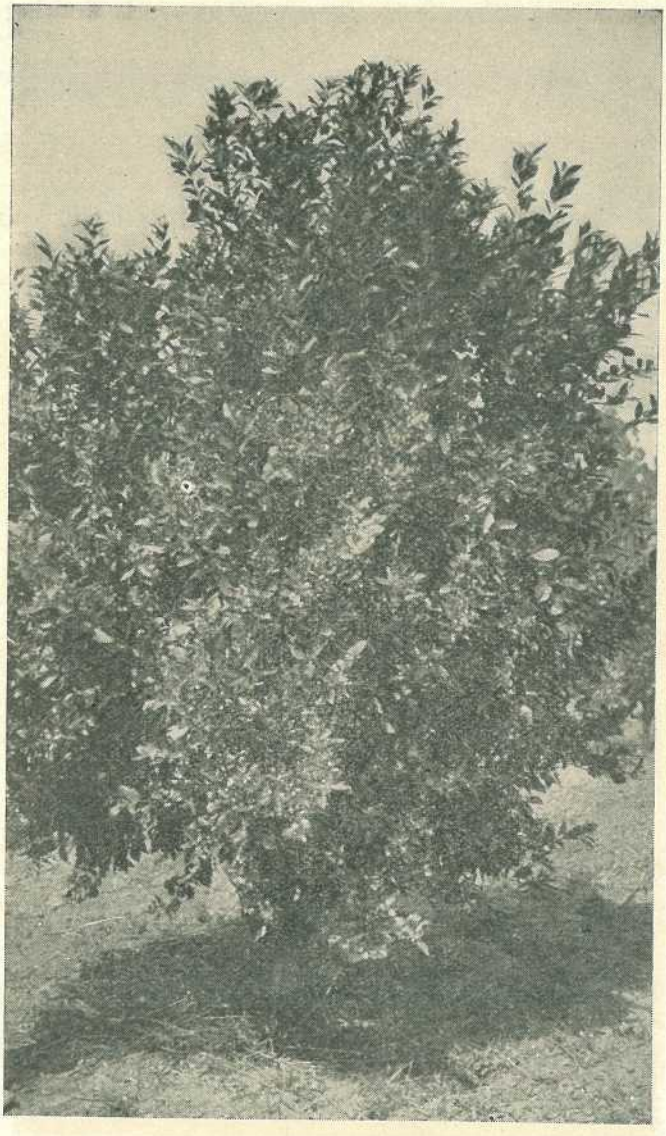

Plate 30.
Four-year-old Glen Retreat Mandarin.

possible shoots that have borne fruits. Such annual treatment permitting ample light and the ready circulation of air throughout—(1) greatly increases the vigour of the tree; (2) suppresses surplus growths and twigs; (3) improves the size and quality of the fruit; and (4) provides for the renewal of ample young and vigorous fruiting wood.

LEMONS.

With lemons the general practice with growers has been to prune severely while the trees are young in an effort to control the growth and so produce a strong framework. In some instances such treatment has retarded growth, and certainly it has retarded the early fruiting of the

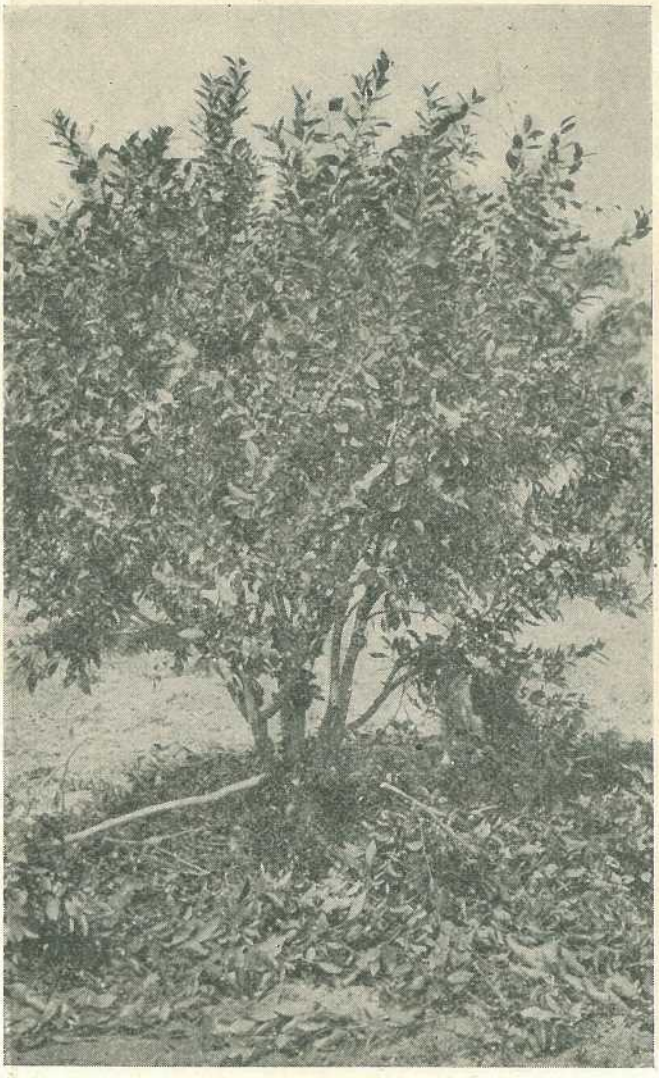

Plate 31.
Tree in Plate 30 after pruning.

trees. Apart from the necessary trimming at planting, which, similarly to oranges, consists of shortening back and removing broken and bruised roots, and a corresponding shortening back of the head of the tree in such a manner as to produce a strong straight stem with three or four

well-placed arms radiating therefrom, little pruning should be done during the first two or three years. All that is necessary is a light thinning to remove any undesirable shoots that are out of place and would later upset the balance of the tree, and perhaps a shortening of

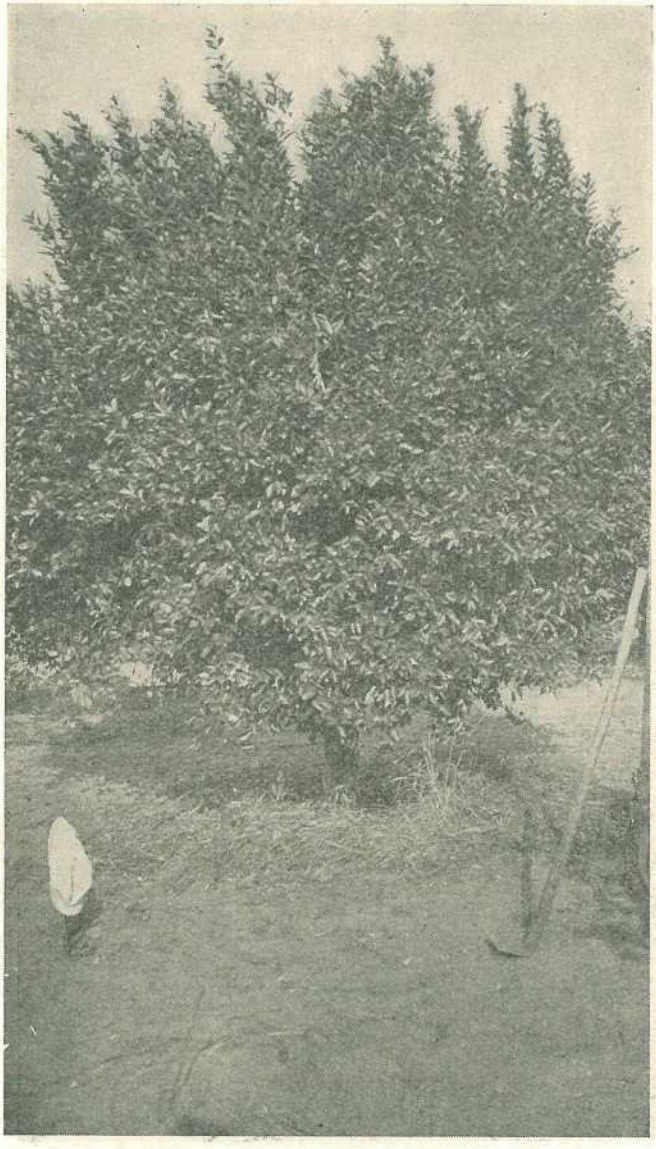

Plate 32.
Twelve-year-old Glen Retreat Mandarin before pruning.

excessively vigorous shoots. Main upright-growing limbs, evenly spaced, should be selected as main leaders. As the trees get older these become weighted down at the ends by subdivision, and the weight of fruit and strong side shoots will arise from them. These side shoots should be

thinned out, but not all removed. Those left should be shortened back to form spurs which will produce the best fruit. Suitable growths close to the centre of the tree may be left to grow upright and take the place of the first leaders which have been weighed down.

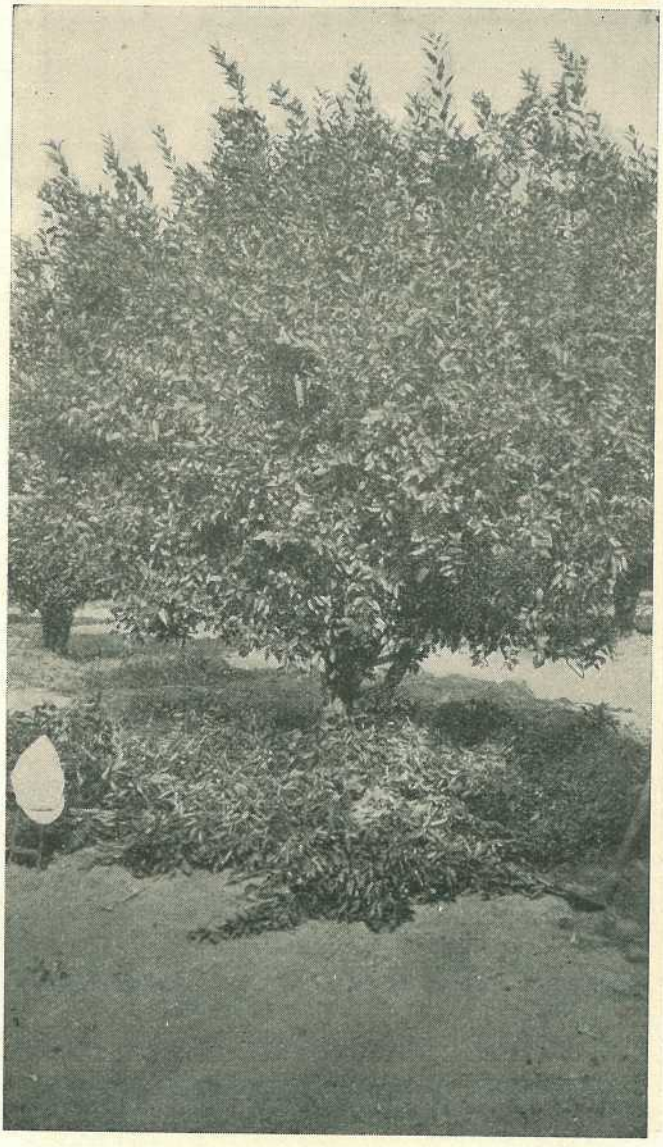

Plate 33.

Twelve-year-old Glen Retreat after pruning.

In time it will be found the tree is built up of series of tiered branches radiating from the main framework. The object of building up the tree in this manner and spurring it is to encourage a fruit-bearing habit. This is explained as follows:—As the fruit weighs the

vertical branches down to a more horizontal position, the vigour of the branches is reduced, and side shoots arising from such branches are, when spurred as outlined above, conducive to fruit production.

When shortening side shoots, the cuts should be made well back into ripe wood, thus throwing the sap into dormant buds. Light wood

Plate 34.
Typical young lemon tree.

issuing from inside the more erect permanent arms may be retained, shortening for spurring, and from time to time renewed. No rank growth should be tolerated unless it is required to continue the work of

Plate 35.
Lemon leader weighted down. Note strong side shoots.

Plate 36.
The fallen leader shown in Plate 35 after thinning and shortening back the side shoots.

some displaced leader. As the limbs drag down it will be necessary from time to time to lift the tree by removing some of the lower limbs.

Plate 37.
Badly framed young lemon.

RENOVATING DECADENT TREES.

The renovating of many of our old citrus orchards which are rapidly failing in productivity and health constitutes a serious problem. The cause of the decline of citrus trees in Queensland is chiefly due to

starvation together with a combination of climatic and soil conditions. The characteristics of decadent trees may be enumerated as follows:—

(1) Increased percentage of small-sized fruits.

(2) Decreased yield.

(3) Dwarfed foliage in the tree tops.

(4) Weak leafless fruiting wood.

(5) Heavy production of weak blossom.

Plate 38.
The same tree illustrated (Plate 37) after pruning.

There are numerous instances where many of our old and decadent trees may be profitably renovated. Several methods have been used in rejuvenating citrus trees—deheading (by which is meant the cutting back of the tree to three or four main arms to within 18 inches to 2 feet of the main stem); a modification of this in which the secondary

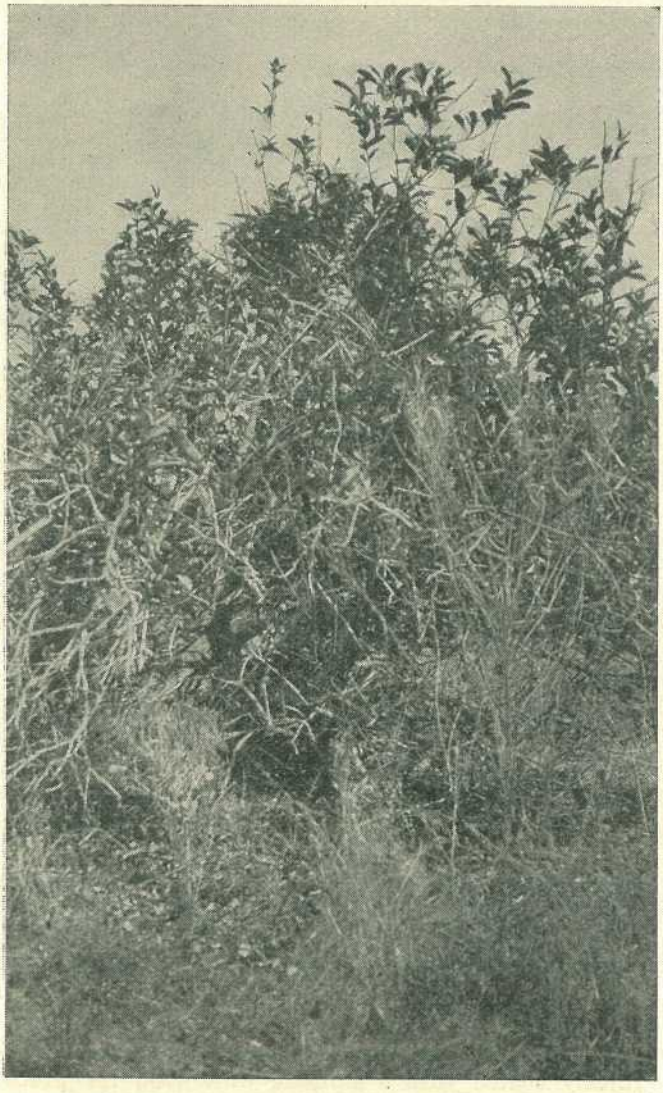

Plate 39.
A decadent lemon tree.

branches are stubbed back to a foot or so in length. Both these methods are somewhat severe, as in removing the entire top of the tree, the balance is upset and the rooting system weakened. Skeltonising—a much less severe method—has now found favour and is giving satisfactory results.

The entire framework of the tree is generally left, except where crowded and diseased limbs require to be removed. Cross limbs and unnecessary leaders are cut out or shortened back. An entirely new fruiting system is built up from the remaining skeleton. The degree of severity of cutting back depends upon the condition of the tree. When declining trees are cut back in this manner, it should be remembered

Plate 40.
The same tree shown (Plate 39) after pruning.

that the bark is very susceptible to sun scald and all the exposed limbs must be thickly coated with a suitable whitewash for protection. A simple whitewash formula can be made as follows:—

Quick Lime	7 lb.
Sulphur (powdered)	2 lb.
Salt, flour, or size	1 lb.

As the lime is slaked down, the sulphur and salt should be well stirred in, and sufficient water should be added to bring the mixture to the consistency of a good paint.

[TO BE CONTINUED.]

Lime for Agricultural Purposes.

F. B. COLEMAN, Officer in Charge, and R. A. TAYLOR, A.A.C.I., Inspector and Examiner, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers and Stock Foods Investigation Branch.

UNDER "*The Fertilisers Act of* 1935," lime for agricultural purposes is dealt with very comprehensively.

The classification set out in the Act with respect to the types of lime for agricultural purposes is as follows:—

(1) Burnt lime, caustic lime, or quicklime—consisting chiefly of lime in the form of calcium oxide (CaO); or

(2) Slaked lime, air-slaked lime, mild lime, hydrated lime—consisting chiefly of lime in the form of hydrate of lime ($CaOH_2$) and/or carbonate of lime ($CaCO_3$), obtained by the slaking of burnt lime; or

(3) Processed lime—consisting of a by-product from a process—chiefly lime in the form of hydrate and/or carbonate of lime; or

(4) Pulverised limestone, marble, coral, or shells—consisting chiefly of lime in the form of carbonate of lime ($CaCO_3$) obtained by crushing or pulverising; or

(5) Earthy lime—consisting chiefly of lime in the form of carbonate of lime ($CaCO_3$) obtained by excavation of the natural substance; or

(6) Gypsum—consisting of lime in the form of hydrated sulphate of lime ($CaSO_4.2H_2O$).

The classification of lime, as shown above, is based upon terms in common use, which describe the process of preparation or manufacture to which the limes concerned have been subjected.

Burnt Lime is obtained as follows:—

Limestone is first quarried and broken into pieces of suitable size. These pieces are placed in a kiln with fuel—in Queensland usually wood—which is ignited. The heat serves to liberate the carbon dioxide from the calcium carbonate, leaving calcium oxide and a quantity of impurities proportionate to the purity of the original limestone.

Pure limestone would contain 56 per cent. calcium oxide and 44 per cent. carbon dioxide; pure burnt lime would contain 100 per cent. calcium oxide. In actual fact the minimum purity of good burnt lime can be accepted as 90 per cent. calcium oxide (CaO). It should be emphasised that the impurities mentioned above, consisting of iron, alumina, magnesia, silica, &c., are naturally present in limestone, and cannot without great expense be removed; moreover, in normal proportions they do no harm and can be disregarded.

It is essential that the limestone should be completely burnt, otherwise the purchaser is buying some of the original limestone at the price of burnt lime.

An analysis of burnt lime indicates whether the limestone has been completely burnt; even if the burnt lime has been partially slaked it is still possible to determine this.

Burnt lime slakes under normal atmospheric conditions, taking in carbon dioxide and water from the air and "altering" from calcium oxide to a mixture of calcium hydroxide and calcium carbonate. This slaking may be considered in two steps:—

At first the calcium oxide alters to calcium hydroxide and calcium carbonate, with calcium hydroxide in much greater proportion than calcium carbonate.

An analysis would show, say—

50 per cent. calcium oxide (CaO) as calcium oxide.
30 per cent. calcium oxide (CaO) as calcium hydroxide.
4 per cent. calcium oxide (CaO) as calcium carbonate.

When the whole of the oxide has "altered," the proportions of the hydroxide and carbonate would be represented by, say—

0 per cent. calcium oxide (CaO) as calcium oxide.
60 per cent. calcium oxide (CaO) as calcium hydroxide.
10 per cent. calcium oxide (CaO) as calcium carbonate.

This slaked lime would then gradually "alter" until it becomes all carbonate, an analysis revealing, say—

55 per cent. calcium oxide (CaO) as calcium carbonate.

This is then a stable article, and undergoes no further change under atmospheric conditions.

Following on the above, it may be assumed that an analysis of—

50 per cent. calcium oxide (CaO) as calcium oxide,
30 per cent. calcium oxide (CaO) as calcium hydroxide,
4 per cent. calcium oxide (CaO) as calcium carbonate.

represents a well-burnt lime that has partially air-slaked.

An analysis such as the following, however, would indicate by the excess of calcium carbonate, compared with calcium hydroxide, the presence of unburnt calcium carbonate, and consequently could be assumed as being a partially-slaked, badly burnt lime:—

50 per cent. calcium oxide (CaO) as calcium oxide.
7 per cent. calcium oxide (CaO) as calcium hydroxide.
22 per cent. calcium oxide (CaO) as calcium carbonate.

Of course the following—

70 per cent. calcium oxide (CaO) as calcium oxide,
0 per cent. calcium oxide (CaO) as calcium hydroxide,
16 per cent. calcium oxide (CaO) as calcium carbonate,

is obviously a freshly-prepared, badly burnt lime.

It must be noted that the percentages given are *calcium oxide* (CaO),—not calcium hydroxide ($Ca(OH)_2$) or calcium carbonate ($CaCO_3$).

When a farmer realises that burnt lime slakes under normal atmospheric conditions, and its percentage of calcium oxide (CaO) and its neutralising value become lower, it is easy to see that burnt lime should be packed and railed as *freshly burnt* material. If the material has

started to slake before being packed and weighed, the purchaser is buying and paying freight on partially slaked lime, which, as above stated, has a lower percentage of lime (CaO) and lower neutralising value.

Thus, a person who pays for burnt lime and asks the manufacturer to slake it for him, unless he gets the *increased "weight equivalent"* of slaked lime, is losing badly on the proposition; in any case he is paying freight on carbon dioxide and water that could be added to the burnt lime on his own property.

Burnt lime should be purchased on the basis of net weight at the place of burning—which in North Queensland is usually some distance from the coast—as, during transit to the coast, an increase in weight could occur (due, as above stated, to taking up of carbon dioxide and moisture) before weighing; if weighed at the coast this increase would be included in the net weight charged for. In other words, 10 tons of burnt lime at the kilns could weigh 11 tons on the coast, with a consequent increased cost to the purchaser.

Ground Burnt Lime is, as its name indicates, burnt lime that has been pulverised by machine without first slaking. One such product is now being offered for sale in Queensland.

The farmer in this case must weigh the additional cost of the material against any advantage in fineness, taking into consideration the facts that although he can easily slake unground burnt lime on his own property, there is no additional freight cost (as with slaked lime) involved with ground burnt lime, providing it is bagged and railed immediately.

Of course the fine state of division would accelerate slaking considerably, and this would not be apparent from appearance—as the original material is already in a fine state.

Slaked Lime, as stated above, is usually obtained by air-slaking—that is, exposing burnt lime to the slaking effects of the atmosphere. A more rapid slaking can be obtained by sprinkling with water; this produces a rapid chemical change, with evolution of heat, and results in a fine, white powder, termed water-slaked or hydrated lime.

With a correctly-made water-slaked lime the amount of water added is about one-third of the weight of the original burnt lime; the resultant product should be practically all calcium hydroxide, and should give a minimum analysis of 70 per cent. calcium oxide (CaO) as calcium hydroxide.

Possibly owing to lack of experience in this method of slaking, and the necessity for careful control with respect to proportions, &c., in order to obtain a "consistent" product, water-slaked lime for agricultural purposes can be stated to be practically absent from the Queensland market.

The slaked lime made by farmers from burnt lime is commonly air-slaked lime.

Of course, water-slaked lime on exposure will gradually alter to air-slaked lime, changing in time from practically pure calcium hydroxide to practically pure calcium carbonate.

The proportion of calcium oxide present and the forms in which it occurs at the time of application to the soil vary with the progress made in the process of slaking; this, of course, causes complications with respect to the amount of lime to be applied.

If burnt lime is purchased, the purchaser should apportion the lime actually applied to the soil into the same number of units as he planned for the original burnt lime.

For instance:—

A farmer buys 10 tons of burnt lime with a neutralising value of 160, planning to apply $\frac{1}{2}$ ton per acre to 20 acres.

When slaked ready for use the total weight may have increased to, say, 12 tons.

The neutralising value will be *reduced* by the slaking.

The lime should still be divided into twenty lots and applied as planned, but the actual weight per acre will now be $\frac{12}{20}$ x $\frac{1}{2}$ = $\frac{12}{20}$ ton = 12 cwt. instead of 10 cwt.

The actual weight of calcium oxide (CaO) applied to the soil will be the same, however.

This is demonstrated thus:—

10 cwt. x neutralising value 160 = 1,600

12 cwt. x neutralising value $133\frac{1}{3}$ = 1,600

The neutralising value bears an approximate ratio to the calcium oxide (CaO) percentage.

There is not much of any slaked lime sold as slaked lime in Queensland; as will be seen, only one is registered.

Processed Lime.—In certain industries lime (usually burnt lime) is used in chemical processes, and a resultant lime by-product is obtained. In Queensland, only one lime of this type is offered for sale; when freshly run-off in paste form it contains calcium hydroxide and calcium carbonate, but on being spread out in the open the hydrate gradually alters to carbonate. The final product, when dried, is ground, and constitutes a recognised lime for agricultural purposes.

Pulverised Limestone, Pulverised Marble, Pulverised Coral, or *Pulverised Shells* are the respective natural materials after treating by passing through a crushing or pulverising machine.

The percentage of calcium oxide varies according to the purity of the original material; the calcium oxide is in the form of calcium carbonate. *Pulverised limestone* varies in quality, but, generally speaking, is a fairly high-grade source of lime. It must be ground in a pulverising machine, as is explained elsewhere under the heading of "*Fineness.*"

The degree of fineness is an important factor governing its value. The natural impurities usually present are chiefly magnesia, iron, alumina and silica.

Earthy Lime consists of lime carbonate which is in a naturally disintegrated or friable condition, and is dug out after removal of the "overburden." It is comparatively impure and of a softer nature than limestone. It needs very little treatment before being offered for sale; sieving is usually sufficient to obtain a satisfactory degree of fineness—to which importance should be attached.

The calcium oxide content varies according to the purity of the material—as in pulverised limestone—and is wholly present in the form of calcium carbonate.

Earthy lime should always be screened before being bagged ready for sale.

Magnesian or Dolomitic Lime Carbonates.—A number of natural limestone deposits contain an appreciable quantity of magnesia. When this type of material is marketed in Queensland the maximum percentage of magnesia (MgO) must be declared on the label for the information of the purchaser, who may decide from this percentage whether the product is suited for his particular purpose or otherwise. Reference to the table of registrations will show that one magnesian lime for agricultural purposes is at present on the Queensland market. In this particular instance the material occurs as an earthy lime which requires very little pulverising.

Of course, practically all naturally occurring lime carbonates contain a small amount of magnesia.

It should be noted that the maximum percentage stated on the label refers to magnesia (MgO)—not magnesium carbonate ($MgCO_3$). This is comparable to the declaration of the percentage of calcium oxide (CaO) and not calcium carbonate ($CaCO_3$), as explained under "*Labelling.*"

Gypsum.—Gypsum is a naturally occurring form of lime, and may be described as dihydric calcium sulphate ($CaSO_4.2H_2O$).

It is very little used in Queensland, and although it has a minimum lime content of 32 per cent., it has no actual neutralising value.

No material is registered in Queensland under this name.

Miscellaneous Limes.—From time to time limes for agricultural purposes are placed on the market that owing to the quality of the material used, or difficulties involved in the process of manufacture or preparation, or other factors, do not compare with limes in the group to which they purport to belong.

In these cases they are classified as miscellaneous to allow purchasers to value them on their own merits apart from any group in which they would appear out of line.

Neutralising Value.—This term applies to all limes for agricultural purposes, except gypsum, and affords a means of comparison applicable to these limes.

It is a comparative figure which denotes the ability of the lime in question to neutralise acidity, which is one of the main purposes for which lime is used.

It is a figure ascertained practically, and would include any other carbonates or basic materials present.

The standard of comparison is 100 per cent. pure calcium carbonate, which would have a neutralising value of 100.

Comparative neutralising values would be:—

Burnt lime	160
Slaked lime	120
Pulverised limestone	90
Processed lime	86
Earthy lime	80

Fineness.—With respect to lime sold for agricultural purposes, fineness is of importance with earthy lime, pulverised limestone, pulverised marble, and other pulverised carbonates, and also processed lime.

"Fine" means particles that will pass a sieve with apertures $\frac{1}{100}$ inch square.

The whole of the limes to which fineness applies must pass a sieve with apertures $\frac{1}{8}$ inch square.

Burnt lime is not affected by fineness, and the resultant slaked lime is also exempt from this provision.

Carbonates with equal neutralising values may be compared on a fineness basis.

The reason why fineness applies to earthy lime, processed lime, pulverised limestone, and other pulverised carbonates, and not to burnt or slaked lime, may be set down as follows:—

It has been repeatedly proved *that lime carbonates, unless in a fine state of division, are not rapidly absorbed by the soil, being insoluble in pure water and only slowly soluble in slightly carbonated water—that is, water containing carbon dioxide in small quantity.

Artificial grinding (or screening) is therefore necessary with these materials.

Burnt lime, however, is in large lumps when sold, and of its own accord breaks down on slaking—either artificial or natural—to a fine powder. This powder, being usually largely hydroxide when applied, is fairly water-soluble, and is absorbed readily by the soil.

No artificial grinding is therefore necessary, and a fairly uniform absorption by the soil is obtained from all burnt or freshly slaked limes.

The table on page 99 sets out the various limes being offered for sale within the State.

The Value of Group Names.—The use of names indicating the groups to which the particular limes relate is of importance.

For instance, a purchaser uses the name "Burnt Lime." Now, providing names used are a correct indication, any burnt lime registered would have a neutralising value that should be associated with burnt lime, e.g., say, at least 160.

If he orders a pulverised limestone, irrespective of "specific designation," he would get a material with a neutralising value of, say, at least 90, and with earthy lime, say, 70 to 90.

In addition, with the use of the name "Burnt Lime," he can dispense with fineness, whereas, with pulverised limestones, earthly limestones, &c., he has two factors of importance—neutralising value and fineness.

In short, limes may readily be compared with other limes in their own respective groups, and the strict adherence to this grouping with respect to the names used on the labels is of importance in allowing this comparison to be easily made.

* "Value of Different Forms of Lime," by Dr. H. W. Kerr and C. R. von Stieglitz, Farm Bulletin No. 6, Bureau of Sugar Experiment Stations.

LIMES FOR AGRICULTURAL PURPOSES.

REGISTERED UNDER THE FERTILISERS ACT OF 1935 FOR THE YEAR ENDING 31ST DECEMBER, 1936.

Name and Address of Dealer.	Brand.	Guaranteed Analysis.					
		Calcium Oxide (CaO).	In the under-mentioned Form.	Neutralising Value.	Magnesia (MgO) as Magnesium Carbonate.	Fine.	Coarse.
Burnt Lime—		Minimum %		Minimum.	Maximum %	Minimum %	%
Ambrose Lime Works, Ambrose	Ambrose	90	As oxide	160	..	..	..
Crotty Lime Works, Ootann Siding, via Cairns	Crotty	90	As oxide	160	..	..	..
Demchok, M., Mungana	Mungana	90	As oxide	160	..	..	..
Ryan Lime Co. (Pty.) Ltd., Townsville	Ryan	90	As oxide	160	..	..	..
Tamaree Lime Works, Tamaree	Tamaree	90	As oxide	160	..	..	..
Webb & Son, Reid River, N.Q.	Webb's	90	As oxide	160	..	..	..
Burnt Lime (Pulverised)—							
Ryan Lime Co. (Pty.), Ltd., Townsville	Ryan	85	As oxide	150	..	..	..
Slaked Lime—							
Ambrose & Sons, H., Tamaree	Tamaree	5	As oxide	120	..	..	..
		45	As hydroxide				
		11	As carbonate				
Processed Lime—							
A.C.F. & Shirleys Fertilizers Ltd., Brisbane	A.C.F. Hydrolime	47	As carbonate	88	..	50	50
Australian Chemical Co. Ltd., Brisbane	Acco	47	As carbonate	88	..	50	50
Pulverised Limestone, Marble, &c.—							
Ambrose Lime Works, Ambrose	Ambrose	50	As carbonate	90	..	84	16
Crotty Lime Works, Ootann Siding, via Cairns	Crotty	51	As carbonate	92	..	77	23
Gibbs, Bright, & Co., Brisbane	S.C.	50	As carbonate	91	..	60	40
Marberete Co., Valley, Brisbane	Marberete	55	As carbonate	99	..	44	56
Ryan Lime Co. (Pty.) Ltd., Townsville	Ryan	50	As carbonate	90	..	50	50
Earthy Lime—							
Breen & Olsen, Marmor Lime Works, Marmor	Breen & Olsen	51	As carbonate	90	..	70	30
Bryant C. J., Didcot, Gayndah Line	Didcot	47	As carbonate	80	..	74	26
Ryan Lime Co. (Pty.) Ltd., Townsville	Ryan	45	As carbonate	80	..	30	70
Webb & Son, Reid River, N.Q.	Webb's	45	As carbonate	80	..	30	70
Containing Magnesia—							
Inkerman Lime Co., Inkerman	Inkerman	43	As carbonate	85	7	60	40

Fine means particles that will pass a seive with 1/100" square apertures.

Labels.—The method of labelling lime with respect to lime content (as indicated also in the Table) is as follows:—

The percentage or percentages of calcium oxide (CaO) and the respective forms in which it occurs must be stated. This means that, with slaked limes or carbonates, not the percentage of calcium hydrate and percentage of calcium carbonate should be stated, but the percentages of calcium oxide (CaO) that are present in each of those forms.

Let us take a partially air-slaked lime for an example. This may consist actually of—

50 per cent. calcium oxide,
40 per cent. calcium hydroxide, and
5 per cent. calcium carbonate,

with, say, 5 per cent. impurities.

Now, in the calcium hydroxide and calcium carbonate, only the percentages of calcium oxide (CaO) can be called active constituents.

To compare with burnt lime containing, say, 90 per cent. calcium oxide (CaO), all as calcium oxide, this lime must be reduced to a common basis. In other words, to compare with a material that has lime present only as calcium oxide (CaO), the percentages of calcium hydroxide and calcium carbonate must also be reduced to the amount of calcium oxide (CaO) that they contain—the forms in which the calcium oxide (CaO) occurs being, of course, also stated.

Thus, the label would read—

50 per cent. calcium oxide (CaO) as calcium oxide
30 per cent. calcium oxide (CaO) as calcium hydroxide
2·8 per cent. calcium oxide (CaO) as calcium carbonate

Total 82·8 per cent. calcium oxide (CaO).

On this figure the material can then be compared with any other lime on a total calcium oxide (CaO) basis.

Of course, the neutralising value gives a definite method of comparison, but it includes magnesia and other neutralising material, and is a comprehensive figure only; also, of course, the neutralising value does not indicate the form or forms in which the calcium oxide occurs, and is of value only with respect to neutralising soil acidity.

It is provided by the Fertilisers Act that all limes for agricultural purposes shall be labelled in such a manner as to set out:—

The kind of lime;
The percentage of calcium oxide (CaO) and the form or forms in which it occurs;
The neutralising value;
The net weight;
The percentage of fineness (except in the case of lime which has been burnt); and
The name and address of the manufacturer or dealer.

The following sets out examples of labels:—

BURNT LIME FOR AGRICULTURAL PURPOSES.
When packed, lb. net.
90 per cent. Calcium Oxide (CaO) as Calcium Oxide.
Neutralising Value, 160.
(*Name and Address of Manufacturer or Dealer.*)

PULVERISED LIMESTONE FOR AGRICULTURAL PURPOSES.
When packed, lb. net.
50 per cent. Calcium Oxide (CaO) as Calcium Carbonate.
Neutralising Value, 90.
Fine, 80 per cent. Coarse, 20 per cent.
(*Name and Address of Manufacturer or Dealer.*)

EARTHY LIME FOR AGRICULTURAL PURPOSES.
When packed, lb. net.
45 per cent. Calcium Oxide (CaO) as Calcium Carbonate.
Neutralising Value, 80.
Fine, 65 per cent. Coarse, 35 per cent.
(*Name and Address of Manufacturer or Dealer.*)

MAGNESIAN EARTHY LIME FOR AGRICULTURAL PURPOSES.
When packed, lb. net.
43 per cent. Calcium Oxide (CaO) as Calcium Carbonate.
7 per cent. Maximum Magnesia (MgO) as Magnesium Carbonate.
Neutralising Value, 85.
Fine, 60 per cent. Coarse, 40 per cent.
(*Name and Address of Manufacturer or Dealer.*)

This article deals only with the legislation controlling the sale and quality (both chemical and physical) of the various limes for agricultural purposes, that are sold within this State.

Any information desired as to the actual use or application to the land for specific purposes should be directed to the other branches of the Department that are concerned.

Summary.

The chief original source of lime for agricultural purposes in Queensland is limestone rock.

The principal kinds of lime derived from this are as follows:—

Burnt Lime.—This is made by burning lumps of limestone, and providing it is packed and railed when freshly burnt, is a "concentrated" source of lime. It is to the farmer's advantage to slake burnt lime on his own property.

An average quality burnt lime should analyse—

90 per cent. calcium oxide (CaO) as calcium oxide, and neutralising value, 160.

Burnt lime is used in certain chemical processes; the resultant by-product is known as *Processed Lime,* and contains the calcium oxide (CaO), chiefly in the form of carbonate.

An average quality processed lime should analyse:—

46 per cent. calcium oxide (CaO) as calcium carbonate, neutralising value, 86; fine, 50 per cent.; coarse, 50 per cent.

Pulverised Limestone is the original rock quarried and ground. An average quality material should analyse:—

50 per cent. calcium oxide (CaO) as calcium carbonate, neutralising value, 90; fine, 80 per cent.; coarse, 20 per cent.

Other important limes for agricultural purposes are:—

Earthy Lime, which is an impure form of lime carbonate that can easily be worked by digging, being softer than limestone, and usually requiring screening only. An average quality material should anlayse:—

45 per cent. calcium oxide (CaO) as calcium carbonate, neutralising value, 80; fine, 65 per cent.; coarse, 35 per cent.

Magnesian Limes for Agricultural Purposes, which are pulverised limestones or earthy limes containing appreciable quantities of magnesia.

The maximum percentage of magnesia (MgO) as magnesium carbonate must be declared on the label, and this should be considered by the farmer with a view to the application of the material for particular purposes.

Efficiency of Lime for Agricultural Purposes.—Limes which have been burnt may be compared on a neutralising value basis only.

Other forms of lime may be compared within their own respective groups on a neutralising value and fineness basis.

Labels should set out the—

Kind of lime,

The percentage of CaO and forms in which it occurs,

The neutralising value,

The net weight,

The fineness (unless prepared by burning),

The name and address of the manufacturer or dealer.

Buyers of lime of a greater value than 10s. should receive an invoice bearing the warranty required by the Act with respect to the quality of the article.

On no account should purchasers accept delivery of lime for agricultural purposes that is not labelled and invoiced in the manner outlined above.

All complaints or inquiries should be addressed to the Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch, Department of Agriculture and Stock, Brisbane.

REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts, 1923 to 1934,*" during the year 1936-37:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37.

Name.	No.	Age.	Description.	Owner.
Admontem	1710	Aged	Chestnut	J. Allingham, Kangaroo Hills, Ingham
Aladdan	1498	6	Grey	N. G. Walker, Iveragh
Astor King	1688	5	Bay	R. Sta..r, M. P. Creek, Wondal
Ben Art	1423	5	Chestnut	A. G. Anderson, Hendra
Bernfield	1711	Aged	Brown	M. Meehan, Toonpan
Bill Savin	1689	6	Iron grey	W. L. Wieckhorst, Tingoora
Black Guard	1243	6	Black	R. Betts, Boonah
Bollitree	1418	5	Bay	R. De la Bere Hill, Unumgar
Boystock	1712	Aged	Bay	A. Cox, Ayr
Brutus	1618	6	Brown	S. S. Webb, Toowoomba
Bubble	1492	5	Bay	J. B. Shannon, Tooloombah
By Golly	1690	5	Brown	F. Cockrell, Archookoora
Cavalier	1378	6	Bay	R. J. D'Arcy, Glenrock, Gatton
Chieftain	1691	5	Iron grey	Hunter Bros., Cinnabar
Cottingham	1408	Aged	Chestnut	H. T. Sheppard, Greenbank
Denis Lad	1411	6	Chestnut	G. E. Crane, Elbow Valley
Diamond	1427	6	Bay	W. Gunn, Goondiwindi
Don Pride	1692	5	Brown	C. Svenson, Bundaberg
Duinatic	1693	5	Bay or brown	J. Drinan, Wallaville
Dux	1619	5	Brown	R. Fawcett, Toowoomba
Emblem Mat	1695	5	Iron grey	W. Elsebach, Gayndah
Embleso	1696	5	Brown	L. Wedemeyer, Eidsvold
Falling Star	1458	5	Brown	A. C. Williams, Homevale, Nebo
Father's Footsteps	1420	5	Brown	Miss D. O'Neill, Lisson Grove, Clayfield
Flavic's Son	1459	6	Brown	W. G. Ney, Nebo
Frolic	1460	5	Brown	E. L. G. Johnson, Orkabie
Gaine Carrington	1425	Aged	Chestnut	T. Jennings, Greenmount
Glengarry	1493	5	Brown	W. C. Dickinson and Sons, Boynedale
Glenlock	1461	Aged	Brown	Cook and Cook, Wandoo, Koumala
Glen's Spear	1416	5	Brown	G. Cameron, Marian, Mackay
Gold Dust	1713	6	Bay	A. R. Foot, Reid River
Goldie	1379	Aged	Chestnut	W. E. Houston, Blackbutt
Gold Syce	1697	5	Chestnut	D. V. Wagner, Aranbanga, Gayndah
Gun Mark	1428	5	Black	T. Phelan, Gladfield
Hastate	1417	5	Bay	W. A. Collins, Cairns
Herriot	1714	Aged	Bay	Estate J. S. Love, Egera, Charters Towers
Imitate	1415	5	Brown	E. S. Cox, Upper Paddington
Jimsard	1462	Aged	Chestnut	W. J. Edwards, Mirani West
Kentabie	1698	5	Brown	P. J. Bishop, Mundubbera
Kerbat	1494	Aged	Brown	T. H. Craig, Broseley, Miriam Vale
Kildare	1463	Aged	Brown	D. W. Blyth, Koumala
King Emblem	1699	5	Brown	C. E. Pascoe, Ceratodus
King John	1715	Aged	Bay	Queensland Stud Limited, Wandovale
Knight Gold	1716	Aged	Bay	C. Schultz, Woodhouse, Ayr
Ladowee	1717	5	Brown	C. B. MacPherson, Mingela
Le Cornett	1718	Aged	Chestnut	Mrs. F. Calcott, Low Holm, Pentland
Lord Poitrel	1719	Aged	Bay or brown	Trustees J. Allingham, Hillgrove, Charters Towers
Major Hardy	1380	Aged	Bay	P. A. Peach, Upper Tent Hill
Mane Berd	1429	6	Bay	R. Devlin, Mill Hill
Master Persse	1381	5	Chestnut	E. J. Griffiths, Mount Forbes
Meloa	1720	Aged	Chestnut	T. Naughton, Broughton, Charters Towers
Menelaus	1700	5	Brown	Mrs. J. B. Salter and Sons, Biggenden
Mikado	1701	6	Bay or brown	G. R. Briggs, Swindon, Mount Perry
Moon Mirror	1497	5	Chestnut	G. Cunningham, Lion Mountain, Rockhampton
Mount Lad	1620	5	Grey	A. D. Orr, Aubigny
Mr. Singer	1382	5	Bay	P. Tuite, Toogoolawah
Nappatarra	1430	Aged	Bay	Leonard and Sons, Welltown
Oddenda	1621	6	Brown	P. T. Dwyer, Maclagan
Oratory	1722	Aged	Brown	A. W. Fadden, Executor Estate J. S. Love, Townsville
Orb	1464	5	Bay	E. G. Lascelles, Proserpine
Othello	1721	Aged	Bay	A. Shepherd, Milray, Pentland
Pan Yan	1723	Aged	Brown	S. Vaughan, junr., Bohle River
Playbox	1465	5	Grey	A. C. Williams, Homevale, Nebo
Pommy	1725	Aged	Bay	B. Anning, Cargoon
Prince Kerman	1431	Aged	Bay	P. J. Brosnan, Kooreela, New South Wales
Prince Orange	1622	5	Chestnut	D. Wormwell, Athlone, Meandarra
Robemond	1422	5	Black or brown	R. Baker, Caboolture
Saint Hero	1623	5	Chestnut	J. A. Bridge, Tara
Sarauda	1495	5	Chestnut	P. J. Hanrahan, Gogango
Serlodi	1424	6	Brown	W. H. Reynolds, Hamilton, Brisbane
Showfelt	1624	5	Brown or black	J. L. Thompson, Brookstead
Sinclair	1383	6	Bay	G. McLean, Esk
Sir Dignity	1433	5	Chestnut	Rae and Doyle, Bungunya
Sir Force	1434	5	Bay	A. G. Rowling, Texas
Sir Monarch	1421	5	Brown	T. Jennings, Greenmount
Song Time	1724	Aged	Chestnut	Estate of J. S. Love, Egera, Charters Towers
Sonny Boy	1702	Aged	Bay	A. M. Deighton, Gympie
Sonny Boy	1409	6	Bay	A. C. Corrie, Oxley

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37—*continued.*

Name.	No.	Age.	Description.	Owner.
Stout Fella	1436	Aged	Bay	C. Webster, Newinga, Talwood
St. Stephen	1432	5	Chestnut	Wright and Sons, Goondiwindi
Sunshine	1625	5	Bay	A. R. Curd and Sons, Jandowae
Thalacre	1626	6	Bay	R. W. Jahnke, Rywung
Tooloomba	1496	5	Brown	J. W. Mylrea, Canoona
Townie	1703	Aged	Bay	S. B. Trigger, Lakeside
Treken	1410	5	Chestnut	G. F. Scott, Beaudesert
Turkish Prince	1704	5	Brown	E. Zillman, Wallaville
Vertibra	1726	Aged	Black	Mrs. A. Black, Jajingo, Charters Towers
Victor	1705	6	Chestnut	R. Sommerfield, Tinana
Volunteer	1706	Aged	Chestnut	A. L. Gaden, Molangool
War Sash	1727	5	Dark bay	W. D. White and Sons, Bluff Downs
Weirwedge	1437	Aged	Bay	T. Flood, Goondiwindi
Winaspear	1384	5	Bay	C. Harsant, Harrisville
Wondul	1438	Aged	Bay	W. Sharp, Goondiwindi
Wyvern	1728	Aged	Dark chestnut	E. E. D. White, Bluff Downs
Xoanon	1467	5	Chestnut	J. Andrews, Dornford, Bowen

PONY STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37.

Alec	1488	6	Brown	J. Blakely, Sarina
Barney Google	1627	Aged	Brown	H. C. McKee, Duleen, Dalby
Bay Boy	1391	6	Bay	J. Kennedy, Pine Ridge, Southport
Bonnie Boy	1707	5	Bay	C. Jose, New Moonta
Bonny Blue	1729	5	Black	W. H. Bryant, Hewitt street, Charters Towers
Bonny Lad	1386	5	Cream	I. G. Bonney, Rosewood
Boonah Jewel	1392	5	Black	C. Sproxton, Maleny
Circus	1393	5	Piebald	J. Fenton, Beaudesert
Danny Boy	1439	5	Bay	J. Flynn, Clifton
Emir	1730	Aged	Black	Mount Elsie Estate Co., Mount Elsie
Harpace	1387	Aged	Bay	C. Arnold, Toogoolawah
La Cigale	1440	5	Bay or brown	R. C. Cooke, Upper Pilton, Clifton
Little Tom	1708	Aged	Grey	G. I. Titmarsh, Maryborough
Lord Loch	1412	5	Iron grey	J. Kenny, Lismore
Novelty	1628	5	Black	T. H. Saville, Ascot Mail, Greenmount
Nuggett	1709	5	Brown	H. Schmidt, Coringa, Degilbo
Prince	1441	Aged	Brown	J. A. Murray, Lagoon Flat, Texas
Red Robin	1442	6	Chestnut	E. F. Blomley, Eagle Bar, Bungunya
Shamrock	1389	6	Brown	C. A. Kanofski, Grandchester
Silver Dandy	1489	5	Taffy	W. J. S. Pitcher, Bell's Creek, Sarina
Silver King	1443	Aged	Grey	D. G. Cross, Boorandalla, Texas
Spotlight	1629	5	Brown	H. V. Farquharson, Ramsay, Cambooya
Stockings	1490	5	Chestnut	G. K. Gordon, Mount Pleasant, Binbee
Tom	1395	Aged	Dark bay	W. Morrison, House Mountain, Samford
Toy	1731	Aged	Chestnut	C. Meehan, Toonpan
Treasure	1396	5	Light chestnut	V. W. Francis, Cooran
Welsh Pride	1390	6	Piebald	J. Greenfield, Gatton
Wildfire	1491	6	Chestnut	G. K. Gordon, Mount Pleasant, Binbee

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37.

Abbey Patch	1385	5	Cream	F. A. Hoger, Gatton
Childe Era	1486	Aged	Bay	C. Morgan, Chelona, Mackay
Grand Bells	1487	5	Chestnut	J. E. Kelly, Bowen
Machine Mantle	1426	6	Bay	R. G. Morrell, Elphinstone
Monto Wilkes	1499	5	Black	A. Thomasson, The Caves
Sparkling Ribbons	1419	5	Bay	P. D. Fiechtner, Greenmount
Vale Opera	1687	6	Dark chestnut	L. T. Graham, Goomeri

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37.

Allora Crystal	1445	5	Bay	W. Lysaght, Clinton Vale
Andrew Boy	1630	5	Brown	W. Biegel, Rywung
Athaldo	1476	Aged	Brown	C. J. Harding, Delta, Bowen
Baron	1732	Aged	Bay	W. H. F. Wordsworth, Manton, *via* Townsville
Baron Fancy	1631	5	Bay	S. Otto, Bum Bum Creek, Crow's Nest
Baron's Pride	1760	5	Bay	F. Mundey, Gladfield, Warwick
Baroona Badger	1733	Aged	Chestnut	Burke Bros., Brandon
Bay Boy	1756	5	Bay	L. Ryan, Baringha, G.N.R.
Bay Prince	1242	Aged	Bay	J. Cruice, Durundur, Woodford
Beau Ideal	1673	5	Bay	A. H. Greenup, Bancroft, Monto
Ben Bolt	1632	Aged	Bay	J. Ross, Captain's Mountain, Milmerran
Black Prince	1633	5	Black	J. Simmons, Coo-ee Ville, Milmerran
Blue Peter	1500	5	Blue roan	W. J. Lewis, Velindre Farm, Wowan
Bob of Abbotsleigh	1667	5	Bay	Estate W. C. Collins, Rosedale
Bold Lad	1674	Aged	Bay	A. T. Simpson, Aramara
Bold Laddie	1244	5	Bay	T. Armstrong, Rosewood
Bold Prince	1245	5	Bay	G. A. Heise, Minden
Bowler	1734	5	Bay	T. Kelly, Ayr
Bowler	1634	5	Bay	T. Gadsby, Wooleebee Junction
Brilliant Master	1675	5	Bay	R. Stark, M. P. Creek, Wondai

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936–37—*continued*.

Name.	No.	Age.	Description.	Owner.
British Prince	1246	5	Bay	M. O'Neill, Rockton, Peak Crossing
Briton	1447	6	Bay	R. Chandler, Forest Springs, Clifton
Brown Son	1735	Aged	Dark bay	Mrs. A. Haighton, Cuba Plains, Pentland
Browntyre	1468	Aged	Bay	M. M. Gordon, Grosvenor Downs, Nebo
Byron Minor	1413	Aged	Black	A. F. McLean, Paradise East, Elsmore, New South Wales
Captain	1676	5	Bay	H. Kopp, Degilbo
Captain	1469	5	Bay	A. Teitzel, Mount Dangar, Bowen
Captain	1736	Aged	Dark bay	J. Kelso, Townsville
Captain	1635	6	Bay	T. B. Freeman, Columboola
Captain	1737	Aged	Bay	Clark Bros., Mirtna, Charters Towers
Captain	1485	6	Bay	D. A. Roberts, Bundarra, Nebo
Carlyle	1636	5	Bay	M. J. Sommer, Goombungee
Carlyle Clinker	1448	5	Black	J. Gilmour, Springvale, Goomburra
Carlyle Perfection	1637	Aged	Bay	J. V. Willis, Meringandan
Chief	1638	5	Brown	J. A. Hick, Jackson
Chieftain	1738	Aged	Light bay	Hoey Bros., Brandon
Chinchilla Prince	1640	5	Black	H. L. Zerbst, Wamba Creek, Chinchilla
Chrystal	1639	5	Brown	N. R. Trousdell, Pinelands
Clyde Hill Intent	1406	5	Bay	J. Lehmann, Coolana, *via* Rosewood
Clydemere	1641	5	Bay	S. Hartwig, Groomsville, Pechey
Crown Duke	1643	5	Bay or brown	H. C. Dornbusch, Cross Hill, Oakey
Crystal's Pride	1449	5	Bay	A. F. Watt, Freestone
Cub	1677	6	Bay	G. A. Pollock, North Kolan
Danny	1644	5	Bay	L. Lloyd, Wandoan
Darkie	1470	Aged	Black	E. Hannon, Savannah
Darwin	1678	5	Bay	C. Cavanagh, junr., Kybong
Dobbin	1645	5	Bay	S. Marriage, Glenbrae, Narko
Don	1739	5	Brown	W. Porter, Home Hill
Don	1740	Aged	Bay	W. McLellan, Ayr
Donald Boy	1646	6	Bay	J. W. Wormwell Estate, Athlone, Meandarra
Don Bute	1668	5	Bay	H. C. Willert, Berajondo
Duke	1741	5	Bay	T. Cass, Balfe's Creek
Gay Lad	1397	5	Bay	G. White, Petrie
Glenlea Pride	1471	5	Bay	J. T. Dumma, Kuttabul
Haile Selassie	1669	5	Bay	W. A. Priddis, Wowan
Hermitage Lad	1450	5	Bay	H. A. Gillespie, Hermitage
Hero	1679	5	Chestnut	J. M. Taylor, Ness Farm, Childers
Highland Land	1647	5	Bay	E. H. Volker, Flagstone Creek, Helidon
Intent	1472	5	Bay	Land Bros., Eton Vale, Binbee
Irton Lustre	1247	5	Bay	West Moreton Horse Breeders' Association, Laidley
Jim Crow	1757	Aged	Brown	J. J. Webber, Ayr
Jolly Boy	1648	6	Dark bay	A. Hair, Lucksall, Dulacca
Jondaryan Janitor	1680	5	Bay	C. G. Walker, Tarong
Jondaryan Mac	1248	5	Bay	B. G. Kerle, Minden
Kadlunga	1742	Aged	Grey	W. D. White and Sons, Bluff Downs, Charters Towers
Landmark	1743	Aged	Chestnut	H. Bawden, Reid River, N.Q.
Larry	1649	Aged	Black	G. Stephens, Kiama, Hannaford
Lone Star	1451	5	Bay	Gross Bros., Campbell's Plains, Warwick
MacWallace	1744	Aged	Bay	G. Linton and Sons, Home Hill
Major	1651	Aged	Brown	Wellcamp Pastoral Co., Wellcamp
Major Dale	1249	5	Bay	C. A. Kanofski, Grandchester
Major Wallace II.	1398	5	Bay	F. A. Doeblein, Burnside, Yatala
Major Wylie	1653	5	Brown	H. Newton, Squaretop
Master Wheeler	1473	5	Brown	F. Bundesen, The Range, Eton
Model Farm Champion	1474	5	Bay	A. C. Williams, Homevale, Nebo
Model Meredin	1414	5	Brown	R. Stokes, Collingwood, Victoria
Montie	1745	5	Brown	C. B. MacPherson, Mingela
Moonlight	1746	Aged	Chestnut	W. C. Dennis, Selheim
New Hope	1650	5	Bay	E. Erhich, Greenmount
Noble	1681	5	Bay	T. O'Meara, Gleneden, Humphrey
Nobleman	1653	5	Dap. grey	J. R. H. Frizzell, Southbrook
Nugget Brown	1475	6	Brown	F. De Costa, Orkabie, N.C.L.
Oakwat Chancellor	1682	5	Brown	F. E. Mitchell, Silverleaf, Murgon
Power	1399	6	Bay	J. W. Gooding, Southport
Pride Again	1747	Aged	Bay	G. W. Davenport, Ayr
Pride of Dartmoor	1654	5	Bay	Mrs. E. H. Egan, Mount Tyson
Pride of Kinkabilla	1655	5	Bay	J. D. Dransfield, Kinkabilla, Meandarra
Pride Sheppard	1656	5	Bay	A. C. Kreig, Brookstead
Prince	1477	5	Chestnut	J. S. McFarlane, Eton
Prince	1670	5	Bay	H. A. McCartney, Yaamba
Prince	1452	5	Bay	J. W. Bickers, Kurrumbul
Prince	1250	5	Bay	R. E. Turpin, Lowood
Prince	1478	6	Bay	W. Watts, Wereena, Prosperine
Prince Campbell	1375	5	Bay	G. McKenzie, Dayboro'
Prince Foot	1671	5	Brown	J. C. Bayliss, Heathwood, Miriam Vale
Prince Henry	1400	5	Black	H. F. Storr, Beerburrum
Prince Henry	1657	5	Brown	F. D. Lipp, Greenmount
Prince Thomas	1658	5	Brown	A. Orr, Mount Irving, Aubigny
Prince Walston	1758	Aged	Bay	D. Meehan and Sons, Toonpan
Punch	1683	Aged	Roan	Hunter Bros., Mount View, Cinnabar
Punch	1659	Aged	Bay	A. J. Morris, West Haldon
Punch	1748	5	Bay	G. B. Klumpp, Home Hill
Rajah	1479	5	Chestnut	H. Ivers, Rosella, Mackay

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1936-37—*continued.*

Name.	No.	Age.	Description.	Owner.
Renown II.	1401	5	Bay	J. T. Collett, Pomona
Ripplevale Treasure	1660	5	Bay	J. V. Willis, Meringandan
Roan Oak	1480	Aged	Roan	W. H. Gillham, Suttor Creek, Nebo
Robin	1661	Aged	Bay	W. S. Lumley, Milmerran
Royal	1481	Aged	Black	C. Zunker, Rosella, Mackay
Royal Dale	1402	5	Bay	C. Sproxton, Maleny
Royal Glencoe	1453	5	Brown	J. M. Thompson, junr., Stanthorpe
Royal Hope	1454	5	Bay	J. A. Murray, Lagoon Flats, Texas
Royal Master	1749	5	Bay	D. P. Jack, Brandon
Salamoniac	1455	5	Bay	Evan's Bros., Oona Vale, Goondiwindi
Scotchman	1403	Aged	Grey	M. J. Mangin, Goodna
Scotland	1750	6	Brown	J. Brabon, Harold street, West Townsville
Seargent	1662	5	Bay	E. A. Ward, Meandarra
Sheperd	1663	5	Bay	C. F. Nauschatz, Jandowae
Shepherd Hill Prince Charley	1684	5	Bay	R. B. Jeffries, Johnstown, Nanango
Sirdar	1751	Aged	Brown	Drysdale Bros., Pioneer
Star	1752	Aged	Brown	F. Cross, Mingela
Statesman	1753	Aged	Black	W. D. White and Sons, Toomba, N.Q.
St. Helen's Bruce Dale	1664	6	Bay	C. B. Bazley, Tipton, Dalby
St. Helen's Captain Windermere	1685	5	Bay	A. Sippel, Redgate, Murgon
The Rajah	1754	6	Brown	Mrs. E. C. Clarke, Maryvale, Charters Towers
Toby	1457	6	Bay	D. F. Marshall, Kondor, Goondiwindi
Toby	1482	Aged	Roan	H. A. Flohr, Wotonga, Nebo
Top Hails	1376	5	Bay	H. F. Dickfos, Gap View, Kalbar
Trimmer	1665	5	Bay	J. H. Morris, Hannaford
Trooper	1755	Aged	Black	R. C. Ramsay, Mingela
Wallace Monarch	1404	5	Bay	J. Murray, Bromelton, Beaudesert
Warrior	1759	5	Bay	W. Jackson, Myola, Balfe's Creek
Willie Mac	1405	5	Bay	W. A. K. McAulay, Yandina
Windermere Cellus	1686	5	Bay	L. C. Walker, Bingera
Worthy Prince	1666	5	Bay	Baumgarten and Sons, Meandarra
Wyaga	1456	5	Bay	Munro and Turner, Goondiwindi
Yacum	1484	5	Bay	J. Renwick, Proserpine
Young Dale	1672	5	Bay	J. B. Shannon, Tooloomba, Rockhampton
Young Hero	1377	5	Brown	G. C. Reinke, Minden

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1936-37.

Archer	1370	3	Brown	L. E. Gosson, Nanango
Beebo Shell	1152	3	Chestnut	D. W. Bell, Beebo
Bender Boy	1223	4	Bay	W. E. Stevens, 16 Mile Creek, Chinchilla
Bernor	1383	4	Bay	C. Meehan, Toonpan
Black Magic	1288	4	Brown	C. E. Froggatt, Nebo
Bon Aero	1138	3	Bay	P. Brennan, Jimboomba
Bronzoldo	1139	4	Chestnut	J. Daniels, Canungra
Brown Lock	1119	4	Bay	J. Reid, Glamorgan Vale
Brown Poitrel	1371	4	Brown	A. G. Cross, Kingaroy
Cannon King	1224	4	Chestnut	J. Thomas, Cooyar
Carawob	1225	4	Brown	D. Wormwell, Meandarra
Daily Leader	1153	4	Bay	S. C. Luck, Warwick
De-Wedge-Man	1155	3	Brown	R. Newman, Goondiwindi
Flywedge	1154	3	Brown	N. Wright, Goondiwindi
Gold Arrow	1226	4	Chestnut	S. S. Morris, West Haldon
Gold Dust	1227	4	Brown	W. J. Brazier, Jandowae
Golden Leaf	1384	4	Chestnut	C. W. A. Wordsworth, Manton
Havalock	1372	4	Brown	F. G. Willert, Goomeri
Hecla	1385	4	Brown or black	W. T. Wharton and Co., Lolworth
High Eagle	1228	4	Brown	R. C. K. Lethbridge, Mitchell
Idol Answer	1373	3	Brown	R. Webb, Beaconsfield
King Leo	1120	4	Bay	J. Stenzel, Carney's Creek
King's Colours	1289	4	Bay	G. M. Myers, Nebo
Lavender	1374	4	Chestnut	R. Sims, Aramara
Lord Leopolis	1229	3	Brown	Misses J. and N. Pomeroy, Toowoomba
Marlboro	1230	3	Chestnut	O. G. Ridge, Toowoomba
Master Cypher	1311	4	Bay	Miss G. E. Perrier, Mount Larcom
Mick Hatten	1137	3	Bay	H. Golz, Fassifern
Muscatel	1121	3	Bay	P. E. Logan, Upper Tent Hill
My Paddy	1231	3	Brown	H. A. Clark, Tara
Pandosto	1218	4	Brown	O. G. Ridge, Toowoomba
Pathfield	1310	4	Chestnut	F. Smith, Beaconsfield
Polyphonic	1375	3	Chestnut	M. MacDonnell, Gympie
Sea Laddie	1122	4	Black	T. J. Ford, Gatton
Senator	1319	4	Bay	R. G. Mackay, Morinish
Serf King	1290	4	Chestnut	A. T. Wellby, Mackay
Shumar	1232	4	Chestnut	H. V. Farquharson, Drayton
South Kerman	1123	4	Chestnut	J. H. Heck, Glamorgan Vale
Starlight	1376	3	Black	Mrs. L. J. Mackaway, Goomeri
Sunrise	1377	3	Chestnut	E. N. Sawtell, Coolabunia
Tantitha	1378	3	Bay	G. Briggs, Childers
Taubada	1233	4	Bay	Mrs. R. V. Breydon, Haden
Tibicen	1217	4	Bay	I. J. Moore, Ascot
Waratah	1379	4	Bay	G. W. Nahrung, Miva

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1936–37—*continued*.

Name.	No.	Age.	Description.	Owner.
Warrigal	1234	4	Chestnut	J. F. Lowien, Coalbank
Warwick Bachelor	1235	4	Brown	F. J. C. Martin, Kumbarilla
Warwick Lad	1124	3	Bay	G. A. Heise, Minden
Weir Wedge	1236	4	Brown	F. G. Searcy, Meandarra
Whiteflag	1125	3	Chestnut	R. Jackson, Munbilla
Zulu	1312	4	Black	F. A. Chardon, Mount Morgan
Unnamed (dead)	1208	3	Chestnut	A. A. Stokes, Abbotsford

PONY STALLIONS CERTIFICATED FOR THE YEAR 1936–37.

Ankor II.	1156	4	Dap. grey	W. Gilmore, Allora
Basra	1140	4	Bay	D. McDougall, Veresdale
Black Pride	1141	4	Brown	J. T. Collett, Pomona
Bonny Gem	1129	4	Bay	I. Ridge, Toowoomba
Boonah's Pride	1128	4	Black	G. E. Kirchner, Boonah
Cupid	1130	3	Bay	J. Duncan, Helidon
Darbie's Boy	1157	3	Grey	T. Hildred, Gladsfield
Darby	1380	4	Chestnut	Mrs. L. J. Mackaway, Goomeri
Essence of Fun	1131	3	Grey	I. Ridge, Toowoomba
Golden Laddie	1132	4	Chestnut	W. H. Strassburg, Lark Hill
Hope	1133	3	Bay	R. C. Draney, Laidley
Jacko	1158	3	Bay	N. T. Wright, Goondiwindi
Jimmy Boy	1237	4	Bay	P. T. Dwyer, Maclagan
Little Ken	1238	4	Black	J. C. Campbell, Haden
Little Sam	1381	4	Black	E. Althouse, Cloyna
Lord Ashwell	1159	3	Blue roan	C. Hensler, McLean street, Goondiwindi
Master Easmon	1386	4	Brown	W. Kelly, Ayr
Master Ludo	1216	3	Bay or brown	A. Kenyon, Eagle Farm
Migalo	1382	3	Bay	M. Daly, Gympie
Pilgrim	1134	3	Grey	D. D. Logan, Kilcoy
Pride of Allamby	1239	3	Bay or brown	H. P. Sperling, Crow's Nest
Ramadi	1135	4	Grey	I. Ridge, Toowoomba
Silver King II.	1136	4	Taffy	E. Grace, Maroon
Springmead Bright Fox	1209	3	Black	C. J. Cotter, Ipswich
Springmead Bright Lad	1221	4	Bay	Zeisemer Bros., Bongeen
Stibnite	1142	3	Iron grey	J. M. Newman, Caboolture

TROTTER STALLIONS CERTIFICATED FOR THE YEAR 1936–37.

Brisbane Chime	1151	4	Bay	B. Gooding, Southport
Chiming Derby	1220	3	Bay	S. H. Scells, Eveliegh street, Wooloowin
Cole Sound	1126	4	Bay	W. D. Dale, Rosewood
Derby Cole	1160	3	Bay	F. K. Weidman, Clifton
Direct Dean	1127	4	Bay	C. A. J. Tillack, Laidley

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1936–37.

Abbey Morn	1240	3	Brown	C. H. Frizzell, Southbrook
Adam	1082	4	Bay	J. McGrath, Moombra
Admiral Jack	1161	3	Bay	G. R. Shannon, Allora
Admiral Wallace	1162	3	Bay	P. J. Wilson, Elphinstone
Aerial Mail	1313	4	Bay	Camboon Pastoral Co., Camboon
Aldoman's Hope	1291	3	Bay	A. A. Brooks, Mackay
Arraglen	1322	4	Bay	Pownall and Pownall, Monto
Attraction	1323	4	Bay	R. T. Jones, Didcot
Bally	1241	3	Brown	G. Parton, Glenaven
Bally	1392	6	Bay	A. E. Carter, Home Hill
Barney	1324	3	Brown	T. Embrey, Kunioon
Baron Kerr	1083	3	Bay	J. Lehmann, Coolana
Baron Knight	1325	4	Bay	S. B. Scotney, Moorlands
Beau Laddie	1084	4	Bay	S. J. Draper, Woodford
Ben Attow	1388	3	Bay	W. D. White and Sons, Bluff Downs
Black Intent	1086	3	Black	D. Vogel, Boonah
Black Prince	1326	4	Brown	L. C. Walker, Bingera
Bold March	1327	3	Bay	L. Horne, Takura
Bold Noble	1328	5	Bay	W. T. Barrett, Bella Vale
Bonnie Intent	1329	4	Brown	W. Elsebach, Gayndah
Bonnie's Pride	1242	3	Bay	L. S. Gordon, Broxburn
Bonny	1314	3	Bay	R. W. Stirling, Theodore
Bonny Boy	1087	3	Bay	G. Erbacher, Harrisville
Bonny Shepperd	1287	3	Brown	W. Park, Toowoomba
British Abbot	1243	3	Brown	J. Sheedy, Yamsion
British King	1163	3	Bay	T. J. Ryan, Clinton Vale
British Prince	1330	4	Bay	C. F. Draheim, Murgon
British Royal	1212	3	Bay	Mrs. E. M. Craikie, Warwick
Burrendale George	1331	4	Bay	J. E. Stanton, Goomeri
Bute's Pride	1164	3	Chestnut	W. H. Hagenbach, Upper Freestone
Captain	1332	4	Bay	Mulcahy Bros., Nanango
Captain	1143	4	Bay	A. C. Andreassen, Tuchekoi
Captain Shepherd	1244	4	Brown	M. G. Polzin, Douglas
Captain Wallace	1088	4	Bay	W. E. Houston, Blackbutt

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1936-37—*continued.*

Name.	No.	Age.	Description.	Owner.
Captain Wallace ..	1333	3	Bay	A. Perrett, Kingaroy
Carlisle Boy	1165	3	Bay	J. H. McIvor, Emu Vale
Carlyle Boy	1245	4	Bay	W. Redman, Braemar
Carlyle Chief	1206	3	Bay	J. H. Lawson, Camp Mountain
Carlyle Pet	1246	4	Bay	A. R. Curd and Sons, Jandowae
Carlyle's Hero ..	1369	3	Bay	R. Maudsley, Murgon
Cedric	1247	4	Black ..	E. C. Stark, Crow's Nest
Clematic Flash Mac ..	1089	4	Brown ..	J. M. Newman, Caboolture
Clinker	1166	4	Bay	V. Osborne, Cobba-da-mana
Clyde's Pride	1389	4	Bay	W. D. White and Sons, Toowoomba
Cornish Laddie ..	1090	3	Bay	J. Evans, Helidon
Craig Hero	1248	3	Bay	Derrick Bros., Bell
Crest Vale Nobility ..	1167	3	Roan.. ..	A. Ritson, Clifton
Crystal Boy	1199	6	Brown ..	S. Webster, Kilcoy
Crystal King	1334	4	Black ..	J. B. Edwards and Sons, Kingaroy
Crystal Macbride ..	1249	3	Bay	Mrs. H. Kewley, The Gums
Culverthorpe Favourite Hero	1261	4	Brown ..	T. W. Caldicott, Yandilla
Culverthorpe High Opinion	1335	3	Bay	S. B. Trigger, Lakeside
Dale	1293	4	Bay	W. H. Gillham, Nebo
Dale Square	1250	4	Brown ..	B. McGovern, Greenmount
Dalkerk	1336	3	Bay	R. G. Allen, Wolca
Damsel's Lad ..	1091	4	Bay	W. C. Miller, Stanmore
Dark Chief	1252	3	Brown ..	M. Stower, Linthorpe
Darnley Boy	1168	3	Bay	W. R. Penrose, Beebo
Dayfield	1292	3	Chestnut ..	A. T. Wellby, Glenella
Dick Turpin	1169	3	Bay	W. J. Jones, Emu Vale
Dobin	1294	3	Brown ..	G. M. Myers, Nebo
Dolphus	1337	3	Brown ..	E. Reinbott, Kingaroy
Donald	1390	3	Light bay ..	W. H. Jackson, Ayr
Don of Cracow ..	1338	3	Bay	A. E. Gorrie, Childers
Dooling Major Lea ..	1201	4	Bay	R. Stokes, Collingwood, Victoria
Dragon	1197	4	Bay	G. S. Burns, Goondiwindi
Duke	1339	3	Bay	F. E. Chippendale, Bollier
Duke of Gloucester ..	1196	4	Bay	J. Little, Cobba-da-mana
Empston	1092	3	Black ..	T. Zellinskie, Lake Clarendon
Eureka Waller ..	1321	3	Chestnut ..	Central Queensland Meat Export Co., Lakes Creek
Fairval Gaiety's Best	1170	4	Bay	W. J. McKee, Clifton
Fairval Noble.. ..	1295	3	Bay	S. R. Whitehead, Kuttabul
Fairval Regal Gaiety..	1171	3	Bay	J. T. Scrymgeour, Warwick
Fairymead Baron Knight	1172	3	Bay	J. P. Warden, Goondiwindi
Fairymead Success ..	1340	3	Bay	Fairymead Sugar Co., Bundaberg
Farleton John ..	1391	4	Brown ..	A. P. Nelson, Charters Towers
Farmer's Pride ..	1093	3	Brown ..	R. Kucks, Wilson's Plains
Fashion's Prince ..	1173	3	Bay	T. J. Brosnan, Killarney
Favourite Blend ..	1203	3	Bay	A. A. Stokes, Abbotsford, Victoria
Gaiety Again	1174	3	Bay	W. P. Canning, Tannymorel
Gay Lad	1904	3	Bay	T. D. Gnech, Boonah
General Dale	1296	4	Brown ..	J. Martin, Mackay
General Douglas ..	1205	3	Bay	R. Stokes, Collingwood, Victoria
General Ker	1095	3	Bay	A. F. Schimke, Laidley
George Wallace ..	1176	4	Bay	T. J. Lyons, Clinton Vale
Gladfield	1341	4	Grey ..	Apel Bros., Gayndah
Glasgow Clyde ..	1252	3	Bay	A. Kahler, Geham
Glenbar Royalist ..	1254	3	Bay	J. V. Willis, Meringandan
Glen Donald	1255	4	Bay	Ada Perina and Sons, Crow's Nest
Glen Lock	1342	3	Bay	W. T. Birt, Theebine
Glenroy	1297	4	Black ..	A. Parkinson, Finch Hatton
Glen Royal	1343	3	Black ..	J. P. Fortune, Kingaroy
Glen the Second ..	1253	4	Bay	J. Tennyson, Chinchilla
Gold Mount Prince ..	1256	3	Brown ..	C. Mesken, Maclagan
Gold Naught	1177	3	Chestnut ..	D. Sullivan, Allora
Grove King	1298	4	Bay	B. J. Langford, Finch Hatton
Haile Selassie ..	1299	4	Brown ..	N. Mackay, Mirani
Hero	1178	6	Brown ..	A. E. Charles, Inglewood
Hero	1344	3	Bay	B. T. and L. Balderson, Theebine
Intention	1179	3	Brown or black	J. Dwyer, Clifton
Intent Laddie ..	1345	4	Bay	H. Siefert, Crawford
Intent's Perfection ..	1180	3	Bay	J. Glasheen, Clifton
Intent's Pride ..	1393	4	Bay	H. B. Burstall, Ayr
Irish Chief	1181	4	Bay	J. Madigan, Dalveen
Jack	1144	4	Bay	J. Hose, Pomona
Jackson	1257	3	Bay	W. D. Kirstenfeldt, Kulpi
Jelbyn Jock	1300	4	Bay	Wright and Davidson, Nelbo
Johnnie Walker ..	1258	3	Bay	T. Gadsby, Woolabee Junction
Jondaryan Duke ..	1259	4	Bay	G. W. Hartmann, Bowenville
Jondaryan Worthy Minstrel	1397	4	Bay	W. J. Lloyd, Harrow
Jondaryan Worthy Sheriff	1260	4	Bay	Eva B. Armstrong, Toowoomba
Jumbo	1301	4	Bay	S. Micallef, Eton
Kelso Surprise ..	1210	3	Bay	A. Stokes, Abbotsford, Victoria
Kerlock	1096	4	Black ..	R. E. A. Schafferius, Gatton
Kerr Lad	1097	4	Bay	H. D. Reisenleiter, Mount Sylvia

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1936-37—*continued.*

Name.	No.	Age.	Description.	Owner.
Kerr Son	1098	3	Black	N. D. Dallinger, Mount Sylvia
Kerrston Again	1099	4	Black	P. Ryan, Viewlands
Kerrston Again	1081	3	Black	G. Elliott, Laidley South
Kerrston Delight	1100	3	Chestnut	W. M. E. P. Prufert, Laidley
Kerrston Lad	1101	4	Black	S. H. Hallas, Gatton
Kerrston's Viceroy	1346	4	Black	W. D. Porter, Kumbia
Kerwein	1102	3	Bay	H. Schultz, Lake Clarendon
Kimbar Mailboy Jack	1262	4	Bay	O. G. Ridge, Toowoomba
Kingdale	1182	4	Bay	W. Eastwell, Warwick
King David	1103	3	Black	J. Burnham, Forest Hill
King Wyllie	1104	4	Black	F. T. Harm, Plainland
Knight	1105	4	Black	A. O. Raddatz, Ingoldsby
Knight Abbit	1396	Aged	Brown	W. R. Buckholz, Bundaberg
Lad	1315	4	Black	H. Nightingale, Goovigen
Lehmann's Tenor	1263	3	Brown	Mrs. R. V. Breydon, Haden
Lincoln	1302	4	Brown	F. O. Schmidt, Eton
Lion	1347	4	Bay	W. Ellicomb, Mundubbera
Logan Prince	1145	3	Bay	W. W. Bell, Rathdowney
Lord Kerrston	1264	3	Black	J. R. Anderson, Southbrook
Mac	1394	4	Bay	W. Conley, Ayr
Macadair	1348	3	Bay	J. Bishop, Maidenwell
Mail Boy's Heir	1146	3	Bay	R. H. F. Graham, Beaudesert
Major	1349	3	Brown	T. Turner, Kingaroy
Major Lace	1350	4	Black	H. Seiler, Stuart River
Major Robin	1213	3	Bay	J. Kelvington, Glenore Grove
Major Wallace	1222	4	Bay	E. J. Breen, Eukey
Major Wyllie	1219	4	Bay	J. Summerville, Kholo
Marshall Gaiety	1106	3	Bay	C. A. Martens, Marburg
Marshall Mark	1303	4	Bay	F. J. Muller, Bowen
Marshall Ney	1304	3	Roan	M. R. Shannon, Nebo
Master Carlyle	1266	4	Bay	G. H. Bidstrup, Warra
Master Dale	1107	3	Bay	H. O. Neumann, Plainlands
Master Wallace	1183	4	Bay	T. O'Dempsey, Lower Freestone
Master Wallace	1351	3	Bay	G. E. Spratt, Nanango
Max	1352	4	Bay	S. Anderson, Tingoora
Max Pride	1265	4	Black	L. McGrath, Oakey
Mountain Lad	1316	4	Bay	E. A. Russell, Thangool
Mull Mull Benson	1200	4	Bay	R. Stokes, Collingwood, Victoria
Mull Mill Prince Ronald	1207	3	Bay	R. Stokes, Collingwood, Victoria
Nigger	1267	3	Black	C. Dunemann, Murra Murra
Noble	1108	3	Bay	F. Lawrence, Gilla
Noble	1305	3	Bay	A. F. Claussen, Mackay
Noble Hero	1268	4	Brown	E. Ehrlich, Murra Murra
Noble Lad	1184	5	Roan	W. J. Ryan, Kincora
Noble's Choice	1353	3	Bay	J. W. Horrobin, Tingoora
Oakbranch	1354	3	Brown	A. A. Dent, Gayndah
Pensfield Lad	1306	4	Bay	G. H. Ellis, Merinda
Peter Jackson	1269	4	Bay	Baker Bros., Pty., Ltd., Bowenville
Pinevale Mainmast	1270	4	Black	Jondaryan Estates, Jondaryan
Plucky Prince	1317	4	Bay	W. H. Davey, Baralaba
Pop's Pride	1271	3	Bay	K. R. Jasch, Pampas
Pride	1272	3	Bay	S. E. O'Brien, Jandowae East
Prince	1274	4	Brown	M. J. MacGinley, West Haldon
Prince	1307	4	Chestnut	A. J. Diecke, Proserpine
Prince	1273	3	Bay	H. Simmons, Yandilla
Prince	1185	3	Bay	S. G. Bremner, Yelbarbon
Prince Abbey	1275	3	Black	G. and H. Tews, Pittsworth
Prince Dale	1355	4	Bay	F. Rekow, Bundaberg
Prince Dale	1147	4	Bay	W. Rudd, Mudgeeraba
Prince Fabric	1175	5	Brown	R. A. Roylance, The Pocket
Prince Henry	1276	4	Bay	Bebbington Bros., Cambooya
Prince Rocket	1356	3	Bay	McCauley and Stewart, Mundubbera
Prince Roy	1277	4	Bay	P. G. Ruhle, Motley
Punch	1318	4	Bay	A. Thomasson, The Caves
Rare Champion	1109	4	Bay	H. O. A. Bartholomai, Boonah
Revenue	1118	5	Bay	P. Connole, Helidon
Robin	1308	4	Bay	D. S. Miller, Don River
Robin of Lilyvale	1215	4	Bay	J. P. O'Hagan, Belmont
Rob Roy	1278	3	Black	A. H. Geirke, Chinchilla
Rodney	1395	4	Roan	C. Brownson, Charters Towers
Ron	1357	3	Bay	Cribb Bros., Gayndah
Rose Farm Bold Kerrston	1110	3	Bay	J. W. Evans, Boonah
Royal	1358	4	Brown	J. A. Perkins, Mundubbera
Royal Banker	1186	4	Black	Hart Bros., Pilton
Royal Chief	1559	3	Chestnut	W. R. Lester, Monduran
Royal Dale	1279	3	Black	I. N. Kahler, Geham
Royal Intent	1187	3	Bay	H. J. Pacholke, Clifton
Royal Kerr	1111	3	Bay	E. H. Weier, Hatton Vale
Royal Lamington	1360	4	Black	A. Birch, Murgon
Royal Mac	1361	3	Bay	J. McDermid, Monto
Royal Prince II.	1280	3	Bay or brown	G. V. Hess, Kaimkillenbun
Royal's Bride	1189	3	Bay	R. Collins, Warwick
Royal Scot	1281	3	Brown	J. L. Strack, Helidon
Royal Top	1188	4	Bay	A. N. McKechnie, Fleurbaix
Sandy Kerlin	1214	3	Brown	J. H. Kelvington, Glenore Grove

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1936-37—*continued.*

Name.	No.	Age.	Description.	Owner.
Shamrock	1190	4	Bay	M. Bourke, Yangan
Sir Earl	1112	3	Bay	S. V. Carseldine, Linville
Sir Nolan	1148	3	Bay	P. V. Campbell, Lamington
Sir Walter Samson	1362	5	Brown	R. J. McKenzie, Wallaville
Sonny Boy	1320	4	Bay	S. A. Barrett, Thangool
Sterling Slade	1202	4	Black	F. Powell, Richmond
Studleigh Laddie	1113	4	Bay	W. H. Grans, Upper Tent Hill
Sudden Surprise	1282	4	Brown	L. F. Kuhl, Narko
Sydler	1309	3	Bay	J. L. Dalton, Walkerston
Talgai Hero	1283	3	Black	W. Freyling, Hodgson Vale
Talgai John	1191	3	Bay	H. Sprott, Talgai West
Talgai Model	1192	4	Bay	J. J. Rynne, Goomburra
Tarzan	1114	3	Bay	Roderick Estate, Wilson's Plains
The Willow's Trustep	1193	4	Bay	A. M. Cadell, Texas
Toby	1364	5	Bay	T. Clark, Wietalaba
Toby	1149	3	Bay	J. Herron, Closeburn
Toby	1363	5	Roan	J. Malone, Sandy Creek
Trooper	1284	3	Bay	R. J. and L. V. Ole, Yarranlea
True Blue	1150	3	Grey	B. T. Smiles, Rathdowney
Ulupna Carl	1285	4	Bay	A. A. Treasure, Brigalow
Viron	1365	4	Bay	H. J. Rasmussen, Bundaberg
Wallace	1366	4	Bay	W. H. Lamke, Gundiah
Wallace Lad	1115	3	Bay	A. Muller, Mulgowie
Wickside Brilliant Son	1367	4	Bay	W. G. Currant, junr., Gunalda
Wildash Pride	1368	4	Black	W. J. Borchert, Murgon
Willowbank High Degree	1211	4	Black	J. Hamilton, Forest Hill
Worthy John	1194	4	Bay	W. A. Deacon, Allora
Worthy Lad	1116	3	Roan	P. Truloff, Minden
Yarradale Flash Marshall	1204	3	Brown	R. Stokes, Collingwood, Victoria
Young Douglas	1195	4	Bay	E. Costello, Thane
Young Kerrston	1117	3	Bay	B. O'Connor, Grantham
Young Ngapuna	1286	3	Bay	A. J. Harris, Yarranlea

REJECTED STALLIONS.

List of Stallions in respect of which Certificates of Registration were refused, on account of either lack of type and/or conformation, lack of size, or unsoundness during the year 1936-37. These horses are prohibited from service, either public or private:—

BLOOD STALLIONS REJECTED DURING 1936-37.

Name.	Age.	Description.	Reason for Rejection.	Owner.
David	Aged	Bay	L.T.	C. Mooney, Gin Gin
Julie Boy	3	Bay	L.T.	W. S. Forsyth, Gin Gin
Laddie Palms	4	Bay	Ost. and Curb	L. J. Russell, Thangool
Monarch	Aged	Brown	L.T. and Con.	J. G. Hollingsworth, Samford
Musician	Aged	Chestnut	L.T. and Con.	G. E. Archer, Charters Towers
Mutiara	5	Bay	Roarer	T. Addicott, Monto
Prince Henry	4	Bay	L.T. and Con.	G. Browne, Pittsworth
Rainbow	4	Piebald	L. Con.	W. Scantlebury, Theodore
Royal Bachelor	3	Bay	L.T. and Con.	J. A. Plant, Helidon
Sandy	5	Bay	Ringbone	T. B. Butterworth, Pindi Pindi
The Turk	3	Brown	L.T. and Con.	H. J. Watts, Yangan
Torpedo	6	Grey	L.T. and Con.	R. W. Brown, Kinkabilla
Westcott	3	Bay	L.T.	T. Toomey, Kingaroy
Young Mystic	Aged	Brown	Cataract	C. Myers, Nebo
	5	Bay	L.T. and Con.	J. J. Johnston, Kerry
	6	Bay	L.T. and Con.	J. T. Atkinson, Maryvale
	5	Chestnut	L.T. and Con.	J. Waldron, Goondiwindi
	4	Chestnut	L.T.	E. Diamond, Bundaberg
	4	Chestnut	Spav. and Curb	E. Hopes, Rockhampton
	6	Brown	L.T. and Con.	C. Quigley, Townsville

PONY STALLIONS REJECTED DURING 1936–37.

Name.	Age.	Description.	Reason for Rejection.	Owner.
Ace of Hearts	4	Brown	L. Con.	E. C. McNamee, Theodore
Black Feather	3	Brown	L.T.	G. Jones, Biggenden
Bright Laddie II.	4	Brown	Curb	V. C. Schelbach, Boonah
Darby Dean	Aged	Grey	L.T. and Con.	T. Walker, Maryvale
Don Pro	5	Bay	L.T.	J. Tinworth, Wondai
Teddie	Aged	Chestnut	L.T.	J. F. Leslie, Gympie
Welsh Boy	4	Bay	Ost.	G. Hart, Strathpine

TROTTER STALLION REJECTED DURING YEAR 1936–37.

..	Aged	Bay	Ringbone ..	—. Schafter, Mackay

DRAUGHT STALLIONS REJECTED DURING YEAR 1936–37.

Baron Rich	3	Bay	L.T. and Con.	W. Kapernick, Murgon
Baron's Chief	Aged	Black ..	L.T. and Con.	Mrs. E. H. Egan, Mount Tyson
Black Prince	4	Black ..	Sidebone ..	W. J. Prasser, Kulpi
Blaze	5	Bay	Sidebone ..	Carroll Bros., Kingaroy
Blue Prince	5	Brown ..	Spavin ..	S. C. Zahmel, Finch Hatton
Blutcher	4	Brown ..	Sidebone ..	J. E. Holland, Wycarbah
Bold Boy	6	Bay	Sidebone ..	L. A. Armstrong, Rosewood
Bolder	3	Bay	L.T. and Con.	D. J. Soden, junr., Mount Beppo
Bold Jock	5	Grey	L.T. and Con.	A. J. Kuss, Ropeley
Boom's Best	3	Bay	L.T.	F. Tucker, Kingaroy
Bounce	3	Bay	L.T.	W. H. O. Smith, Ceratodus
Bright Star	3	Bay	L.T.	R. S. McKenzie, Mount Perry
British King	4	Bay	L.T.	R. Kahler, Deep Creek
Bunny	4	Grey	Sidebone ..	R. M. Inslay, Bouldercombe
Captain	Aged	Chestnut ..	Size	G. L. Kelton, Dulacca
Charlie	4	Bay	L.T. and Con.	H. P. Opperman, Tamborine
Clan McDhu	5	Bay	L.T. ..	A. E. Gorrie, Childers
Clyde	5	Black ..	Sidebone ..	J. O'Leary, Leyburn
Crystal Son	Aged	Bay	Sidebone ..	A. S. Burdell, Bohle River
Diamond	Aged	Brown ..	L.T. and Con.	J. Guy, Ayr
Dodger	5	Brown ..	L.T. and Con.	C. V. Roberts, The Wallan
Don	Aged	Brown ..	Sidebone ..	B. Weekes, Bowen
Don	6	Bay	L.T. and Con.	W. J. Langton, Gilla
Donald's Pride	4	Black ..	L.T. and Con.	C. J. Hegarty, Clifton
Earl Marshall	5	Bay	Spavin ..	G. W. Orchard, Parapi
Evergreen Lad	3	Bay	L.T. and Con.	E. A. Munt, Maclagan
Exile	Aged	Black ..	Sidebone ..	W. Brazier, Jinghi Jinghi
Grand Master	5	Bay	L.T.	J. W. Betts, Kolan River South
Happy Charlie	3	Grey	L.T. and Con.	A. J. Rose, Chinchilla
Highfield Challenging	5	Bay	Bog Spavin ..	R. H. Applin, Biloela
Kenstar	5	Brown ..	Sidebone ..	J. Bridgeman, Cracow
Laddie	4	Bay	Sidebone ..	L. A. Ruhle, Motley
Lawrie	5	Bay	L.T.	R. Sommerfield, Tinana
Lorna's Pride	Aged	Bay	Sidebone ..	H. Bell, Toogoolawah
Major	6	Chestnut ..	Sidebone ..	H. Northdurft, Oakey
Major II.	3	Bay	L.T.	O. Horton, Kingaroy
Monte Carlo	4	Bay	Sidebone ..	T. C. Hoffman, Gladfield
Noble	5	Brown ..	Sidebone ..	W. E. Stark, Kingaroy
Noble	3	Bay	L.T.	G. Duffy, Neumgna
Noble	4	Bay	L.T.	Cowan Keys, Wondai
Olad	4	Bay	Thoropin ..	C. G. King, Goombungee
Pancho	3	Roan ..	L.T. and Con.	A. Erlandsen, Milmerran
Prince	5	Bay	L.T.	G. A. Elliott, junr., Dallarnil
Prince	4	Bay	L.T. and Con.	G. J. Austin, Crow's Nest
Prince Isles	5	Bay	L.T.	G. A. Steinhardt, Murgon
Prince Valley	5	Chestnut ..	Sidebone ..	Aplin Bros., Maroondan
Punch	5	Bay	L.T. and Con.	H. F. Scholoss, Dayboro'
Punch	3	Bay	L.T. and Con.	H. Webb, Reid River
Ravendale	6	Black ..	L.T. and Con.	W. Burgess, Laidley
Royal Wallace	4	Bay	Sidebone ..	N. G. Walker, Iveragh
Scottish Airs	4	Bay	Sidebone ..	V. C. Cutmore, Burndale
Shepherd's Robin	5	Bay	Sidebone ..	M. R. Shannon, Nebo
Sir Charles	5	Bay	Sidebone ..	V. C. Potter, Speedwell
Snip	5	Bay	Side and Spav	R. Stanbury, Proserpine
Special Mac	6	Bay	Sidebone ..	D. G. McIntosh, Goomeri
Standard	Aged	Skewbald ..	Sidebone ..	F. Kelly, Ayr
Stepford Belted Knight	6	Bay	Roarer ..	J. M. Hagenbach, Upper Freestone
Tarzen	3	Bay	L.T.	C. J. Zilkie, Bundaberg
The Sheriff	3	Brown ..	L.T. and Con.	A. Mutze, Umbiram
Toby	4	Bay	L.T. and Con.	H. McClymont, Oman-ama
Tom	6	Bay	L.T. and Con.	N. M. Watson, Ripley
Vanguard	4	Brown ..	L.T.	R. Briggs, Mount Perry
Willengie	Aged	Bay	L. Con. ..	W. J. Stanley, Cannon Valley
Worthy Carlisle	6	Bay	Sidebone ..	P. Truloff, Minden
Young Ivanhoe	5	Black ..	Sidebone ..	T. H. Oberhardt, Pittsworth
..	6	Bay	L.T. and Con.	W. G. Soper, Home Hill
..	3	Bay	L.T.	H. D. Giles, Biggenden
..	Aged	Brown ..	L. Con. ..	J. E. White, Rockhampton
..	Aged	Grey	L. Con. ..	S. Sammut, Alligator Creek
..	4	Bay	Sidebone ..	L. Jockheim, Longford Creek
..	3	Bay	Ringbone ..	J. Head, Mirani

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by Officers of the Department of Agriculture and Stock.

On Friday of each week, as from the 6th January, 1937, a fifteen minutes' talk, commencing at 12.45 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures until the 30th April, 1937.

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Friday, 8th January, 1937—"Humus and the Soil," by E. H. Gurney, Agricultural Chemist.

Friday, 15th January, 1937—"Citrus Orchard Practices," by R. L. Prest, Instructor in Fruit Culture.

Friday, 22nd January, 1937—"Looking Ahead—New Developments in Agriculture," by J. F. F. Reid, Editor of Publications.

Friday, 29th January, 1937—"Some Introduced Grasses—(1) Summer-growing varieties; (2) Winter varieties," by C. T. White, Government Botanist.

Friday, 5th February, 1937—"The Importance of Type in Queensland Merino Flocks," by J. L. Hodge, Instructor in Sheep and Wool.

Friday, 12th February, 1937—"Fat Lambs in Queensland," by J. L. Hodge, Instructor in Sheep and Wool.

Friday, 19th February, 1937—"Increase your Return from Eggs. How it can be done," by P. Rumball, Poultry Expert.

Friday, 26th February, 1937—"With the Flock in February. Points for the Poultry Farmer," by J. J. McLachlan, Poultry Inspector.

Friday, 5th March, 1937—"The Harvesting of Cotton," by R. W. Peters, Cotton Experimentalist.

Friday, 12th March, 1937—"Plant Nutrition," by E. H. Gurney, Agricultural Chemist.

Friday, 19th March, 1937—"Sheep Management under the Varying Conditions in Queensland," by Jas. Carew, Senior Instructor in Sheep and Wool.

Friday, 26th March, 1937—"The Care of the Flock," by Jas. Carew, Senior Instructor in Sheep and Wool.

Friday, 2nd April, 1937—"Winter Pastures," by C. W. Winders, Assistant (Agronomy).

Friday, 9th April, 1937—"Pork Products as Regular Items on the Menu," by E. J. Shelton, Senior Instructor in Pig Raising.

Friday, 16th April, 1937—"Some Poultry Farmers' Problems. What to Breed and How to Breed," by J. J. McLachlan, Poultry Inspector.

Friday, 23rd April, 1937—"Strawberry Planting and Other Seasonal Fruit Hints," by H. Barnes, Director of Fruit Culture.

Friday, 30th April, 1937—"Wheat Improvement in Queensland," by R. E. Soutter, Agricultural Research Officer.

NOTICE TO SUBSCRIBERS.

When renewing your subscription, write your full name plainly, preferably in block letters.

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

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 November, 1936 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Dot 5th of Oakvilla (238 days)	W. G. Marquardt, Springlands, Wondai	11,274·1	443·873	Victory of Greyleigh
Starlight II. of Oakvilla (227 days)	W. G. Marquardt, Springlands, Wondai	10,352·25	414·096	Victory of Greyleigh
Daisy 5th of Oakvilla (236 days)	W. G. Marquardt, Springlands, Wondai	9,704·65	381·447	Gussie
JUNIOR 3 (UNDER 3½ YEARS), STANDARD 270 LB.				
College Dinah	Queensland Agricultural High School and College	6,828·46	296·63	Duplex of Greyleigh
JERSEY.				
JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.				
Trecarne Merle 4th	D. R. Hutton, Cunningham	7,001·46	395·579	Trecarne Golden King
SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.				
Wyreene Chance	J. B. Keys, Gowrie Little Plain	5,898·25	313·609	Lyndhurst Majesty

Answers to Correspondents

BOTANY.

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

Specimens from the Lockyer Identified.

J.C., Project Club (Calvert)—

1. *Angophera intermedia* (apple tree). The apple tree is used as fodder in times of drought, but it is generally conceded that it is of little nutritive value.
2. *Crotalaria linifolia*, a small species of rattlepod.
3. *Gnaphalium japonicum* (cud weed).
4. *Eryngium rostratum* (Queensland eryngo).
5. *Boerhaavia diffusa* (tar vine). This plant is very widely distributed throughout Queensland both on the coast and inland. In the more inland parts of the State it is generally regarded as excellent fodder for stock.
6. *Alternanthera nana*. Species of Alternanthera are common weeds in the mixed native pasture and in cultivations in Queensland. They belong to the Amaranth family, and are quite wholesome.
7. *Sida* sp., probably *S. spicata*, a native weed allied to to *Sida retusa*.
8. This specimen is rather poor, but we should say it represents *Atriplex semibaccata*, the creeping salt bush or salt weed. It is generally regarded as quite good fodder.
9. *Modiola multifida* (button mallow).
10. *Eustrephus latifolius* var. *angustifolius*, a climbing plant of the lily family. The only name we have heard applied to it is native orange, due to the small orange red fruits which it bears.
11. *Neptunia gracilis* (the sensitive plant).
12. *Myoporum debile*.
13. There is a mixture here. The yellow flower belongs to a species of Goodenia, and the small, leafy stalk to a species of Phyllanthus. The specimens are too fragmentary for specific determination.
14. *Polygonum aviculare* (knot grass or knot weed). A very common weed in cultivations in Southern Queensland, particularly on the Darling Downs. It is not known to possess any harmful properties, although the long, running stems sometimes cause impaction.
15. *Celtis sinensis* (Chinese celtis). This is also commonly called the Portuguese elm, but it is not a native of Portugal, and this name belongs more particularly to *Celtisaustralis*. It is not very common, being seen occasionally in gardens and at a few places on the Darling Downs. The leaves are excellent fodder for stock.
16. *Swainsona* sp., a variety of Darling pea.
17. *Phaseolus lathyroides*. This is a leguminous plant, a native of tropical America, introduced into Queensland some years ago as a fodder. So far as our experience goes, however, stock do not take to it very readily. It is now a fairly common naturalised weed in many localities.
18. *Helichrysum ramosissimum*, a small native everlasting.

Cestrum Parqui. Poison Peach.

C.N.H. (Didcot)—

The specimen represents *Cestrum parqui* (the green cestrum), a native of Chili and the Argentine, now a naturalised weed in Queensland. It is poisonous to stock, and severe losses in South Queensland have been traced to it during recent years.

Poison peach is a different shrub (*Trema aspera*). In spite of its name this plant is often very freely eaten by stock without any ill effects following. At times, however, it develops a prussic acid-yielding glucoside, and if eaten heavily by hungry stock may cause death.

Beaudesert Plants Identified.

L.T. (Jimboomba)—

1. *Dodonæa viscosa* (hop bush). This is a small tree very common in Queensland both on the coast and inland. The leaves are used for fodder in times of drought, but it is not a particularly good fodder plant.
2. *Oxalis corniculata* (wood sorrel), a very common weed with an acid taste. It is sometimes mistaken for a legume.
3. *Lepidium ruderale* (bitter cress). This is one of the numerous weeds known in Queensland as mustard or turnip weed. It is quite a good fodder, but taints milk rather badly.
4. *Callistemon viminalis* (red bottle brush).
5. *Epaltes australis.*
6. *Hypericum gramineum* (St. John's wort).
7. *Phyllanthus thesioides.* This small plant is sometimes seen in the native mixed pasture. It is usually not very abundant in any one locality, and we have heard no local name given to it. So far as we know it possesses no particular properties of any interest, either useful or otherwise.
8. *Helichrysum ramosissimum,* a small native everlasting.
9. *Gnaphalium japonicum* (cud weed). Species of cud weed are very common in Queensland, both in pasture land and old cultivation paddocks. It is not known to possess any poisonous or harmful properties.
10. *Poranthera microphylla,* sometimes known as small poranthera.
11. *Jasminum suavissimum,* a native jasminth.
12. *Plantago lanceolata* (rib grass). This is not a true grass, but a member of the family Plantaginaceæ. In some countries it is regarded as quite good fodder, but in Queensland stock do not seem to take readily to it.
13. *Mallotus philippinensis* (Kamala tree). This is a very common tree in Queensland, and extends to India. The red, powdery substance surrounding the seeds is said to be used as a vermifuge.
14. *Galinsoga parviflora* (yellow weed). This is a common weed in cultivations in Queensland. It is generally regarded as quite good fodder for stock, particularly poultry.

Milky Cotton Bush. Tie Bush.

F.C. (Ormeau)—

1. *Asclepias curassavica* (red head or milky cotton bush), a native of tropical America, but now naturalised as a weed in most tropical and sub-tropical countries. It is quite common in Queensland, particularly along creeks and in gullies. It is poisonous to stock, but, generally, is not eaten by them in sufficient quantity to cause trouble.
2. *Wickstræmia indica,* commonly called tie bush on account of the fibrous nature of the bark. It is a native shrub very common in some localities and reputed to be poisonous to stock. Some years ago feeding experiments with this plant were carried out with leafy material at the Animal Health Station, Yeerongpilly, and after about a fortnight the heifers showed signs of emaciation and bloody scours, but recovered when put on ordinary food. A couple of years ago we received specimens of the berry of this plant from the vomit of a child which had died through eating a number of fruits of this plant. They are small, red, and succulent. A quntity were gathered and fed to guinea pigs at Yeerongpilly. The guinea pigs died in convulsions very shortly after feeding.

   In the circumstances, the eradication of both these plants is recommended.

Daisy Bush.

J.E.L. (Monto)—

The specimens represent a species of daisy bush (*Olearia elliptica*), very common in some parts of Queensland, particularly as undergrowth or on the edge of some of our drier scrubs in the Burnett and Darling Downs districts. The plant is not known to possess any poisonous or harmful properties, but, as you suspect it, it might be as well for you to forward some samples as fresh as possible for the Agricultural Chemist to test for the formation of a prussic acid-yielding glucoside. The sample supplied is too dried and rather meagre for the purpose. About ½ lb. sent in as fresh as possible would be desirable.

Sudan Grass.

G.W.D. (Dalrymple Heights, Mackay)—

The Agricultural Chemist, Mr. Gurney, advises that Sudan grass does at times contain a prussic acid-yielding glucoside, but nothing to the same extent as the other sorghums, and usually it is quite free. In the circumstances, however, it is wise to use a little caution and not feed the grass in its young stage, nor allow empty cows to gorge themselves on it. It is also advisable to cut the grass and allow it to wilt before feeding. Sudan grass is essentially a summer fodder.

Blue Bush.

Inquirer (Yeerongpilly)—

Your specimen represents *Chenopodium auricomum*, blue bush. It is a native Chenopodium, sometimes called fat hen, although blue bush is the more common name applied to it. It is generally regarded as quite good fodder in the absence of better feed.

Johnson Grass. Knot Grass.

E.M. (Rathdowney)—

1. *Sorghum halepense*, Johnson grass. This grass is rather a pest in cultivation, as it spreads very rapidly. If any of its roots are cut up each little piece possessing an eye is capable of forming a new plant. The grass is often used for fodder, and stock seem to be rather fond of it, but, as with other members of the sorghum family, a certain amount of care should be exercised in feeding. Like other sorghums it contains a prussic acid-yielding glucoside.

2. *Polygonum aviculare*, knot grass or knot weed, a fairly common farm weed in South-Eastern Queensland, particularly on the Darling Downs and in the Lockyer and Fassifern districts. It is not known to be poisonous, but the long, stringy, fibrous stems may cause impaction if stock eat them to any extent.

CROWN LAND FOR GRAZING HOMESTEAD SELECTION. ST. GEORGE DISTRICT.

38,625 acres of Sheep Land. Part of Mona expired Holding.

This land, being surveyed portion 4, parish of Dewurra, will be open for Grazing Homestead Selection at the Land Office, St. George, on Tuesday, 2nd February, 1937, for a term of lease of twenty-eight years and at an annual rental of ⅝d. per acre during the first period of seven years.

The improvements on the land are provisionally valued at £388 and comprise fencing.

Special conditions will require the enclosing of the land with a fence which is both rabbit-proof and marsupial-proof during the first three years; the destruction of all prickly-pear during the first year and the ringbarking of 7,000 acres during the first seven years.

The land is watered both naturally and by bore drains, but further water will probably be required. The portion contains patches of belar, wilga, gidya, and mulga scrubs.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent, St. George, and the Government Intelligence Bureaux, Sydney and Melbourne.

General Notes

Staff Changes and Appointments.

Messrs. E. H. Gurney, Agricultural Chemist, and W. T. Gettons, Accountant, of the Department of Agriculture and Stock, have been appointed to act temporarily as members of the Central Sugar Cane Prices Board at any time that Messrs. J. M. MacGibbon and A. R. Henry, respectively, may be prevented, through any cause, from attending a meeting of such Board.

Messrs. H. G. Gillan, Colonial Sugar Refining Co., Ltd., Victoria Mill, via Ingham, and J. J. Taylor, Emily street, Highgate Hill, have been appointed honorary rangers under the Animals and Birds Acts, and Mr. T. W. Hardcastle, Boonah, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. J. A. Hennessy, Somerset Dam, via Esk, has been appointed an honorary ranger under the Animals and Birds Acts.

The appointment of Mr. W. H. Kirk, Auburn, via Chinchilla, as an honorary acting inspector of stock, has been cancelled.

Mr. N. Stubbings (Mundubbera) has been appointed an honorary ranger under the Animals and Birds Acts, and Messrs. W. Schneid (Mudgeeraba), A. Ludke (Nerang), H. Lee (Numinbah Road, via Nerang), and A. L. Sprenger (Mudgeeraba), patrolmen, Nerang Shire Council, have been appointed honorary rangers under the Native Plants Protection Act.

Mr. C. J. F. Swinburne, Durikai, has been appointed Instructor in Sheep and Wool, Department of Agriculture and Stock.

Messrs. G. H. Williams (Kureen), W. J. Sloan (Malanda), J. F. Britton (Malanda), R. T. Croker (Malanda), and W. C. Gordon (Kureen), have been appointed honorary rangers under the Animals and Birds Acts.

Messrs. A. J. Busuttin (Brampton Island, via Mackay), F. C. Wooster (Newry Island, via Kuttabul), and R. B. Jamieson (Proserpine), have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

"Filler" in Fertilizer.

A Regulation has been issued under "The Fertilizers Act of 1935" providing that the maximum weight and common name of any "filler" contained in any mechanically mixed fertilizer shall be declared on the label attached thereto.

Stanthorpe Fruit and Vegetables Levy.

Executive Council approval has been given, under the Fruit Marketing Organisation Acts, to an extension of the Stanthorpe fruit and vegetables general levy for a further period of twelve months, as from the 22nd December, 1936. This levy is payable by fruit and vegetable growers in the Granite Belt who consign their produce by rail or road in any one lot with a minimum of half a hundredweight and upwards. The amount of such levy is 3s. 4d. per ton, and a proportionate part of this amount is provided for each portion of a ton of fruit and/or vegetables.

Wild Life Preservation.

The recently declared National Park Reserve extending from Pioneer Point to Cape Conway, between Mackay and Proserpine, has been declared a sanctuary under the Animals and Birds Acts, and it will accordingly be an offence to take or kill any native animal or bird within the boundaries of this sanctuary.

Committee of Direction of Fruit Marketing.

Under the Regulations in force under the Fruit Marketing Organisation Acts, the various sectional group committees, with the exception of the "Other Fruits" sectional group committee, appoint two representatives to the Committee of Direction of Fruit Marketing.

An amendment of the Regulations has been approved, which will provide that the "other fruits" sectional group committee shall also have two representatives on the Committee of Direction, instead of one as formerly.

Commodity Board Ballots.

Certain regulations under the Primary Producers' Organisation and Marketing Acts, dealing with the conduct of ballots in connection with commodity boards have been rescinded, and fresh regulations issued in lieu thereof. The regulations, in their amended form, merely allow of certain slight alterations in the existing procedure, and provide that nominations in connection with pool board elections may be lodged with either the Returning Officer, or some person specified by the Minister. Again, ballot papers may be placed in a ballot box provided by the Returning Officer as well as forwarded through the post, as formerly.

Papaw Levy.

Approval has been given, under the Fruit Marketing Organisation Acts, to the extension, for a further twelve months, of the Papaw Levy Regulation. The extension will operate as from 2nd January.

Animals and Birds Sanctuary near Goomeri.

Tansey Reserve, Goomeri, has been declared a sanctuary for the protection of native birds and animals under "*The Animals and Birds Acts*, 1921 *to* 1924."

Central Sugar Cane Prices Board Election.

Following is the result of the election for Canegrowers' and Millowners' Representatives on the Central Sugar Cane Prices Board held on the 13th November, 1936:—

Canegrowers' Representative—	
Powell, T. A.	2,573
Holt, F. J. E.	977
Hudson, G. F.	923
Kirwan, P.	102
Informal	79
Millowners' Representative—	
Smith, E. S.	Returned unopposed

BOBBY CALVES.

In the last few years a trade has developed in veal, both for local consumption and for export. This trade has been of immense value to the dairy farmer, for in the past it has been the practice on many farms, where the carrying capacity is limited, to destroy all calves at birth. With the opening of this trade in bobby calves, the farmer has been able to obtain a return for what were previously useless calves.

Unfortunately, with some farmers, the practice is to send calves to the meatworks as soon as they are born, in what is really an immature condition. At one slaughtering establishment the total number of calves slaughtered in one year was 4,823, and of this number 538 were condemned as unfit for consumption, giving a condemnation of 11.11 per cent. This figure, obtained from a works situated in a farming district, is probably low for calves which must be trucked to works. The principal cause of these condemnations was immaturity. This loss could easily have been avoided by retaining the calf for ten days longer on the farm.

The milk of a newly-calved cow is fed to pigs and poultry, and is therefore not wasted, but it should be borne in mind that this milk would show a better return if fed to the new-born calf than if fed to pigs. The value of this milk is often not so much as a weight increaser as a preventer of weight loss. This is true of the larger breeds. With the smaller breeds its value is, of course, primarily for growth.

The law provides for a dressed weight of not less than 40 lb., and not less than fourteen days old.

Not only are condemned calves a direct loss to the farmer, but they involve the meatworks in loss, due to wasted labour in dressing, &c.

Mature veal is a wholesome food article, while immature veal, which has a laxative effect on the consumer, is not allowed on the market for consumption.

This loss, due to immature calves, can be avoided if the calf is fed for a few days on the milk of the freshly-calved cow. The calf should weigh 80 lb. or more live weight, before being sent to the meatworks. This live weight will give a dressed carcase of approximately 40 lb.

Rural Topics

Grading of Onions is Essential.

The quality of onions grown in Queensland is recognised by purchasers in the Southern States, the varieties of onions produced being of good flavour, stout and firm in texture, and capable of withstanding the stress of transport without serious bruising or other damage.

Buyers, however, have raised complaints because of onions being forwarded to market without due regard being given to the classification of the onions in accordance with the size of the bulbs. It is the custom of some growers to include large and small sized onions in the same bag. This practice is against the interests of the farmer, and is contrary to the wishes of the selling agents, and results in comparatively lower realisations on the market.

Farmers who have included onion growing in their cropping programme for the coming year are reminded that onions should be classified in acordance with their size. The small sized onions, say, below 2 inches in diameter, should represent one "size" grade. Onions ranging from 2 inches to less than 3 inches in diameter should comprise another grade, and onions from 3 inches to 4 inches in diameter should form a further grade.

Some growers prefer to classify the onions in grades in agreement with each ½-inch increase in diameter. This practice results in the onions in each grade being particularly even and uniform in appearance.

The number of grade classifications should be determined by the variation that occurs in the size of the individual bulbs comprising the crop. In ordinary circumstances, the classification of the bulbs into three or four grades will suffice. It is important, however, that the onions should be graded as evenly as practicable, and to effect the elimination of all "outsized" bulbs, especially the onions that are coarse, and are customarily referred to as "bull-necks."

The market prospects for 1937 are good, and no doubt the ultimate realisations will be governed very largely by the care that is taken by growers in placing the bulbs on the market in a manner conforming with the requirements of the trade.

As the defect complained if is purely of a mechanical nature, the remedy is comparatively simple, and capable of correction by any growers desiring to take suitable action.

Careless Branding of Stock.

Some stockowners exhibit great carelessness in branding their stock, cattle particularly. A visit to any of the large saleyards will reveal the slovenly use of branding irons. Not only are slipshop methods employed, but in some cases there is evidence of actual, but unintentional, cruelty. It is cruel to hold the hot iron on an animal until the skin is burnt through, and it is quite unnecessary. This practice may be due to underheated irons, but it may be due to over-hot irons held on the skin a fraction of a second too long, or with too much pressure. Such branding causes blotches, and very often the actual letters or figures are undecipherable. The skin in the area involved is urined for tanning purposes, and festering sores may result. Identification of the animal by means of such a brand is rendered very difficult, if not impossible.

It is a well-known fact that, on large stations, where thousands of calves are branded yearly, and where speed is a factor in the handling of large mobs, the standard of branding is much higher than on some small holdings, such as farms, where only two or three calves may be branded at irregular periods.

Good Grazing Depends on Control of Pastures.

Dairy farmers and stock raisers are advised to make a critical examination of their permanent pastures with an eye to the future of the most useful paddocks. In many instances the land-holder will find his pastures of paspalum, Rhodes grass, &c., to consist of a series of closely grazed patches interspersed with clumps comprised for the most part of dried stemmy grass which the stock will not touch. It is easy to visualise what will be the condition of these pastures during the coming spring. If the usual grazing methods are not improved upon the clumps which are useless now will remain neglected by stock, and will produce rank growth of no value for grazing. This means, of course, a very serious reduction in the total area of pasture actually grazed. The explanation of such uneven grazing lies in the preference shown by stock for short, leafy grass, which has a much higher feeding value than the same grass in a rank and stemmy condition, for when an animal is turned into a paddock which supplies a superabundance of feed it will graze the pasture in patches and will return again and again to these short patches, neglecting the overgrown clumps.

The first step in any plan designed with the object of keeping the whole of the grazing area in the short, leafy condition is to ensure adequate control of the pastures. This can be effected only by subdivision of large paddocks. While holdings of 160 acres continue to contain paddocks of 20 acres or more, so long will pasture be wasted as a direct consequence of insufficient control of the grazing areas. The extent of subdivision desirable depends upon the size of the herd or flock, upon the shape of the farm, upon the topography, upon the class of pasture, and so on. Consequently, no hard and fast rule can be laid down. The aim is to have each paddock small enough to permit of the producing stock grazing the pasture down evenly within a few days. Ten or twelve dairy cows concentrated on 1 acre of paspalum pasture about 6 inches tall will within a week have the pasture well down, so a farmer milking on an average sixty cows might have his better grazing area divided into a number of paddocks each 5 or 6 acres in extent. The number of paddocks should be six or more, as this will allow each paddock to be grazed for a few days when the grass is 5 or 6 inches high. Under favourable seasonal conditions, using six paddocks, the first grazed paddock should be ready for grazing again after the other five have been grazed in rotation. In most districts, however, there is great risk of sudden rainfall deficiency, and under these conditions nine or ten paddocks should be provided for rotational grazing purposes.

Amended Regulations of the Dairy Produce Acts.

Although a cooler type of dairy house has been prescribed by the new regulations governing production on the farm, every existing dairy house will not be condemned forthwith. If it is found to conform reasonably with requirements it will be passed, provided that the new method of ventilation is adopted. For instance—the new regulations provide for the use of wire-netting or ¼-inch woven wire for ventilation in place of the very closely-woven wire or gauze hitherto commonly used. All new buildings must comply with the new regulations.

Much inferior quality cream has been due to lack of cleansing equipment on the farm, and provision has been made for the installation of a hot water boiler, washing-up trough, and draining rack. For dairies using milking machines extra safeguards have been introduced in order to protect the milk from possible contamination where separating is done in rooms adjacent to the bails. Dairymen supplying milk to a cheese factory or for local consumption may be spared the expense of building what will be known as Dairy House A, but, instead, must provide a milk stand—a small enclosed platform three (3) feet from the ground. A cheaper building, known as Dairy House B, for washing and storing utensils must, however, be provided. A dairyman must use the buildings on his premises for the purposes prescribed, and must not allow stock within thirty (30) feet of a dairy house or milk stand. It will be necessary to provide a shelter shed to protect cream awaiting collection from the sun. No person shall collect cream from any other shed wthout the approval of a dairy inspector.

Cloths and receptacles must be used for cleansing the teats and udders of the cows at the bails at the time of milking, and cleansed thoroughly after each milking. Every person must be clean and wear clean clothes when milking and in the dairy. All milk provided for any purpose must be strained and cooled in an approved way. When milk or cream is kept in a dairy house, it must be pro-

tected from dust and insects and stirred every four (4) hours with a metal stirrer. Milk must be delivered to a cheese factory before 9 a.m. in the summer, and 9.30 a.m. in the winter.

The time by which the cleansing of the milking shed and utensils must be completed has been fixed. Cans returned from the factory must be scalded before being used again. All cans must be marked with a registered number allotted and the number of the can. It is illegal for any person to use a can owned by another person. Any conveyance used for the carriage of cream or milk shall comply with the regulations, and such conveyance shall be cleansed thoroughly after each time it is used. Milk being conveyed to a cheese factory must be covered, and any milk not so covered shall be rejected. A conveyance for the sale or delivery of milk has been prescribed, and provision has been made for the protection of protruding milk taps from dust by an approved cover.

Provision has been made to hold samples of cream for check testing at a factory. The owner of the factory must notify the supplier immediately any cream is below first grade or the prescribed standard of butter fat.

Milk delivered by every supplier to a cheese factory shall be tested not less than four times per month. The samples shall be held in numbered composite bottles and kept in a locked cupboard.

Every owner of dairy produce premises who prepares curd or casein shall provide a detached room constructed and used for the purposes prescribed. All skim milk to be used must be conveyed to the curd-preparing room in a manner approved, but any can used for cream or milk shall not be used for carrying the skim milk to the curd room. The whey must be removed from the room daily. The buildings, plant, and utensils must be kept in a clean and sanitary condition. Standards have been prescribed for the manufacture of cans.

Increasing Pineapple Yields by Closer Planting.

Pineapple plants are able to get along with relatively small quantities of water, provided the soil around their roots is kept moist. Since the pineapple is a shallow-rooting plant, this very desirable objective can be obtained by shading the soil around the bases of the plants. Reducing evaporation of soil moisture in this way is one of the chief advantages to be gained from the use of paper mulch. Where paper mulch is not available, or where its use is precluded for economic or other reasons, conservation of soil moisture in pineapple fields can be readily and efficiently effected by setting the plants closely together. It has been found from experiment that the shading of the soil, which is effected by the foliage of closely set plants, conserves almost as much moisture as the plants grown therein require for transpiration, indicating that the rate of water loss from the unshaded soil between the rows is greater than that from soil shaded by the plants. In the light of these considerations, it will be clear that pineapple yields can be markedly increased by increasing the number of plants per acre, provided always that such factors as sunlight, rainfall, and soil properties are favourable for the proper development of a greater plant population. It should be borne in mind, however, that increasing the number of plants per acre likewise increases the drain on the nutritional sources of the soil in which they are grown, and consequently correspondingly heavier applications of fertilizer are necessary.

A great deal of experimental work has been carried out in Hawaii to determine the best planting systems for pineapples. In general, it has been found that increasing the number of plants per acre tends towards a decrease in fruit size, but leads to marked increases in yields. Fruits from widely-spaced plants, while large in size, are prone to be irregular in shape, and they show an increased tendency towards multiple and fasciated tops, and to the incidence of such diseases as brown speck and fruitlet core rot.

From a consideration of all of the factors involved, it is recommended that on the sandy soils of the coastal areas pineapple plants should be set out at the rate of from 14,000 to 16,000 per acre, while for heavier soils at higher altitudes and for regions of relatively heavy rainfall a smaller plant population of from 10,000 to 11,000 per acre is likely to prove more satisfactory.

The rate of water loss from sandy soils in sunny localities is relatively high, and consequently closer planting is recommended, because of the increased need for shading the soil. For heavier, colder soils and for cloudy regions, however, a slightly wider spacing of the plants is desirable, in order that sunlight may penetrate between the leaves, so that drying of the soil after excessively wet periods is facilitated, and a soil temperature favourable to root development is maintained.

During recent years many different systems of plant spacing have been tried out, and while certain advantages may be claimed for three and four-row systems, under special conditions, it is now generally agreed that the double-row system affords most of the advantages of other systems with few of their drawbacks. Under this system, each plant can be conveniently weeded, fertilized, and harvested from the passage-way between the rows. Moreover, each plant is afforded uniform exposure, there being no "inside plants," as with three or four-row systems. In these latter systems, the plants of the inside rows are apt to suffer severely from shading by their stronger neighbours of the outside rows. While shading of the soil is desirable and distinctly beneficial, shading of the leaves is definitely harmful, as it may delay blossoming for twelve months, and inevitably leads to the production of small, late-maturing fuit of poor quality.

On second-cycle (replanted) fields, the spacing of double-row beds, centre to centre, should be about 5 feet 6 inches, with a 22-24-inch spacing between the two rows of each bed. This would leave a 3-feet 6-inch passage-way between the beds, which is of ample width for carrying out cultural, fertilizing, and harvesting operations. If the plants were spaced 1 foot apart in the rows, the number which could be set out per acre would be in excess of 15,000. By spacing the beds on 6-feet centres, as should be done on new land, but maintaining the same distances between the rows and between the plants in the rows, the number of plants required for an acre would be approximately 14,000. In wet or cloudy districts, the beds should be laid out on 6-feet centres, but while the spacing between the rows would remain the same as for sunnier areas, namely 22-24 inches, the distance between the plants should be increased to 18 inches. This would give a population of about 10,000 plants per acre. Proper spacing of plants in the rows can only be accomplished by the use of a cord or wire marked at the appropriate distances; in the absence of some such guide, the tendency is to plant at wider spacings than those intended, with the result that the number of plants per acre falls short of requirements.

Provided subsequent cultural and fertilizing operations are properly carried out, the yields which may be obtained from close planting systems greatly exceed those being secured from existing wide-centre systems. A first crop yield of approximately 50 tons per acre is theoretically possible from a population of 16,000 plants per acre; the fact that in excess of 40 tons per acre has been harvested from the first crop (plant crop) on a 400-acre field in Hawaii, planted at the rate of 16,000 plants per acre, clearly demonstrates the benefits of closer planting.

Lice and Mites in Pigs.

When pigs are seen frequently rubbing against convenient objects in their run, or when the skin is rough and scaly, particularly on the head, neck, and shoulders, skin parasites should be suspected.

Lice and mange mites are the common external parasites of the pig which cause the above symptoms. Lice measure up to about one-quarter of an inch in length, and as they occur on the skin surface are very readily seen. The mange mites, on the other hand, are extremely minute in size, being only about one-fiftieth of an inch long, and as they live under the skin surface the aid of the microscope is necessary to find them.

Both lice and mites cause considerable irritation, preventing the animal from making normal growth, and by lowering its vitality make it readily susceptible to other diseases. The mange mites cause the skin to become roughened, thickened, and thrown into folds, and unless their spread is controlled they are quite capable of causing death.

Parasitic mange is readily contagious, and all affected animals should be immediately isolated. After a thorough washing with warm soapy water, the animal should then be covered with crude oil, which is best applied by hand on a cloth. This disease may, when in an advanced stage, become very obstinate to treatment, and numerous applications of oil at frequent intervals may be necessary to effect a cure.

Crude oil is also very effective against lice, but as the first application does not kill the eggs, a second application should be made after an interval of fifteen days.

Pigs should be oiled in the evening, as exposure to the sun immediately after oiling, especially in white breeds, may cause blistering of the skin.

Where mange is suspected, scrapings from the affected areas should be taken. The scrapings should be made from the newer areas of infection, being sufficiently deep to cause the appearance of blood, and then forwarded in tightly-corked tubes to the Animal Health Station, Yeerongpilly.

Soil Conservation.

Soil conservation has within recent years become a problem of major importance to the various States of the Commonwealth, and it is satisfying to observe that a consciousness has been awakened in respect of soil drift in the arid areas of the Commonwealth and erosion in general in the various States.

Recently the Commonwealth Council for Scientific and Industrial Research appointed an officer to undertake preliminary investigations into the problem of soil drift, and this officer has just completed an initial survey of the north-eastern portion of South Australia and embodied his findings in a report issued by the Council for Scientific and Industrial Research. The effects of overstocking accentuated by climatic conditions have been stressed in the report, which emphasises the idea that although the problem is a botanical one the solution lies largely in the administrative field. The Commonwealth officer is now continuing his investigations in the south-western corner of Queensland, and is being assisted on the botanical side by the Government Botanist and the Walter and Eliza Hall Fellow in Economic Biology of the University of Queensland, who is accompanying the Commonwealth officer in the field. The Department of Agriculture and Stock is assisting in every possible way this investigation, which is of outstanding importance to the future of the arid areas of the Commonwealth. The results of the present investigation, which is based on an arrangement made between the Commonwealth Council and the Queensland Department of Agriculture and Stock, will be awaited with great interest.

Another problem—that of soil erosion, gullying, &c.—is also engaging the attention of the Department of Agriculture and Stock. Experiments are being initiated in certain parts of the coastal areas by an Experimentation Committee appointed by the Minister. The importance of this problem to the conservation of agricultural and orchard lands is fully realised. The Department is, further, maintaining contact with the investigations being carried out in other parts of the world, and notably with those of the Soil Conservation Service of the United States of America.

The Value of Strain in Pasture Plants.

Many of the cultivated pasture plants with which farmers and graziers are familiar are now grown in countries far removed from their original homes. Rhodes grass, for instance, is a native of Africa and which, within the last forty years, has been distributed to all other continents. It is only to be expected that, in course of time, the type developed in one particular area should differ in some respects from a type developed under different conditions of soil, climate, or management. In the case of Rhodes grass, for example, pastures raised from Queensland-grown seed are superior, even in Africa, to pastures developed from African seed. As a matter of fact, large quantities of Queensland seed of Rhodes grass are annually exported to Africa. These different types are known as "strains."

What is true of Rhodes grass applies also in varying degrees to many other grasses and clovers, as well as to lucerne. In a number of countries which are well advanced in pasture research (for example, New Zealand and Great Britain) a great deal of attention has been paid to the differences in pastures developed from various lines of seed. Commercial and other lines of seed of the locally important species have been collected from many local and foreign sources, tested against one another under field conditions, and the lines producing the best pastures traced back to their respective origins.

Such trials on recognised testing stations have resulted in the seed market being supplied with lines of seed certified by responsible authorities to be superior for sowing purposes to certain other lines. Thus we have New Zealand Government certified perennial ryegrass, cocksfoot, and white clover seeds, &c. In some instances the preliminary testing station trials have been dispensed with, and certification accorded seeds from pastures known to be long-lived. New South Wales Government certified seed of *Phalaris tuberosa* is of this nature.

None of the grasses embraced in the seed certification schemes of other States and countries is as yet grown for seed purposes in Queensland; consequently the activities of the Queensland Department of Agriculture and Stock have been directed towards the testing of certified strains from other regions against one another and against uncertified strains. This work has revealed the following seeds to be very suitable for local use:—

Perennial Ryegrass—New Zealand Government certified permanent pasture.
Cocksfoot—New Zealand Government certified Akaroa.
Phalaris tuberosa—New South Wales Government certified.
White Clover—New Zealand Government certified.

Orchard Notes

FEBRUARY.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand. Where green cropping is not practised it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth of weeds provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rooted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codling moth. If there is a slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

ECONOMY IN DAIRY PRODUCTION.

A measure of economy which involves the dairy farmer in very little extra work is to increase production by systematic herd testing and culling, and breeding only from the best producers.

Far too many herds include cows whose production falls far below average, and the dairy would be run far more economically if these cows were fattened for the butcher. They belong to the "boarder" class, and usually consume more fodder than a heavy producer. Too many animals of this class impair the efficiency of the farm.

No matter how close a watch is kept, it is almost impossible to pick the lowest producers without systematic testing over the whole lactation period. If the farmer is prepared to do this himself well and good, but he requires to have an accurate knowledge of testing and the principles involved in calculating results.

The Department of Agriculture and Stock offers a herd-testing service which involves the dairyman in no monetary expenditure whatsoever. In other States and countries up to 6s. per cow is paid for a similar service. Surely it is impossible to believe that dairy farmers in other parts pay for something that is valueless.

In Queensland many dairymen have availed themselves of the services offered, and the results achieved by those who have tested and culled over a number of years have proved that it is well worth while. Nevertheless, there are very many more who could do so to their own advantage.

To obtain this service it is only necessary to make application to the Department. Sample bottles in a box are sent to the farmer, and all he has to do is to weigh each cow's milk and place a sample in a bottle, as directed. Then, if the factory he supplies is co-operating with the Department, he forwards the box of bottles containing the samples to that factory. Otherwise he may send his samples direct to the Department of Agriculture and Stock, which pays the rail freight.

The testing is done five times at intervals of, approximately, sixty days, and at the end of the period the farmer receives a complete return showing the relative value of each cow under test. It must be remembered that the object of testing is not so much to find out the best cows in the herd as to find out the worst and least profitable.

Testing is only half the job, and the Department depends on the good sense of the farmer to see that he does not keep feeding unprofitable cows indefinitely. Testing is of no value in raising the standard of production of the herd unless the low producers are culled regularly.

It is a poor farm that cannot afford to dispose of the two least profitable cows each year. Remember the first loss is the least. The longer the "boarders" are kept the more expensive they become. They eat the feed of a good milker and much time is wasted, frequently, in rearing their calves, which turn out no better producers than the dams.

Farm Notes

FEBRUARY.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broad-leaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed-bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germinatior of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Sudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and saccaline.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

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.

HOLIDAY TRAVELLING.

Travelling with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand, a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby who has been properly managed should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely. But these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen)—not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats, and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once—never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean boiled butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At

the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddler avoid bought foods, cakes, and sweets, which may do him much harm especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm but a day of over-feeding may go a long way to spoil his holiday and your own too! Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of wholemeal or cerevite bread. These may contain lettuce, sliced tomatoes, egg, either sliced or scrambled, or soft cheese spread on butter, or marmite. Add a few dates or seedless raisins, apples or oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him quiet by feeding him all the time. You won't succeed; it will only make him cross and irritable, miserable himself, and a torment to others. But let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture books and writing pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed, he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well, you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort!

IN THE FARM KITCHEN.

VALUE OF ORANGES AND MANDARINS.

Oranges and mandarins are not acid-forming. On the contrary, they are alkaline in reaction and serve to balance the recognised staple foods which are acid-forming and which, if used too freely, result in acidosis, a forerunner of many common ailments which often lead to dangerous disorders. Medical opinion on their value is quoted as follows:—

Sir William Arbuthnot Lane, Bart, C.B., M.S., F.R.C.S., etc. (England):—

"An orange is a perfect beginning to a meal. The minimum amount daily to prevent scurvy is one ounce of orange juice."

W. D. Sansum, M.A., M.D. (America):—

"Oranges have an alkaline reaction in the blood which offsets the acidity caused by such good foods as meat, fish, eggs, cereals, and bread."

In a questionnaire sent to 118 child specialists by the California Fruit Growers' Exchange, asking what fruits they recommend most often for children under three years of age, 93 out of the 107 who replied simply wrote "oranges." Some of the reasons they gave for this choice were:—

Orange juice is easily digested. Its salts and acids form the best natural mild laxative that physicians know. It is a preventive of children's disorders due to sterile or deficient food. It has a naturally corrective medicinal diet; and, not to be overlooked, all children like oranges. Orange juice helps to build up a sound, healthy bone-and-muscle structure, and gives the body the right start.

It is particularly helpful in building good tooth structure. Aside from its regularity benefits, orange juice supplies a necessary element to growth—vitamins.

The value of orange juice is stressed in all advice given with regard to the feeding of babies, beginning with a teaspoon a day diluted with an equal quantity of water, as early as the sixth week. For the artificially fed baby, orange juice is of even greater importance.

The value of oranges and mandarins may be summarised:—

1. Being rich in vitamin A, they help to resist infection of the eye, nose, and throat.

2. Rich in vitamin B, they promote growth and are consequently particularly valuable for young children.

3. They offer an abundant supply of the antiscorbutic vitamin C, the food factor most likely to be wanting in the ordinary diet, and the lack of which is often the cause of scurvy, retarded growth, malnutrition in children, bone and growth development, anæmia, &c.

4. They are alkaline in reaction and prevent acidosis.

5. They stimulate the appetite.

6. They are mildly laxative.

7. They contribute to the diet potash, calcium, phosphate, and iron.

8. They aid digestion.

9. They contain a large percentage of natural fruit sugar which provides energising food value in an easily assimilated form.

The above are nine excellent reasons for the inclusion of oranges and mandarins in the daily diet. The tenth, and from a family point of view, not the least important, is the deliciousness of the fruit itself.

What youngster does not appreciate mandarins, and how ideal and hygienic are these for inclusion in school lunches.

Oranges and mandarins will often tempt the appetite of the sick and convalescent when other foods fail to appeal.

Remember, the body cannot store some of the health factors required by it, and it is necessary to replace them at frequent intervals. Therefore, during the season buy oranges and mandarins freely so that old and young alike can have them daily.

Schools or consumers not in close touch with retailers will, on application to the Committee of Direction, be supplied with a list of growers prepared to forward oranges and mandarins direct to country customers.

Besides being ideal for eating fresh, oranges and mandarins may be used for household purposes in a multiplicity of ways, e.g.:—

Orange Delight.

Take 5 oranges, 1 teacupful of white sugar, 1 pint milk, 3 eggs, 1 tablespoonful of cornflour. Peel the oranges, cut. Heat the milk by letting it steam in a saucepan of boiling water, add the cornflour, mixed smooth with a little milk, and the well-beaten eggs. Sweeten, stir till thick, pour over the oranges, and beat ½ pint cream. Sweeten, flavour with orange juice and a little grated rind piled on top of the custard, then into slices, removing the pips, and sift sugar over them.

Jellied Oranges Cut in Sections.

Remove a piece 1 inch in diameter from the navel ends of oranges. Remove juice and pulp with a teaspoon, and strain through cheese cloth. With first two fingers take out as much as possible of the white inner membrane from the orange skin. Use juice to make orange jelly, and fill orange skins. Place in upright position in a pan of crushed ice and leave until firm. Cut in halves, then in thirds, and serve with or without whipped cream.

Orange Snow.

Dissolve an ounce of isinglass in a pint of boiling water, strain and let it stand till nearly cold. Mix it with the juice of 6 or 7 oranges and 1 lemon, add the white of 3 eggs, and sugar to taste, whisk all together until like a sponge, put into a mould and turn out the following day.

Orange Roly-Poly.

Two cups flour, 4 teaspoons baking powder, 1 teaspoon salt, 4 tablespoons butter, ¾ cup milk, ½ cup sugar, 4 oranges, grated rind 1 orange, ½ cup water.

Mix and sift flour, baking powder, and salt. With tips of fingers rub in two tablespoons butter, and mix to a dough with milk. Roll out one-half inch thick, and cover with small pieces of orange pulp. Mix sugar, orange rind, and remaining butter, and sprinkle two-thirds of it over the orange. Roll up; pinch ends together; place in baking dish; sprinkle with remaining sugar, surround with water, and bake about thirty minutes. Serve with an orange or lemon sauce.

Creamy Pudding Sauce.

1 egg, ¾ cup powdered sugar, 1 cup cream, 2 tablespoons orange juice, 1 tablespoon lemon juice.

Beat egg until light; beat in powdered sugar. Add cream, whipped until stiff, and fruit juices.

Orange Cream Custard.

Four oranges, 2 eggs, ½ cup sugar, 2 teaspoons flour, ⅛ teaspoon salt, 2 cups milk, ½ teaspoon vanilla, 5 tablespoons sugar.

Beat egg yolks, add one-quarter cup sugar, flour and salt, and mix thoroughly. Add milk and cook in double boiler until thick enough to coat spoon. Cool, add vanilla, and turn into serving dish containing peeled and sliced oranges. Beat egg whites with five tablespoons sugar. Heap on top of custard and serve.

Orange Fritters.

Peel and core the oranges, cut in slices, roll in sugar, dip in batter and fry.

Batter for the above:—Two eggs, 2 tablespoonfuls flour and a little milk. Mix thoroughly and smoothly before dipping the orange slices in. Other fruit may be used in the same way.

Tangerine Delight.

Two cups of pure crystal sugar, 1 cup strained orange juice, 3 dessertspoonfuls powdered gelatine, 1 dessertspoonful vanilla. Bring orange juice to boiling point, pour over the sugar and gelatine, mix well. When cool add essence and beat for 12 minutes very quickly. Set in a buttered tin. When firm cut in blocks and roll in icing sugar.

Orange and Passion Fruit Snow.

Two dessertspoons gelatine, 1 cup orange and passion fruit juice, ½ cup hot water, ½ cup cold water, 3 tablespoons sugar, 1 egg white beaten stiff.

Dissolve gelatine and sugar in hot water, add cold water and fruit juice (add more sugar if necessary.) Leave until thickened, beat with an egg whisk until thick, gradually add egg white and beat until the mixture holds its shape.

Orange Cake.

4 eggs, 8 oz. flour, 8 oz. sugar, 7 oz. butter, juice and rind of two oranges, 3 tablespoons milk, 1 teaspoon good baking powder.

Cream butter and half sugar, add the other half of sugar to eggs. Beat eggs and sugar until spongy, then add to the butter. Mix very lightly, add juice and rinds. Sift flour, with baking powder, and add milk, mix well and bake in moderate oven for 1 hour. (Or bake in sandwich tins.) Ice when cold.

Fruit Sponge.

Juice of two oranges, 1 lemon, 6 passion fruit, 1 cup sugar, 1 heaped tablespoon powdered gelatine, 1 tablespoon flour, 2 cups water.

Mix flour with a little water, dissolve gelatine in half cup water, put all ingredients except passion fruit in a saucepan and bring to boil. When nearly cold beat until nearly stiff, then add passion fruit and put in mould; serve with cream.

Mandarin Cake.

1 lb. flour, ½ lb. butter, ¾ lb. sugar, 3 eggs, 1 cup milk, 2 teaspoons baking powder, 1 teaspoon salt, 2 mandarins.

Beat butter and sugar to cream, add eggs one by one and beat each well as it goes into the mixture. Sift flour, baking powder, and salt, mix with butter and eggs alternately with the milk. Grate the rind of the mandarins and put into the mixture. Put into tin and bake about an hour and quarter. Ice with ¾ lb. icing sugar mixed with 3 tablespoons mandarin juice and just warmed over fire.

Mandarin Filling.

One mandarin, 1 tablespoon cornflour, ½ pint water, 2 oz. butter, 2 oz. sugar.

Put water and butter on to boil, stir in moistened cornflour, add sugar, and stir till thickened, add grated rind and juice of mandarin, cool, and put between sandwich.

PAPAW RECIPES.

Papaw Preserve.

Take 1 lb. of sugar, ½ pint of water, to make a syrup, 2 tablespoonfuls of lime, and a gallon water. Put the lime into the water, and stir until dissolved; peel the fruit, and cut into slices about 2 inches thick and the length of the fruit. Put these pieces into the lime water and allow to remain for about 8 to 10 hours; then take the fruit out, make the syrup, and when boiling put in the papaw; boil quickly for half an hour; take out the fruit and arrange lengthwise in a glass jar. When the syrup is cool, fill the jar and cork down tightly.

Fruit Salad.

Take as many different fruits as possible—oranges, papaws, pineapples, apples, bananas, passion fruit, and the juice of a lemon. Cut bananas into thin slices, and papaws and pineapples into cubes, peel the apples and slice them in. Remove pith from oranges and slice them in. Sprinkle each alternate layer with sugar, squeeze over the juice of the lemon and the passion fruit. Serve with whipped cream.

Mixed Fruit Jelly.

Take 2 large apples, 3 bananas, a nice piece of papaw, a small piece of pineapple, and any other fruit you like. Cut it all up in nice, fine slices, squeeze passion fruit all over the top, sweeten a little, then make a pint of jelly, and when fairly cool pour over the fruit. This can be eaten with whipped cream or custard or served plain.

Papaw Dessert.

Cut up in rather large pieces, put in enamelled stewpan with about a pint or so of water to 3 lb. of fruit, 1 small teacupful of sugar, the juice of 2 lemons, bring to the boil and simmer for 10 minutes, set aside to cool, and serve with a milk pudding, or it may be set in jelly.

Papaw Salad.

By adding a little orange or lemon juice to diced or mashed papaw you can produce a lovely salad in a few minutes. This is the most inexpensive fruit salad possible and is simply delicious.

Tropical Fruit Salad.

Papaws, bananas, and pineapple combine to make a delicious tropical fruit salad. Use in quantities to suit taste, dicing the papaw and pineapple and slicing the bananas. Crush a little of the pineapple to secure juice and sprinkle this over whole with a little sugar, and serve.

Icy Fruit Slices.

Cut a papaw into sections lengthwise, sprinkle with lemon and sugar, and place in ice chest until thoroughly cold. When serving sprinkle with crushed ice if desired.

Crystallising Fruits.

Choose good sound fruit, not too ripe, and prick with a needle. Place in a pan of cold water and bring to the boil. The fruit will rise to the surface, and must be lifted out and placed carefully in cold water. Prepare a syrup by boiling 2 lb. of cane sugar in 1 pint of water till on dipping a skewer into the syrup and blowing through it bubbles will be formed on the other side of the skewer. Then put the fruit into the syrup and boil up. Remove the scum. Take the pan off the fire and pour contents into a basin. Leave till the next day, then pour off the syrup and boil till it threads. Pour over the fruit and allow to stand overnight. Repeat the process for four days and on the fifth day boil the syrup to the "crack," dip the fruit into it and drain on a sieve in a warm place. Sprinkle with fine sugar. Pack carefully and keep in a cool, dry place.

Papaw Tart.

One and a-half cups of self-raising flour, rub in 1 tablespoon of butter, add 1 teaspoon of sugar and a little salt. Mix with milk or water to make a light dough. Roll out thin, spread on a plate, prick all over, and fill with thinly sliced papaw sprinked with sugar and lemon juice or passion fruit. Cover with pastry and bake in a moderate oven.

Frozen Papaw Jelly.

Peel a firm fully ripe papaw, cut the end sufficiently to allow the removal of seeds. Dissolve jelly crystals, when cool pour into papaw cavity; place on ice and allow to set. Cut into rings and serve with whipped cream.

VALUE OF PINEAPPLES.

Pineapples are undoubtedly one of nature's health correctives and healers. Their richness in vitamin A helps to prevent common colds and those eye ailments so prevalent amongst children, particularly in the inland districts of Australia. At the first sign of a cold or when colds are prevalent eat pineapples freely. Being rich in vitamin B, they promote body growth. Owing to their vitamin C content, pineapples are recommended by doctors as a precaution against pyorrhœa, which, according to the "Medical Press and Circular," is largely a dietary affection.

Dr. J. R. Killian, a distinguished American scientist, specialising in the study of nutrition, states that the fight against pyorrhœa and dental decay will be helped in the future by a liberal use of pineapple in the diet.

Pineapples are of great value in after treatment following tonsil removals, and assist the stumps to heal. The pure juice is a proved reliable ferment for dissolving necrosed tissue in quinsy.

These benefits are available to all, as where the fresh fruit is unobtainable the canned pineapple—retaining as it does the properties of the freshly-picked fruit—may be used.

Its uses in the kitchen are legion. Slices fresh or canned, served with cold meat have an appeal which ensures their continued use, particularly with corned meat. To the busy housewife the pineapple presents an easy solution of the ever-present dessert problem. No dish is more quickly prepared or more appetising than grated pineapple, fresh or canned. Its popularity never wanes.

A fruit salad can be rapidly made by the use of pineapple, fresh or canned, and one or more of any fruits in season. For cooked desserts the pineapple may be served in a multiplicity of ways, and the following recipes are recommended:—

Pineapple Jelly.

Wash a good half-breakfastcupful of sago, put in a large jug with half-cupful water, 1 cupful sugar, 2 grated pineapples, and juice of 1 lemon. Put the jug in a pan of boiling water and stir until clear, then put in moulds until cold. Serve with custard or grated pineapple.

Pineapple Fritters.

Put flour in basin, add pinch of salt, baking soda and cream of tartar, the usual quantities to each pound of flour, 1 tablespoonful sugar, and 1 egg to each pound of flour. Mix all together with milk, or half milk and half water, to a nice batter, dip in pieces of pineapple, and fry to a nice brown. Condensed milk may be used if fresh is not available for the batter, by mixing at the rate of 1 tablespoonful to a pint of cold water. This mixture of batter may be used for bananas, mangoes, or apples, or any fruit that is used for fritters.

Pineapple Pie.

Two cupfuls grated pineapple, 1 cupful water, cupful sugar, 2 tablespoonfuls breadcrumbs. Line pie-dish with paste, mix pineapple, water, sugar, breadcrumbs, and yolks of 2 eggs, bake, and when cool beat up the white of eggs and put over pie.

Pineapple Turnovers.

Make a flaky pastry from 2 cups of self-raising flour and half-cup dripping. Cut out shapes the size of a tea plate, put a spoonful of chopped pineapple and a little sugar on each fold, press over the edges of the pastry together, and bake in a brisk oven. The turnovers are better served with hot custard.

A delicious pineapple drink may be made in either of the following ways:—

Pineapple Syrup.

Keep the skins of your pineapples and boil slowly and well in plenty of water. Strain through cloth and add sugar to taste. This makes a delicious drink and retains all the medicinal qualities of the pineapple.

Pineapple Water.

Peel a medium-sized pineapple and cut it into pieces, pound it to a pulp, and mix with it 1 pint of boiling syrup and the juice of 1 lemon, and let it all stand covered for two hours; now strain, and add 1 quart of water, and ice.

HOW TO MAKE SOAP.

Materials.

6 lb. clean dripping; 2 gallons water; 1lb caustic soda; ½ lb. resin; 3 tablespoons borax or kerosene.

Method.

1. Put dripping, resin, and water into a boiler or kerosene tin.
2. Boil until all fat is melted—15 to 30 minutes.
3. Add borax or kerosene; remove from fire.
4. Add caustic soda direct from the tin gradually, allowing bubbles to subside between each addition.
5. Boil gently for one or two hours.
6. Pour into a box lined with a damp cloth.
7. When solid, cut into bars and store in a dry place until hardened.

RANCIDITY IN FRESH CREAM.

A rancid flavour in fresh cream is a most unexpected trouble with dairy farmers, as this defect is usually associated with old, stale cream. Each year, however, particularly from March to July, authentic reports are received of cream (less than twenty-four hours old) being degraded on account of rancidity.

A substance called lipase is the cause of the trouble. Lipase is an enzyme which occurs in milk and cream, and has the property of rapidly decomposing the fat. Its greatest damage is noticeable when cows are approaching the end of their milking period, and usually only one or two cows in the herd are responsible for the spoilage that occurs in the milk or cream.

When confronted with this trouble, farmers are advised to examine the milk from each cow until the offending animals are identified. This may be done by holding about half-a-cupful of milk from each animal for six or eight hours and tasting and smelling at intervals. A sickly, rancid smell and taste will signify the troublesome ones, and the milk from these cows should not be mixed with the bulk milk for separation.

The defect becomes worse hour by hour, and there is no way of stopping its action except by heating almost to boiling point. If such milk is desired for home use it should be boiled immediately it is drawn from the cow.

The Tropics and Man

INFLUENCE OF CLIMATE ON THE EUROPEAN.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M.,—Professor of Physiology, University of Queensland.

No. 1.

"THE proper study of mankind is man," said Alexander Pope in a well-known poem. But I wonder, do we really appreciate what wonderful beings we really are, or do we study ourselves enough? Do we realize on the one hand what we are capable of accomplishing if only we set about it on the right lines, or, on the other, do we remember sufficiently often the extraordinary intricacy and delicacy of our body's mechanism? Those of us whose footsteps have been led by fate into such paths of enquiry might sometimes be temped to pride ourselves on our understanding of the human body, but is our understanding after all very complete, or, for that matter, do we practise ourselves the behaviour we order for others? Is it not usually the case that the medical man or nurse makes the worst patient?

The more closely I have been brought into contact with man's reactions to the various stresses forced upon him by tropical residence, the more I realise our profound ignorance of what hot climates alone do to him, that is, hot climates stripped of their usual accompaniments of infection, social obligations and economic peculiarities. At the same time, the realization of ignorance does not breed pessimism; rather does it appear that closer and more exact study of the actual position should point out how man can better triumph over the present disabilities imposed by hot climates and impose in turn his superiority upon nature in areas and ways as yet only toyed with by him. *But*, first must come knowledge. Action in ignorance or in unthoughtful defiance of nature can end only in disaster, even though its initial stages be tended with apparent success.

It has been pointed out many times by better writers than I, that tropical Australia as a whole, and Queensland in particular by virtue of its larger experience, forms a unique field for the investigation of tropical influences on the European. The position still remains. We still possess a "White Australia," we are still comparatively free from those infectious diseases so prevalent and so devastating in other tropical countries, and we are still conducting with success a mass experiment in European settlement of a tropical country. Many pioneer attempts have been made to assess the progress of this experiment, and the effects of this settlement upon the white race. These assessments are very valuable indeed and provide information with which to compare later information. They suffered, however, from two factors beyond the control of these able investigators—lack of co-ordination one with the other, and absence of much valuable information available to-day from other sources. We are now in a much better position to take up the investigations where these workers were compelled to lay them down. Through the generosity and foresightedness of the Government, Queensland has become possessed of a Medical School of its own, which in addition to training medical students and imparting to them a special interest in tropical medicine, has taken unto itself the keenest interest

in the medical and allied human problems peculiar to the tropics. Organization of a large new undertaking is exacting and time-consuming, but already investigations have commenced and interesting considerations are emerging. From time to time in these pages, reference will be made to the progress of this work and hints given of what this work may mean for the average man in the Queensland tropics. As in the erection of a building, the preliminary work of research is of a mysterious character to those not conversant with the art, and little visible progress is made. Nevertheless, the foundations are the most important part and the more important the larger the subsequent edifice. There is a popular belief that professors, and indeed all University people, are peculiar persons given to burying their noses in abstruse problems out of touch with the realities of life, and to this belief is often attached an appeal to let the "practical" man decide what is to be done. The modern University in no way supports this conception, and to those who know the Queensland University and its courage in appointing youth to recent vacancies, such ideas are ludicrous. Mutual co-operation is the only path by which any State can be led to prosperity, and no group of people are more cognisant of this than the University Staff. National prosperity can be obtained only by national effort, and in this scheme all men must play their part.

Long-range success can be achieved only by long-range planning, and planning can go on intelligently only when adequate facts are available. These facts must cover every conceivable range of the problem, and if they are not available steps must be taken to make them available. Unfortunately, nature will seldom tolerate being overwhelmed with questions, but much prefers to be asked them one at a time in orderly sequence. There are two disadvantages in this, firstly that time and extensive personnel are required for this method, and secondly, separate answers when obtained, have to be fitted together again to make them relevant to the wide problem, a process by no means simple. Unfortunately, again, men are apt to lose patience with nature and discourse at length about her on the basis of very little evidence. The valuable contributions made by earlier investigators of tropical settlement in general and of Queensland's problems in particular suffered very much from hasty generalizations made on the basis of incomplete evidence. It is characteristic of scientific history that most observations have been quite correct, but that interpretations have been so ofter at fault. There can be no doubt that what the earlier workers reported was quite correct, but there can also be little doubt that a lot of the theory built up on that evidence—by no means at the hands of these workers alone—has never been verified. We must realize this, and recognise that we must return once more to *facts* and refuse to accept theory until it has been well tested, and then only to accept it until a better structure can be devised. All this may seem very airy and away from practical application, but I shall, in succeeding articles, frequently have cause to point out faults or weaknesses in present conceptions, and plead for a non-commital attitude until facts are forthcoming.

Granted a healthy doubt in unsubstantiated theories, how are we going to set about collecting the facts? The problem is so wide, and so inextricably mingled are the medical, physiological, economic and social factors that it would be a bold man who would categorically state that such and such is the only plan. I have had the opportunity of studying the problem fairly closely, and to me certain features stand out in

relief, but to others viewing the terrain from a different angle, other features would no doubt be prominent. For this reason I would, in somewhat Hibernian fashion, put as the first point in my plan that several highly competent investigators with different outlooks should co-operate in the formulation of a plan. My own particular interests would for their part then pass to considering just what the effect of hot climates upon an unacclimatised man are, in order to provide a basis from which to work. The next point would be to compare with this the effect of similar climates upon fully acclimatised persons. Having establised both ends as it were, of this mysterious process of acclimatisation, one could investigate its nature with a little more confidence. Once this process was "taped," one should be able to give rational advice about encouraging and hastening it without involving the calamities that are at present liable to occur. All of this sounds fairly simple and straightforward, but nothing is so elusive as facts, and, in any case, before we start, what is a tropical climate, what are its important factors and how do they act? The next few articles will be devoted to examining just these facts which we so often take for granted, but which are really the whole cause of our trouble.

[TO BE CONTINUED.]

WHEN OVERLANDERS MADE HISTORY—GREAT DROVING FEATS RECALLED.

Of the greatest droving feats in Australian history, one is that which was effected by C. and W. Macdonald, of Clifford's Creek, Goulburn, New South Wales. Starting from The Junction, Tuena, with just over 1,000 head of cattle and 100 horses, to form Fossil Downs Station in partnership with the MacKenzie brothers, in Western Australia, and further supplemented by TYI cattle from Tininburra Station, Queensland, they arrived at their destination after having been three years on the road.

Only 13 horses of the 100 survived the trip, though most of the cattle arrived safely, and their brand, the Z/5, is still used by descendants of the MacKenzie family in New South Wales, as well as the Fossil Downs Station. One of the brothers who made the trip was later speared by blacks, and the other contracted pneumonia and died while returning on holiday to Goulburn.

The drover with consistently low loss tallies never wants for a job, and one of the best performances of this kind was put up by Jerry Conolly, a well-known Centralian drover, who started from the Northern Territory with 1,224 bullocks. After covering nearly 2,000 miles over notoriously bad country, he delivered the herd at Muswellbrook, New South Wales, only four short. These had been drowned in crossing a flooded river, and the rest were in first-class condition. The magnitude of this feat can be gauged when it is realised that trips such as this took many months, and sometimes years, to complete.

But in the droving history of Australia the performance which stands out from all others is the early trans-Commonwealth drive of Mick Durack and Tom Kilfoyle. Leaving Mount Marlow Station, Queensland, with 2,000 cows in 1883, they covered 2,500 miles, and arrived at the Ord River, Western Australia, two and a-half years later, in 1885.

Travelling over practically unknown country, menaced for the greater part of the journey by hostile blacks, stricken down repeatedly by fever, and encountering such troubles as long dry spells without water, hungry crocodiles waiting for them at every river crossing, they arrived with practically the whole of their herd intact. Their arrival has been recorded on a huge baobab tree on the bank of the Ord River, about 120 miles inland from Wyndham, and it has been preserved as a memorial to the feat.—Kingsley Temple, in "The Australasian."

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov. 1936.	Nov. 1935.		Nov.	No. of Years' Records.	Nov. 1936.	Nov. 1935.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	2·42	35	0·37	1·25	Clermont	2·04	65	0·16	Nil
Cairns	3·95	54	0·94	2·91	Gindie	2·17	37	..	0·04
Cardwell	4·19	64	2·50	4·35	Springsure	2·20	67	0·10	0·05
Cooktown	2·53	60	1·91	0·38					
Herberton	2·62	50	0·36	1·80					
Ingham	3·87	44	0·99	1·04					
Innisfail	6·33	55	1·47	4·64					
Mossman Mill ..	4·35	23	4·28	3·88	*Darling Downs.*				
Townsville	1·88	65	2·48	0·37					
Central Coast.					Dalby	2·79	66	0·78	0·58
					Emu Vale	2·71	40	1·67	0·26
Ayr	1·77	49	0·12	0·16	Hermitage	2·63	30	..	0·09
Bowen	1·29	65	Nil	0·37	Jimbour	2·59	48	0·78	0·20
Charters Towers ..	1·44	54	0·82	0·04	Miles	2·63	51	1·36	0·37
Mackay	3·12	65	0·38	0·81	Stanthorpe	2·73	63	1·24	0·70
Proserpine	2·95	33	0·29	0·81	Toowoomba ..	3·33	64	1·59	0·39
St. Lawrence ..	2·42	65	1·04	0·15	Warwick	2·63	71	1·66	0·17
South Coast.									
					Maranoa.				
Biggenden	2·82	37	0·86	Nil					
Bundaberg	2·70	53	3·34	0·15	Roma	2·19	62	1·50	0·56
Brisbane	3·78	84	1·35	1·26					
Caboolture	3·53	49	2·41	0·48					
Childers	2·79	41	1·74	Nil					
Crohamhurst ..	4·91	43	2·60	1·76					
Esk	3·26	49	2·27	1·61					
Gayndah	2·97	65	0·99	0·05					
Gympie	3·26	66	2·25	0·18	*State Farms, &c.*				
Kilkivan	2·58	57	2·50	0·10					
Maryborough ..	3·23	65	2·09	1·52	Bungeworgorai ..	2·53	22	1·03	Nil
Nambour	4·06	40	2·48	0·95	Gatton College ..	2·95	37	3·00	0·31
Nanango	2·76	54	1·81	0·16	Kairi	2·42	22	..	..
Rockhampton ..	2·43	65	2·46	0·07	Mackay Sugar Experiment Station	2·86	39	0·35	0·79
Woodford	3·28	49	2·05	0·71					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure at 9 a.m. Means	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·87	88	75	91	20	69	10	191	3
Herberton	..	84	60	93	16	52	10	36	3
Rockhampton	29·96	90	68	99	10	62	12	246	7
Brisbane	29·99	84	65	95	21	55	2	135	4
Darling Downs.									
Dalby	29·95	89	60	102	9	48	13	78	6
Stanthorpe	..	82	52	96	9	39	2	124	4
Toowoomba	..	83	56	96	7	43	2	159	7
Mid-Interior.									
Georgetown	29·87	98	72	105	19	58	1	86	4
Longreach	29·90	97	66	107	20	53	12	29	5
Mitchell	29·93	90	60	104	8	42	2	97	6
Western									
Burketown	29·86	97	74	105	18	65	24	33	3
Boulia	29·88	98	68	108	8	56	2	120	3
Thargomindah	29·92	94	65	109	7	53	12	Nil	..

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January, 1937.		February, 1937.		Jan., 1937.	Feb., 1937.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					p.m.	p.m.
1	5·0	6·50	5·26	6·47	9·32	9·49
2	5·1	6·50	5·26	6·46	10·21	10·24
3	5·2	6·50	5·27	6·46	10·45	11·1
4	5·3	6·51	5·27	6·45	11·16	11·42
5	5·4	6·51	5·28	6·44	11·51	..
						a.m.
6	5·5	6·51	5·29	6·44	..	12·27
					a.m.	
7	5·6	6·52	5·29	6·43	12·27	1·15
8	5·7	6·52	5·30	6·42	1·2	2·11
9	5·7	6·52	5·31	6·42	1·47	3·8
10	5·8	6·52	5·31	6·41	2·35	4·10
11	5·9	6·51	5·32	6·40	3·28	5·10
12	5·9	6·51	5·33	6·39	4·24	6·12
13	5·10	6·51	5·33	6·39	5·28	7·14
14	5·10	6·51	5·34	6·38	6·21	8·14
15	5·11	6·51	5·35	6·37	7·21	9·18
16	5·12	6 50	5·35	6·37	8·22	10·21
17	5·13	6·50	5·36	6·36	9·21	11·32
						p.m.
18	5·14	6·50	5 37	6·35	10·32	12·36
19	5·14	6·50	5·37	6·34	11·26	1·37
20	5·15	6·50	5·38	6·33	12·29	2·30
21	5·16	6·49	5·39	6·32	1·35	3·21
22	5·17	6·49	5·39	6·31	2·40	4·12
23	5·18	6·49	5·40	6·30	3·42	4·54
24	5·19	6·49	5·41	6·29	4·40	5·33
25	5·19	6·48	5·42	6·28	5·34	6·8
26	5·20	6·48	5·43	6·27	6·17	6·41
27	5·21	6·48	5·44	6·26	6·59	7·14
28	5·22	6·48	5·45	6·25	7·36	7.47
29	5·23	6·47			8·10	
30	5·24	6·47			8·44	
31	5·25	6·47			9·18	

Phases of the Moon, Occultations, &c.

4 Jan.	☽	Last Quarter	12 22	a.m.
13 „	●	New Moon	2 47	a.m.
20 „	☾	First Quarter	6 2	a.m.
27 „	○	Full Moon	3 15	a.m.

Apogee, 7th January, at 1.0 a.m.
Perigee, 22nd January, at 1.0 p.m.

On the 14th Mercury will be in inferior conjunction with the Sun (in a line between the Earth and Sun) and on that occasion at a distance of more than 55,000,000 miles from the Earth.

On the 14th also Uranus will become stationary, which can never be an interesting phenomenon to the ordinary observer, since Uranus can only on rare occasions be seen without good optical aid by those with excellent eyesight; moreover, it is among very small stars in the south-west corner of Leo.

On the 17th Venus will be 6 deg. south of the Moon at 1 a.m., and Saturn on the same day 8 deg. south of it at 2 p.m. They will be above the horizon within 3 hours after sunset.

Venus, which since the middle of November has passed through the whole of Capricornus into Aquarius, will there on 24th January meet the distant and slowly moving Saturn, which has been in that constellation since January last. It will be seen as a fairly close conjunction after sunset, since they will be separated by about 2 deg. at moontime.

The Southern Cross, which was absent from the evening sky at Christmas time, will come into view at Warwick about 9 p.m. and at Brisbane not until 11 p.m., low down in the S.S.E. at the beginning of January.

Mercury rises at 6.27 a.m., 1 hour 27 minutes after the Sun, and sets at 8.9 p.m., 1 hour 19 minutes after it, on the 1st; on the 15th it rises at 5.15 a.m., 4 minutes after the Sun, and sets at 6.43 p.m., 8 minutes before it.

Venus rises at 8.21 a.m., 3 hours 21 minutes after the Sun, and sets at 9.54 p.m., 3 hours 4 minutes after it, on the 1st; on the 15th it rises at 8.41 a.m., 3 hours 30 minutes after the Sun, and sets at 9.27 p.m., 2 hours 36 minutes after it.

Mars rises at 12.30 a.m. and sets at 1.20 p.m. on the 1st; on the 15th it rises at 11.59 p.m. and sets at 12.59 a.m.

Jupiter rises at 4.45 a.m. and sets at 6.35 p.m. on the 1st; on the 15th it rises at 4.6 a.m. and sets at 5.52 p.m.

Saturn rises at 10.8 a.m. and sets at 11.48 p.m. on the 1st; on the 15th it rises at 9.23 a.m. and sets at 9.5 p.m.

3 Feb.	☽	Last Quarter	10 4	p.m.
11 „	●	New Moon	5 34	p.m.
18 „	☾	First Quarter	1 49	p.m.
25 „	○	Full Moon	5 43	p.m.

Apogee, 3rd February, at 10 p.m.
Perigee, 16th February, at 6 a.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.