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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Agricultural Situation in Queensland.

IN the course of a general survey of the agricultural position in Queensland in the Annual Report of the Department of Agriculture and Stock, the Under Secretary, Mr. E. Graham, says that the Queensland farmer now possesses much greater bargaining power than he had formerly through centralised selling, which has followed the establishment of commodity boards and the consolidation of existing co-operative associations on a commodity basis.

While the fundamentals of efficient production are not being neglected, the importance of finding solutions for economic and social problems affecting the man on the land is recognised, not only by leaders in the industry but by others who are more or less concerned directly in the improvement of agriculture in this country. It is plain that constructive effort must be directed towards the attainment of a true balance in the industry, and to accomplish this it must cover the whole range of capitalisation, production, marketing, distribution, and consumption. The Department is giving increased attention to economic investigation, and some results of this work have been circulated widely, to the general advantage of those engaged in primary enterprise.

A fuller understanding or appreciation of country life, its special problems and relative matters, is evident among farmers, and they are, through their organisations, developing a definite sense of direction towards agricultural betterment.

Both on the production and marketing sides there is a greater tendency to get right down to business, to work along proven lines and make full use of present means, improving them where possible, and extending methods that have stood practical test.

The Farmer Must make his Own Standards.

THE variation in production on different holdings and in different districts suggests the opportunities that are in the hands of the farmers themselves of modernising methods of cultivation and improving the quality of crops, thus lessening costs. Individual action is quite as important as co-operative action in the establishment of high standards of production, and in the regulation of output, whether in respect of quality or volume, to comply with market demands. However efficient public or community services, commodity boards, or co-operative enterprises may be, the farmer's business success, if climatic and other hazards beyond control are eliminated, is in his own hands. He must primarily make his own standards of living for himself. Inefficiency in farm practice, or lessened productivity, must react inevitably to his disadvantage against any measure designed to extend the radius of his opportunity.

With the return of good seasons the cattle industry is moving once more towards prosperity.

Dairying in Queensland.

DAIRYING is in a relatively favourable position, and dairy farmers are realising, in the main, that the production of high quality milk and increased quantity of butter-fat from fewer cows at less cost is the quickest way of increasing the net farm income. Our average yearly output of butter-fat per cow is far too low, and it is apparent that many dairy farmers are not making any substantial profit on their business.

These facts were confirmed by a Departmental investigation into the economics of the industry, which was continued in the course of the year. Some of the results have been published, and further particulars will be circulated from time to time.

In many districts in Queensland dairying may be carried on under the congenial conditions that are conducive to high quality production, and it is reasonable to expect that the average yield of milk per cow in Queensland should be greater than it actually is. It is realised that our averages are based on the production of all herds registered, without any regard to the fact that some herds are milked only during the period of the year in which the natural pastures are abundant. This practice obviously lowers the average production, as computed for statistical purposes, of our full-time dairy herds.

The records of the Department, however, indicate a very wide variation in the production of butter fat per cow in the herds tested (and it may be assumed that these herds are not below the average in output), and there is, therefore, considerable room for herd improvement in the State, a phase of the dairying industry to which the Department is giving full attention.

Every opportunity is taken of impressing the dairyman with the necessity of making adequate provision for the storage of fodder. It is recognised that, for various reasons, fodder conservation is not always practicable, and those who condemn the improvidence of the dairy farmer often fail to appreciate these circumstances. After making due allowance, however, for the difficulties facing some producers, the practice of providing ample stores of fodder is not as general as it should be, and it is a matter that calls for the serious consideration of every dairy farmer who aims to control a prosperous enterprise.

The Board of Agriculture.

IN the course of the year the Board of Agriculture was constituted as a co-ordinating agency for the prevention of overlapping in scientific and other investigations designed to benefit agriculture in Queensland. A survey of the investigational work now proceeding has been made with a view to determining what overlapping, if any, exists, the measures to be adopted to secure effective co-ordination and co-operation, and other relevant matters. A register of agricultural research, experimental and demonstration work, has also been compiled for the information of the Board in formulating its plans.

Banana Experiment Stations.

UNDER the provisions of "*The Primary Produce Experiment Stations Act of* 1927" it has been decided to establish two banana experiment stations, one at Kin Kin East, near Gympie, and the other at Pawngilly, on the Russell River. They will, it is considered, meet the present requirements of the banana industry.

The main object of these stations is to enable the Department to carry out various forms of necessary research work, and to secure co-ordination among all concerned in the progress of primary industry.

These stations will be similar to the Sugar Experiment Stations already established in their operation and the character and quality of their service to the farming community. The approximate annual value of the banana industry is £1,000,000 sterling; and it is ordinarily a profitable enterprise capable of considerable improvement and much greater expansion. The upkeep of the stations will be a charge in the form of a levy on the industry which they benefit. The fund so accumulated will be subsidised. The principle is accepted that where growers are interested financially in a scheme they will take a more active interest in contributing to its success, and this will, no doubt, ensure complete co-operation between the Department and the farmers concerned.

Much useful work has already been performed in connection with the banana industry, and those engaged in it have, as a rule, applied themselves very closely to the problems with which it is beset, achieving some considerable results, but obviously much yet remains to be done.

There are large areas in the State suited to the cultivation of the fruit, and the districts in which the industry has been established are the main sources of supply for the Commonwealth. Experiments with bananas have been carried out in the North with a view to developing types suitable for the conditions in that part of the State; and the satisfactory results obtained have stimulated an extension of banana growing on our Northern littoral. There is room for much greater development, and this fact is recognised by, and is receiving the attention of, officers of the Fruit Branch.

Agricultural Experiment and Research.

FARMERS are appreciating more the value of experiment and research, for which such stations provide the facilities and the service, and are realising that this work affords the only sure means by which they can travel with any degree of satisfaction along the rough and often disappointing road of hard experience.

The establishment of boys' and girls' pig and poultry clubs, in co-operation with the Department of Public Instruction, also claimed attention in the course of the year. This movement has been marked by much enthusiasm among club members and their parents and teachers, and already it has produced some practical results. It expresses in a very useful way the advantage of keeping the young people on the farm in touch with the best in rural life and of developing natural qualities of leadership, responsibility, good citizenship, and community service.

Agriculture generally throughout the State is showing evidence of healthy progress, and the reports of the several branches of the Department will serve to indicate the systematic development of agriculture and stock-raising in Queensland.

The prospects for the coming year are promising. Winter rains have been general over the agricultural districts, and a good germination has been secured for plantings of root and fodder crops. Grass is plentiful in the coastal and nearer inland areas.

A Healthy Virile Race in the Tropical North.

WRITING to the British Medical Journal, London, in reply to a published letter by Dr. Andrew Balfour, Sir James Barrett, of Melbourne, gives some information regarding tropical Queensland. He quotes figures of the Commonwealth Statistician (Mr. C. Wickens) showing that in 1921 the Italian-born population within the tropics represented 8.37 a 1,000, and south of the tropics 0.56 of the total population.

"It should be remembered," he adds, "that the State is divided into tropical and non-tropical Queensland. The distinction is arbitrary in one sense, as it is based on the Tropic of Capricorn, whereas the whole of Queensland is north of the 29th parallel. From Mr. Wickens's statement it will be seen that the answer to Dr. Balfour's suggestion that the white race in tropical Queensland is of Italian origin is that it is not correct. A healthy white race which is not Italian has been reared in tropical Queensland for several generations. The infantile and the adult death rates are lower than in almost any other place in the world, and the most thorough physiological investigations have shown no deterioration which can be measured by the means at our disposal. Towards the end of his letter Dr. Balfour refers to the low-lying littoral of tropical Queensland. Might I suggest that whether a country is low-lying or hilly tells us very little? It is the accurate record of the wet-bulb temperature that indicates the stress to which human beings are subjected. What may lie in the future I do not know, but I can definitely state that in tropical Queensland a vigorous white race, which contains only a small percentage of Italians, is being reared, and shows no signs of deterioration. In fact, the suggestion that there is deterioration, when made to some of the residents in tropical Queensland, is received with ridicule. Those who saw the soldiers Queensland sent to the front during the Great War will understand the incredulity."

Bureau of Sugar Experiment Stations.

OUTBREAK OF "WIREWORMS."

The Assistant Entomologist (Mr. A. N. Burns) stationed at Mackay has submitted the following report for the month ended 12th October, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Severe Occurrence of Wireworms (*Elaterid* sp.) at Te Kowai.

During the latter part of last month attention was drawn to a serious outbreak of "wireworm" injury to young plant cane (Q. 813) at Te Kowai. A thorough inspection of the affected cane was accordingly made, and of the whole of the block, which comprised 6½ acres, fully 4 acres were completely destroyed. The field for the most part was fairly level, but the damage was greatest in the lowest and most poorly-drained portions. The soil was uniform greyish-brown sandy loam, and was very well worked, despite the very dry weather, and it contained a fair supply of moisture at the depth of the cane sets.

In places where the damage was most severe, about one set only in every dozen had survived and grown, some others had sent out shoots a few inches long, but they had been eaten below ground level, and in other cases the eyes had been destroyed as they were germinating. In many instances the wireworms had left the dead sets and moved along to others, and, in almost every case one wireworm only was found at each set. The plant itself was not bored into at the ends, nor were the roots eaten; the point of entry by the wireworm was invariably through a shoot or eye. In the case of the former, the interior was generally tunnelled out in the underground portion. The set or plant in many cases was injured only near the point of attachment of eyes or shoots, where the wireworms had "ringnecked" round it, following the junction of the internode nearest the attacked eye or shoot.

An adjoining block of H.Q. 426 had occasional sets destroyed here and there, but the injury was negligible, and, being a good "strike," this block showed up in marked contrast to the affected cane alongside.

The wireworms were identified as being larvæ of a species of the true *Elaterid* or "click" beetle type, and were of the flattened form of larva. They much resembled small larvæ of the large predatory Elaterid, *Agrypnus mastersi*, Pase. In length they measured approximately ¾ inch; the body is of a pale yellowish-cream colour, broadened laterally, giving a slightly flattened appearance; head dark reddish-brown; anal segment bearing a depressed plate, pale-brown.

Specimens were brought back to the laboratory, where they are being bred through to the beetle stage. They are voracious feeders, and are able to move very rapidly through the soil.

Prior to planting the cane in the above field, a crop of Mauritius Beans was grown on the land, and ploughed in. Owing, however, to the excessively wet weather of last February and March, the grower stated that the crop of beans was not nearly so heavy as he had anticipated. Had they been heavy when ploughed in, the subsequent damage from these wireworms might have been reduced a good deal. The ploughing-in of a leguminous crop has been recommended as a help in preventing outbreaks of these pests; the amount of organic matter added to the ground being food for the wireworms, and practically sufficient to sustain them without attacking the growing cane. The above crop of beans being poor might possibly have partially been the cause of so severe an outbreak, especially when combined with the abnormally dry weather at present being experienced, the wireworms having exhausted most of the organic matter in the soil of the affected area, and also seeking moisture.

Frenchi Cane Grubs Pupating (*Lepidiota frenchi* Blkb.).

Grubs of this beetle are now mostly all transformed into pupæ, the majority of those breeding at the laboratory having undergone the change a little over a week ago. The actual period spent in the pupa is comparatively brief when compared with the time spent by the grub in its pupal cell before actually pupating. This latter period has, in many instances, lasted as long as four months, whereas the pupal period occupies normally slightly less than a month. Now that there has been an opportunity of working out the larval stages of this cane beetle in the Mackay district, the two-year life cycle may be divided up as follows:—Eggs deposited by beetles usually about December. Between two and three weeks elapse before the young grubs emerge in the first stage. The time occupied in this instar is variable,

but is usually from about January till May; some grubs, however, were still in the first stage late in June. Second-stage grubs occur from about July to October; at the time of writing some grubs are still to be found in this stage. The periods of time spent in the different stages overlap a good deal. The third and final grub stage is generally reached about November, from when the grubs continue to feed until May. They then burrow deeper down into the soil and form their pupal cells, the remaining time before emerging as beetles being spent as abovementioned in the prepupal and pupal stages.

Greyback Grubs also Pupating (*Lepidoderma albohirtum* Waterh.).

Third-stage grubs of this notorious beetle are also at present undergoing the change into pupæ, and, in the majority of cases, about two weeks later than those of *L. frenchi.* This, no doubt, accounts for the latter species occurring on the wing in the Mackay district slightly earlier than the greyback, which, in the Cairns and other far-northern districts, usually appears just in advance of *L. frenchi.*

All the stages from the egg up to the pupa of this beetle have now been bred at the laboratory, and the following data regarding the times of occurrence of each stage have been gathered. Eggs laid by beetles in December and early January (in ordinary seasons), grubs in the first stage from January to about the middle of March, in the second stage from late February till April, and in the third stage from April till October. Not nearly so long a time is spent by *albohirtum* grubs in the prepupal stage as is the case with *L. frenchi.* Specimens now pupating were active and feeding in July and even August, which makes the "resting" period before changing into pupæ in the pupal cells about two months—just half as long as that of *L. frenchi.* The pupal stage occupies approximately four weeks, and the newly-emerged beetle remains in its cell for several weeks, or even months, if the weather be very dry, before finally emerging from the soil. The emergence from the ground of the beetles is controlled by the advent of the first soaking summer rains; the beetles generally appearing a day or two after these. Should a prolonged dry spell occur, however, emergence is retarded, and very frequently numbers of beetles perish in their cells, being unable to escape owing to the hardness of the ground.

Dasygnathus Beetles now in Cells (*Dasygnathus australis-dejeani* Blkb.).

Beetles of this species are now present in numbers in their cells, doubtless awaiting the first early rains to enable them to escape from the soil. A large number of third-stage grubs were collected during last March and April from canefields; most of these pupated about the middle of August, making the duration of the third-grub stage about five months. On an average from six weeks to two months is spent in the prepupal state, and some three weeks only in the actual pupa. Many of the beetles bred at the laboratory have quite "hardened," and no doubt an emergence of this species will take place immediately following the first rains. The weather during the past five months has been exceptionally dry, and, in consequence, the ground in many places has become extremely dry and hard. Abnormally dry conditions such as these would probably tend to slightly lengthen the period of development of pupæ in the soil, so that it is probable if rain had fallen recently there would have been a primary emergence of this beetle.

CANE PESTS AND DISEASES.

Mr. G. Bates, Assistant to Entomologist at the Sugar Experiment Station, Bundaberg, reports for the period July-August, 1928:—

Effect of Sorghum on Cane Grubs.

In the course of investigations the theory has often been advanced by growers that the ploughing-in of young sorghum will kill any grubs that may happen to be in the soil. This impression, no doubt, originated in the fact that sorghum, when young, contains hydrocyanic acid. This is a deadly poison and is frequently responsible for deaths among cattle that have chanced to eat a small quantity of young sorghum, but the idea that it will kill grubs is quite erroneous, and has been clearly demonstrated in both the laboratory and field.

Mr. E. Jarvis, Entomologist of the Bureau, carried out laboratory experiments in this direction in 1921 regarding the effect of poisonous plants on cane grubs, and among other things young sorghum was given a trial. Results showed that grubs "were not injuriously affected, but, on the contrary, appeared plumper and more active."

Regarding field tests, opportunity has been afforded us to witness a trial carried out by a grower in this district on land subject to grub attack. Desirous of planting a crop for green manure, and having heard of instances where the ploughing-in of young sorghum has been credited with killing grubs, he decided to conduct a trial, thinking that perhaps the southern grubs being of a different species from those of North Queensland, the results may be somewhat different. It was therefore arranged that, when planting, a strip would be left bare so as to provide a check plot.

This block was ploughed in December, and although rather old the sorghum was still in a condition that would kill stock if they chanced to eat it. This land was ploughed again in February and April, and on both occasions young sorghum was turned under, this being a volunteer crop, the result of wet weather preventing the stools being entirely killed during previous cultural operations. The land was given further cultivation during August, and on each occasion when ploughing, grubs were found to be numerous and quite healthy.

This field test merely confirms the laboratory experiments—that ploughing-in young sorghum will not exercise any control over cane grubs.

Rats.

Reports of damage by rats in canefields in this district have recently been brought under the notice of this Experiment Station, damage occurring on some low-lying country close to the river.

The damage caused by rats is familiar to most growers, and is often of a serious nature. Various poisons have been recommended for the control of these pests, such as strychnine, phosphorus, arsenic oxide, and barium carbonate. In Hawaii, where rats were doing extensive damage, the best results were obtained from the use of barium carbonate biscuits, and good results have also been obtained from this poison in North Queensland.

In one instance which came under our notice, both Q. 813 and H.Q. 285 were being damaged, and as the loss was appreciable and likely to become worse, it was recommended to poison with barium carbonate biscuits. This was done, and a fortnight after spreading the bait an inspection showed very little fresh damage, the old damage being recognised by the eaten portions being dry and red, or else dried up altogether and brown. This field was examined a second time three weeks after spreading the poison, and in only one part of the field was any freshly eaten cane found. This consisted of only three sticks, located where the damage was worst. Very little cane was freshly damaged compared with the amount seen when spreading the poison. This result is extremely satisfactory, and any grower who is troubled by rats is advised to give this method a trial.

The following formula was the one used, and is identical with that used by the Mulgrave mill, to whom we are indebted for particulars concerning their use of this poison against rats:—

Barium carbonate	.. ..	10¼ lb.
Flour	.. ..	21¼ lb.
Pollard	.. ..	4 lb.
Tallow	.. ..	6 lb.
Salt	.. ..	9½ oz.
Water	.. ..	5½ pints
Aniseed oil	.. ..	¼ oz.

Mix the barium carbonate, flour, and pollard dry. Melt the tallow and mix in roughly. Dissolve the salt in the water and add slowly, making the whole into a stiff dough. Roll out to a quarter of an inch thick, cut up into pieces ½ inch by ½ inch, and bake until dry. Then mix the aniseed oil with an equal quantity of water and spray over the biscuits. The bait is then ready for use. It is advisable to handle the biscuits as little as possible, and to rub oil of aniseed on the hands when putting out the poison. This mixture is both cheap and effective, and has the further advantage of not being highly poisonous to stock, fowls, dogs, and humans, although only a small quantity is required to kill a rat. Barium carbonate can be purchased for 1s. per lb., and the other ingredients are also inexpensive. Made up in this manner, one-third of a biscuit will kill a rat; so that the quantity to spread per acre will naturally depend on the number of rats in the field. Scatter six biscuits every 5 yards along headlands, edges of creeks, &c., where rats are harbouring, and walk through the cane along every twentieth row scattering bait at the rate of six every 10 yards. This is only a guide, as rats may be damaging cane in only one corner of the block; so that no hard-and-fast rule can be laid down, and the quantity put out must be left more or less to the discretion of the person using the poison.

Furthermore, for the efficient control of rats, places which harbour them, such as dirty headlands, creeks, and gullies, should be cleaned up and not allowed to remain as a breeding ground.

RESISTANCE OF VARIETIES OF SUGAR CANE TO DISEASE.

Mr. A. F. Bell, who is in charge of the pathological investigations of the Bureau of Sugar Experiment Stations, states that after consultation with the Pathologist to the Colonial Sugar Refining Company in New South Wales (Mr. D. S. North) it was decided to use the following four classes to describe the relative resistance of any cane variety to disease:—

A. *Commercially Immune.*

This class includes those varieties in which the disease has never, or only very rarely, been observed, although such varieties have been exposed to sources of infection over a period of years.

B. *Highly Resistant.*

Varieties in this class can be grown in the presence of the disease without any precautions.

C. *Moderately Resistant.*

Varieties in this class can be grown in the presence of the disease, provided that suitable precautions are taken.

D. *Susceptibility.*

It is unsafe to grow varieties of this class in the presence or vicinity of the disease, in spite of the exercise of all reasonable precautions.

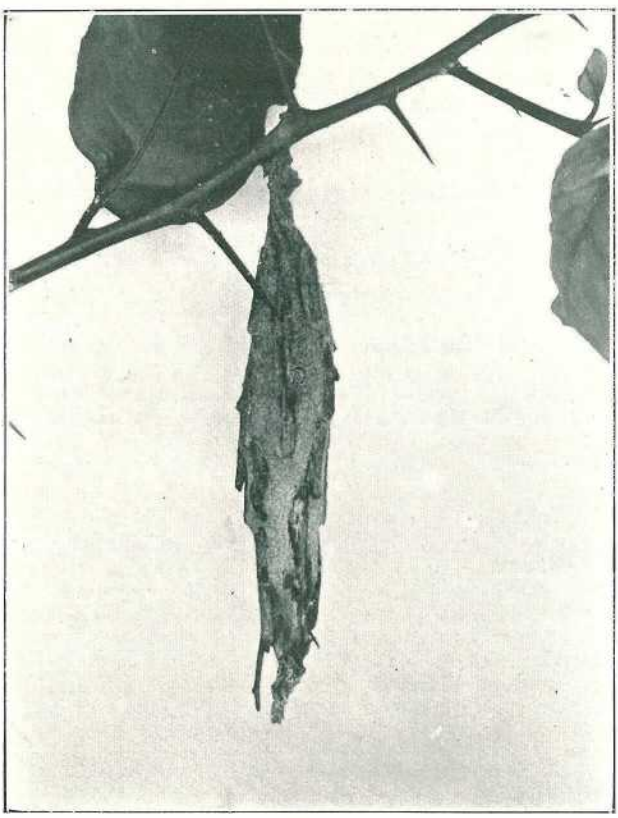


PLATE 113.—THE CASE OF THE "BAG WORM"—A MINOR SUGAR-CANE PEST.

DIVISION OF PATHOLOGY.

The Director of the Bureau of Sugar Experiment Stations has received the following report upon the work of the Division of Pathology during the month of August, from Mr. A. F. Bell, Pathologist:—

Cane in Private Gardens.

Arrangements have been made to grow a number of varieties of Queensland cane in isolation in private gardens in Brisbane. One variety will be planted in each garden, and these will be inspected periodically, and if found to be healthy will supply a nucleus of clean seed for the proposed variety garden.

Distribution of Gumming Resistant Canes.

Under the supervision of this division, small parcels of S.C. 12/4 and B.H. 10/12 have been sent to selected parties. The recipients of the canes have been asked to grow them in isolation in order to propagate disease-free stocks.

Gumming Resistant Trials.

I spent some two weeks in the Bundaberg district, inspecting farms in order to get disease-free seed for the purpose of laying out a gumming resistance trial at the Bundaberg Experiment Station. The following varieties have been included:—Oramboo, Nanemo, Korpi, B.H. 10/12, S.C. 12/4 P.O.J. 2714, Q. 813, Q. 812 A, Uba, Badila, M. 55, Co. 210, Co. 213, Co. 227, Black Innis, 1900 S., D. 1135, and Assam Red. Two plots of two rows of the first four varieties, and four plots of the other varieties have been planted out, the standards being 1900 S., and D. 1135, each variety being in contact with both standards.

Yield Trial.

A yield trial of the gumming resistant canes Co. 210, Co. 213, and Co. 227, was laid out with Q. 813 as standards, there being four repetitions of each variety.

Meetings.

Three meetings of farmers were addressed by me while in the Bundaberg district, and particular emphasis was placed on the need for isolation nurseries. I also met the district executive and discussed this matter; they have undertaken to circularise farmers with a view to finding suitable locations for clean seed nurseries.

Mr. Kelly also addressed a gathering at Mulgrave.

Sectional Chlorosis and Tangle Top.

Sectional chlorosis is very common all over Queensland this year, and particularly so in the Bundaberg area. Several cases were recorded where the collapse of the leaves, following sectional chlorosis, had caused tangle top, and ultimately, in some cases, the death of the cane. An article for publication will be prepared on this subject in the near future.

Applications for Permits to Sell Seed.

A number of applications for permits to sell seed have been received from growers on the Gayndah line. A good deal of inconvenience is caused in making separate visits to these localities, and next year it may be necessary to control the time of application somewhat.

Badila from Wolvi.

The chemist in charge at Bundaberg made arrangements to receive a small crate of Badila from Mr. J. H. Thornton, of Wolvi. This cane will be planted on the Station, and observations made on the time elapsing before it becomes infected with gumming.

Lake Barrine Nursery.

This was inspected on 11th July and 6th August, and no trace of disease found, although the cold weather has been responsible for slow growth, and army worms are proving troublesome.

MOSSMAN DISTRICT.

The district survey was completed by Mr. Kelly on 3rd August. Leaf Scald was found on practically all of the farms inspected, the most commonly infected variety being H.Q. 426. Suggestions were made that an isolation nursery should be started in the Daintree district. Leaf Stripe was seen wherever B. 147 was grown, and was also occasionally seen in D. 1135, Pompey, Q. 813, Badila Seedling, M.Q. 1, Badila, N.G. 24, and M. 55/1182. Scattered cases of Red Rot were noted. Spindle Top was noted, chiefly in Badila, and in most instances was directly traceable to injury by pests.

GORDONVALE DISTRICT.

The inspection of this district was completed by Mr. Kelly on 25th August, and the following is a summary of the diseases found:—

Farms inspected	42	Gumming	1
Leaf Scald	42	Spindle Top	28
Leaf Stripe	1	Red Rot	3
Mosaic	4	Rind Fungus	1

Special visits were also made to a number of farms when the source of seed suggested that they might have cane infected with Leaf Stripe or Mosaic.

Canes which had recently been imported from southern districts were also inspected for possible gumming, but were found to be free.

The area in which Mosaic has been found will be reduced from 89 to 50 acres this year.

The H. 109 at Aloomba, in which gumming was found, is dying from this disease in places; this cane and the adjoining Badila are to be ploughed out next month.

Mr. Kelly also reports the successful use of the barium biscuit in combating the ravages of rats.

MARYBOROUGH DISTRICT.

During the month, farms which were expected to be relatively free from diseases were given a final inspection, and a long list of permits granted; these have already been published in suitable channels.

The final figures showing the distribution of disease are as under:—

Place.	Number of Farms Visited.	Mosaic.	Gumming.	Fiji.
Walker's Point	12	2	..	4
Island Plantation	46	14	1	12
Prawl, Dundathu, Pialba Road	11	2	..	1
Mungar, Antigua, Oakhurst, &c.	19	11	..	6
Iindah, Eton Vale	18	10	..	5
Nerada, Tinana, from Bridge	17	8	..	10
Teddington Road	13	2	..	3
The Pocket	5	1	2	4
Queen Street	6	1	..	6
Granville	9	2	..	6
Magnolia	23	15	..	13
Gympie Road	17	3	..	3
Totals	196	71	3	73

NAMBOUR DISTRICT.

During the inspection of this district, fifty-seven farms were visited, and practically all found to be infested with gumming, twenty-five with Mosaic, and four with Fiji. The percentage of Mosaic is low, averaging less than .5 per cent. on the infected farms, and as farmers are roguing, the position is not serious. The reason for the outbreak of Fiji disease is still a mystery, but the disease is not widespread. The gumming situation is bad, and requires the establishing of nurseries of clean seed in order to control it. Q. 813 is showing practically no trace of gumming and is doing well on the higher river soils, but is not adapted to wet conditions. Badila,

H.Q. 285, N.G. 16, and D. 1135, are rather badly affected. Uba does not appear to be suited to many parts of this district. One farmer (J. Blanche) has a few stools of P.O.J. 2714 which appear to be doing well, although planted in a swampy patch.

Clean Seed for Nambour District.

In response to a request from the Secretary of the Nambour Cane Growers' Association, Mr. Wood was despatched to the Pialba district to make the necessary inspection of farms. The secretary was advised that permits had been issued to the following growers:—Messrs. O. Wendland, R. Wood, O. Moes, Nikenbah; —. Cadell, Kawungan; and J. E. and R. Cormie, Box 10, Pialba.

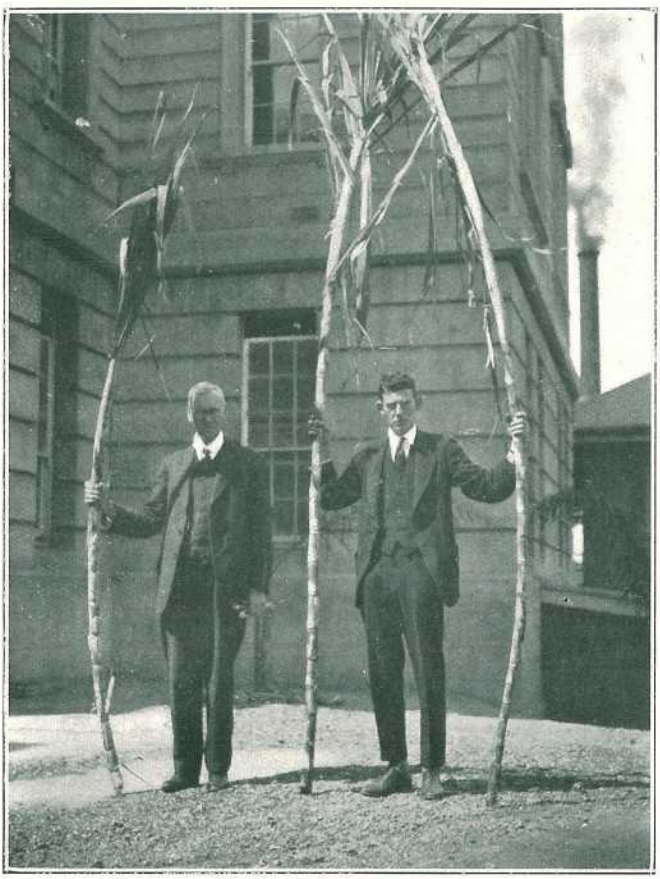


PLATE 114.—SPECIMENS OF S.C. 12 (4) FIRST RATOONS (12 MONTHS OLD) GROWN IN BOTANIC GARDENS FOR SUGAR BUREAU.

In the picture are Mr. H. T. Easterby, Director of the Bureau of Sugar Experiment Stations and Mr. Ferguson Wood of the Bureau Staff.

This cane was received by the Bureau of Sugar Experiment Stations in 1926 and planted in quarantine in the Botanic Gardens.

The photograph is of first ratoons, twelve months old. This cane is highly resistant to the gumming disease in Porto Rico, and was imported for the purpose of trying it in this respect in Queensland.

FIELD REPORTS.

The Northern Field Officer, Mr. A. P. Gibson, reports (13th September, 1928):—

TULLY.

Weather.

The total absence of rain and higher day temperatures during the last two weeks mark the real commencement of summer.

Fifty-three inches of rain were recorded at Ingham to the end of August. Tully, some 58 miles northward, registered 122 inches for the same period; 4.70 inches fell during the month of August.

Progress.

The progress of the industry here has been rapid, and may be judged by the extraordinary growth of the town and district. What was great scrub country a few years ago is now an immense canefield, dotted with homes and intersected with roads or railroads, and has a very modern telephone service.

Soils.

The future wealth of this district depends entirely on sugar—the one big product—and the richness of its soil. Here it is alluvial and varies much in colour, depth, quality, and texture, as most other water-formed soils do. The more fruitful soil is to be found back at various widths from the River Tully and the lesser creeks. It seems unfortunate that some upland country has been bared of its dense vegetation and planted to cane when there is ever so much more superior level land. The soil differs on this rough country; it is coarse grained and reddish in colour; such hilly country is always more costly to cultivate and harvest, and is also responsible for much truck wrecking and a probable rainfall reduction. Some parts of the world are striving to cover with vegetation their bared heights, mainly with the object of increasing the rainfall.

The Crop.

About 99 per cent. of the crop is Badila (N.G. 15); it is expected to yield in the vicinity of 225,000 tons, and is cutting satisfactorily. Upwards of 70 tons per acre have been cut in places. Cane grubs, abnormal tasselling, and much spindle top are factors responsible for a diminished yield in other parts. Despite these reducing mediums, the grand crop summary will probably over-shadow the record by some 20,000 tons.

Harvesting.

Perfect weather conditions prevail for this class of work. Generally speaking, the harvested cane is very dirty. Improper ground cutting was noted.

Milling.

The mill is not so far advanced with its crushing as might be expected owing to time being lost by a strike and an inadequate cane supply at times. Much burnt cane was being milled when the area was inspected—the reported results of many big accidental or mystery cane fires. The dry weather has permitted speedy cane ripening. Last week the mill average was 14.72 per cent. c.c.s.; the seasonal average is slightly under 13 per cent. c.c.s. About 119,000 tons had passed between the crushers to the 15th September; this is over the half-way mark.

Sugar storing has been made compulsory owing to the water-front trouble. Sugar storing means extra handling, which increases the cost of manufacture, and also helps to lower the quality.

Fired Cane.

When cane is fired, its cells perish; they cease functioning, cane weight is reduced, and, if it is not immediately milled, quickly ferments. This, together with improperly harvested cane, considerably reduces the factory efficiency. Farmers should endeavour early in the season to harvest such fields that would serve as handy fire breaks, thus reducing the possibility of big fires. They should also safeguard the areas more by paying greater attention to burning stumps and logs.

Varieties.

Badila is the major cane grown. A small percentage of H.Q. 426 is planted to fill in the gaps, mainly because it is a good germinator and a speedy grower. Some Korpi and 7 R. 428 were noted. A few stools of the Hawaiian cane, H. 109, were seen. Out Syndicate way this looked well; the stems were fully 12 feet long and very straight, standing much higher than the Badila growing round it.

Cultivation.

More land annually is made ploughable by the removal of stumps, roots, and logs. Tractors, fires, and explosives are wonderful helpers in this class of work. Drawing logs together or completely removing them from the field minimises considerably manual labour of the back-breaking type, for it permits the use of animal-drawn light implements, which, when timely used, reduce hoeing and subsequent harvesting rates, and also permit soil sweetening. Some "hurry-up" tilling was noted; several farmers had actually replanted between the old stubbles. Others have ploughed out badly the cane stools cut this year and immediately replanted; some of the old stools were growing again among the new germinating crop, or lay thickly strewn over the surface, which must naturally hinder all subsequent interspace tilling. When these are removed from the field and not ploughed under, soil humus is reduced considerably.

Planting.

Spade holing for planting the first crop is usual. Rag-topped alignment and row-spacing sticks some 12 feet long are placed 5 feet apart and distant 3 or 4 chains. It is advisable to sink cane holes 12 inches by 8 inches by 8 inches and 24 inches by 30 inches apart. Good disease-free seed only should be placed on the loosened bottom soil in the hole and the plant lightly covered. It is common here to see inferior seed placed on the hard pan of too small and shallow a hole; small wonder that many of the Tully canefields have to be renewed before their time. High ground cutting, especially the plant cane, is a tragedy; this, coupled with improper drainage and shallow planting, is responsible for much spindle top and some poor ratoons.

Ploughing.

This at all times should be thorough, and the depth regulated according to the quantity of surface soil. Too deep ploughing in some soils is detrimental rather than beneficial.

Weeds.

Commonly known as blue-top, Commonwealth, and Ink weed quickly grow in profusion immediately after scrub firing; every endeavour should be made to control these before they seed.

Manuring.

It seems obvious that most of the land here will require heavy feeding to keep it fruitful. The price of fertilisers, combined with some low cane prices (the result of surplus sugar), will doubtless have the tendency of putting out of action for cane-growing a percentage of the less fertile land, or some fields growing Badila to-day will be called upon to produce instead a more profitable kind. There is, however, an abundance of surrounding good land, more of which will be wanted in the near future to make good the diminished supply. Owing to the newness and varied nature of the soil, it is difficult to advise with any degree of certainty the most profitable manure to apply until some soil analysis and field trials have been conducted. Nitrogen apparently is wanted. Lime would improve the cohesive ill-drained soils, but its price almost prohibits its use. Humus should be maintained; much surface mould is lost when the fallen scrub is burned. An abundant supply of humus in the soil improves its texture and arrests plant food leaching during periods of excessive wetness.

Yellow cane leaves were noted in isolated patches of new ratoons, apparently due to the lack of plant foods.

Drainage.

An improved system is urgently required on the shallower soils overlying an impervious sub-strata. When the soil becomes super-saturated with water and remains so for any length of time, cane roots perish. The anchorage is reduced and the crop suffers, even falls.

Pests.

The environment is most suitable for the rapid increase of rats. Grubs have been responsible for greater losses than is generally thought. Wallabies and wild pigs are numerous, and have occasioned damage in isolated spots. Army caterpillars have in some fields devoured most of the crop foliage, in some instances, not even leaving the leaf mid-rib. *Pentodon australis* (a black beetle) and larvæ of the tineid moth were found destroying some lesser plant and ratoon shoots. Weevil borers were noted in harvested cane coming from the settlement.

1929 Prospects.

It is yet too early to predict what the ensuing harvest will be. At the moment the stand of cane (save parts) is patchy and lacks a dark-green colour, suggesting that nitrogen is wanted. Its general appearance is less favourable than the present one was at the same time last year.

Unmanured cane in the area seemed to have tasselled most. It is known that manuring and irrigation have arrested arrowing in the territory of Hawaii.

The Northern Field Assistant, Mr. A. P. Gibson, has submitted the following report on the Herbert River Sugar-cane producing area, inspected 14th to 30th August, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

HERBERT.

Weather.

High day temperatures and cool nights have been the rule. The main feature of the month is the scanty rainfall. Earlier in the year parts of this big agricultural district were favoured with some beneficial rain, but very little has fallen during the last four months. A good general fall is urgently needed to replenish the now depleted surface water supply, also to freshen the parched vegetation.

Rainfall.

	Ingham. Inches.	Halifax. Inches.
January	7.29	6.27
February	31.45	27.56
March	6.89	10.11
April	2.93	1.29
May	1.17	0.84
June	2.14	2.54
July	0.73	1.14
August	0.64	0.18
	53.24 inches.	49.93 inches.

Progress.

This area is recognised as one of the best in Queensland. The district and town have made extraordinary progress despite the great setback of the 1927 record flood.

The present crop is the largest yet experienced, so far as tonnage is concerned. The green foliage of the matured crop, especially that of variety H.Q. 409 is heavily blanketed with a fading brown mass of feathery tassels, the fuzz from which is tumbling fast. The large crop is mainly due to the increased area planted to cane, the abnormal amount of plant, and a subsequent favourable season.

Harvesting and Milling.

Up to the present the weather has been very suitable: consequently, operations in field and mill have proceeded uninterruptedly and with amazing speed. Some varieties have tasselled more than ever before, and now possess large stem side shoots which are gradually reducing the weight of the cane, and increasing the cane-cleaning difficulties. The district is panning out in the vicinity of 20 tons per acre. Tractors

are largely used for hauling the loaded cane trucks over portables from field to permanent way. It is pleasing to the farmer to find his crop harvesting heavier than was estimated. Practically all the cane being milled is unburnt, and, owing to the absence of high winds, is straight, lengthy, of excellent appearance, and wondrously clean. Many years have elapsed since the writer has seen better harvested or cleaner cane than that coming forward to the Victoria mill; its condition is a credit to those responsible. Clean cane is very desirable and helpful for efficient mill work.

The two factories are both working to their fullest capacity, making good progress considering the size of their crushers. The record crop estimated at 477,000 tons is being reduced by 15,500 tons weekly. If this remarkably high weekly rate is continued, the district's greatest crop will be fully milled by the end of the year.

Estimates, and some Factory Particulars.

Mill.	Estimate.	Cane Milled up to 26th August.	Greatest Tonnage Crushed per week.	Per cent. of Clean Cane.
	Tons.	Tons.	Tons.	
Macknade ..	225,000	128,000	8,326	96·3
Victoria ..	252,000	110,000	7,415	97·7
	477,000	238,000		

Half the estimated crop has been crushed. Macknade has averaged 8,000 tons a week since starting; Victoria, during the last eight weeks, has averaged over 7,000 tons. Two very old beam crushing engines at Macknade (Darby and Joan) must be giving efficient service. This mill will probably complete its assigned cane about the end of November, after which it may assist its sister mill to finish.

Cultivation.

The weather being favourable, ratooning, ploughing, planting, and interspace tilling are being hurried along. Most of the cane is hand planted. Poor plant germination has occasioned extra work in filling the great gaps among the plant cane. The work in nutgrass fields has to be continued until the foliage covers the row. In some instances tractors are working day and night, immediately ploughing out exhausted stubbles and planting. This is bad practice on the soil and industry at present. It is difficult to get the farmers to grasp the great value of seed selection. Throwing whole canes into cane drills and cutting to lengths as they lie is not plant selection. Eyeless canes, the result of rats, larva of the bud moth or a careless harvester were noted lying in drills where this type of planting was being conducted. H.Q. 409 is obviously a popular variety for the wet shallow lands. This kind tasselled some weeks ago, and is now carrying great side shoots. These have reduced the top 14 inches or more of affected canes to pith and rind, and must, if planted, result in a miss. Headland ploughing after the final ploughing, is necessary, yet is too commonly neglected. A furrow made along the sides of the cane rows prior to planting prevents ragged ends, and also improves the field appearance. Earthing up is frequently overdone; this is a necessary evil and is done to a greater extent in nutgrass land to smother the thick weed growth surrounding the young cane. A bit of new road land recently cleared of guava and burr was planted to cane with the rest of an adjoining field at Halifax. This forged ahead of the rest, and when seen was outstanding in colour, growth, and stooling.

Varieties.

The major varieties grown in the area are as follows:— Badila, H.Q. 409, Korpi, Oramboo, Nancmo, and Q. 813.

Fertilisers and Drainage.

Lime is indispensable to the growth of cane; more of it and a better drainage system would improve the mechanical condition of the soil on many local farms. Large quantities of manure are applied to plant and ratoons annually, and at rates varying from 2 to 5 cwt. per acre with reported beneficial results.

Dominant Weeds.

Much vacant land is being rapidly covered with a rampant growth of burrs and guava; over-wide roads are responsible for its spread. Nutgrass and guinea grass continue to spread. Real Johnson grass is to be dreaded in the cultural lands and should be controlled where possible. One farmer claims to be keeping it down by the timely use of the scythe.

Pests.

The most serious cane enemy here is the field rat; the district's environment is highly suitable for its increase. The need of doing something to control this pest is becoming more pronounced. As the season advances crop destruction must increase, due to the fact that the enemy is being continuously driven from the cut to uncut fields. Rats nest mainly in the ground or about a foot off it in the cane stools. The main injury is the devouring of eyes and the internodes to such a degree that the stem breaks off. This diminishes the sugar content and weight, and increases harvesting costs. Clean field surroundings and the use of poison baits have been successful in controlling this pest. The barium carbonate biscuit has proved effective in the Territory of Hawaii, and also in Queensland areas. Three pence per rat tail is being paid in some parts of the district.

Shoot Killers.

Pentodon australis (a black beetle) larvæ of the tineid moth and big moth borer, also some grubs, were noted.

Foliage Eaters.

During a dry time wallabies are more destructive, and army worms damage the crops.

A judicious attempt is being made to arrest the big river bank erosion on the seaward side of Halifax. A pile-driver is driving red mangrove piles about 24 feet by 6 inches closely together in the soil along the exposed bank.

SAN JOSÉ SCALE.

F. L. JARDINE, Inspector of Diseases in Plants.

One of the most deadly enemies of the fruitgrowers of the Granite Belt is the San José scale, and, though this small insect is rather hard to detect in its earliest stages of infestation, if it is left unchecked it very soon establishes itself to such an extent that it may well be termed one of the worst tree killers to growers of deciduous fruits.

To those growers who are fortunate enough not to have this scale in their orchards and also to those who have not noticed it, it might be as well to point out a few symptoms which may help to detect any trees that have perhaps escaped notice.

The adult insect has a greyish-brown covering, and where a tree is badly infested it has the appearance from a short distance of having been dusted with fine wood ashes; also any tree that shows signs of gumming is well worth investigation, because where San José scale has been left unchecked for a period, gumming of the tree, or the portion affected, generally follows, prior to the dying of the tree or the affected part.

Growers will be well advised, in their own interests and in the interests of their district generally, to make a concerted effort to keep this scale in check and so control a deadly enemy to their trees and an expensive one to exterminate. San José scale can only be fought effectively during the winter months, when oil and lime sulphur sprays can be used at their full strength, and it is then that the orchardist should keep a close watch, and any tree harbouring scale should be tagged or marked by tying on strips of cloth, thus keeping this particular tree under notice.

When the usual winter spraying is in full swing, special attention should be given to the marked trees by giving them a thorough washing, and in cases where the infestation is very bad, two or more good sprayings will be necessary. These may be given at intervals while general winter spraying operations are in progress.

DISEASES OF THE BANANA IN QUEENSLAND.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

IN the early days of the banana industry in Queensland there appears to have been little in the way of disease to trouble the grower. As the industry expanded several maladies came under notice. A few of these, such as Bunchy Top and Leaf Spot, may be considered of a somewhat serious nature, while others such as the fruit rots, Panama and Dry Rot, are for various reasons usually of only minor and local importance. With a view to enabling growers to become familiar with the commoner diseases as they occur in Queensland, there is given in the following pages short descriptions of these, together, where possible, with recommendations for control.

BUNCHY TOP.

Bunchy Top is by far the most serious disease affecting the prosperity of the banana-grower in Queensland. In northern New South Wales and the extreme southern portion of coastal Queensland the once thriving banana-growing industry has, for the time being, been practically wiped out by the ravages of this malady. A similar fate awaits those districts so far free or only lightly affected unless the recommendations designed for the exclusion and control of the disease are strictly adhered to.

The first definite recognition of the presence in Australia of the disease now known as Bunchy Top occurred in 1913. Apparently it was introduced by means of infected suckers imported from Fiji, where the disease had been prevalent for many years. In 1922 the trouble began to assume such serious proportions as to call for special investigation by the officers of the two States concerned. Finally, in 1924, on the recommendation of a Board representing the Commonwealth Institute of Science and Industry and the Agricultural Departments of New South Wales and Queensland, the Bunchy Top Investigation was appointed consisting of Professor E. J. Goddard (Supervisor), Mr. C. P. J. Magee (Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist). The expenses entailed were met co-operatively by the Commonwealth and the Departments of the States concerned. In Bulletin No. 30 of the Council for Scientific and Industrial Research, Mr. Magee has detailed the results of the investigation, and the nature of the disease and its means of transmission are shown to have been clearly demonstrated, with the result that sound control measures may now be advocated.

Symptoms.

The appearance of a typical Bunchy Top plant showing the later stages of the disease is such as cannot readily be confused with any other banana malady. However, for the purposes of prosecuting efficient control measures it is necessary to be able to detect the first visible symptoms of the disease. These can be searched for by holding the lower part of the youngest leaf of the plant so as to look at it from the back with the light shining through. If the plant has become infected there will be noticed short broken lines of a dark-green colour lying between and parallel to the clear veins which run out at right angles to the midrib. The dark streaks are broken up into short irregular lengths so as to resemble the signs of the Morse code. (Plate 115.)

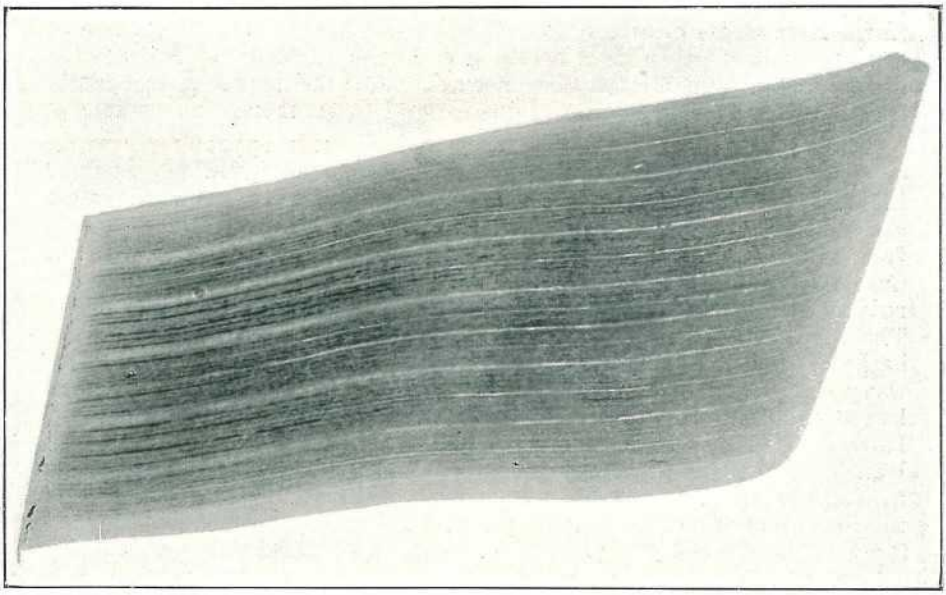


PLATE 115.

A portion from the base of a leaf of a Bunchy Top plant, photographed from the under side by transmitted light, showing the characteristic lines of dots and dashes.

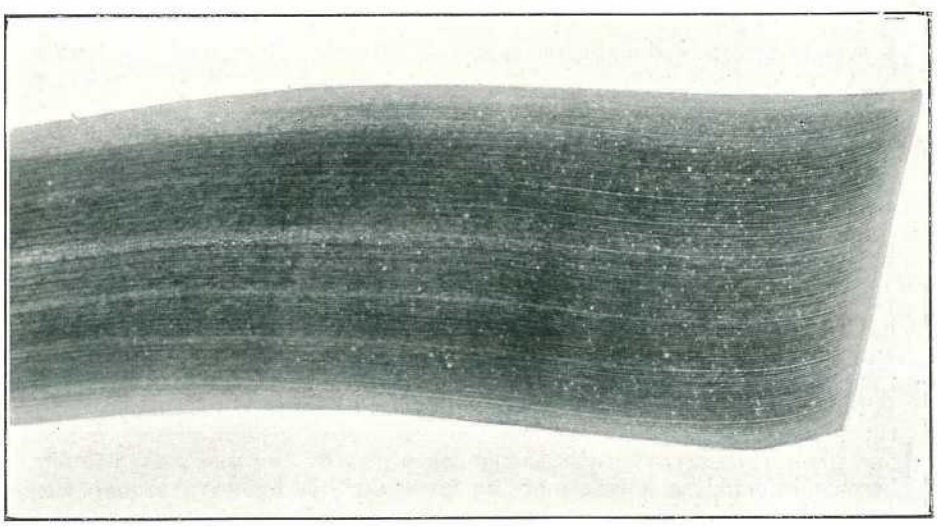


PLATE 116.

A portion of a leaf from a healthy plant photographed in a similar manner to Plate 115.

At first the dots and dashes may be somewhat sparsely scattered, but in the later stages of attack these may be so numerous as to form almost continuous dark-green lines, which give to the affected leaf a somewhat darker green appearance than normal. All the leaves subsequently formed exhibit evidence of the disease and to an increasing extent.

The following additional symptoms usually only appear three weeks or more after the marking just described first becomes visible. Suckers infected from the parent, however, may exhibit them from the start and to even greater intensity. Instead of waiting until it is properly free from the pseudo-stem the newly-thrown leaf will commence unfolding from the top in a funnel-shaped manner. The leaves become reduced in length and width until they are of a somewhat elliptical shape. The blade shows a tendency to droop along the midrib so that the backs of each side approach one another. The edges are rather more wavy than usual and are sometimes slightly curled inwards. Affected leaves exhibit a marked brittleness not natural to the healthy plant. Instead of increasing in size in their order of growth, the leaves of a Bunchy Top plant gradually become smaller. The leaf stalk also fails to elongate and bears the leaf in a more erect manner. The result is the formation of a crown of stiff, narrow, erectly-growing leaves bunched together in a typically rosetted manner. (Plate 117.) A Bunchy Top plant affected in its early stages of growth rarely throws a bunch and when owing to a late infection this does appear it is commonly stunted and possibly malformed owing to the constricted state of the top of the pseudo-stem through which it has to pass.

Cause.

It has now been demonstrated conclusively that Bunchy Top belongs to that type of plant malady known as a virus disease. The various plant diseases included in this type show many general points of similarity, of which the chief lies in the fact that the casual agents are of such minute size that they have so far defied all attempts to view them microscopically. What little is known regarding the nature of the infectious agent or virus concerned in the different virus diseases has been determined by experimenting with the plant juice in which it is known to be present. A virus disease may be transmitted from one plant to another in various ways. For some it is merely necessary to inoculate a healthy plant with the expressed juice from a diseased individual. In other cases grafting of diseased on to healthy tissue becomes necessary. In the more specialised forms the virus is conveyed from plant to plant by means of an insect vector. Bunchy Top belongs to the latter type.

This disease is disseminated by means of the dark banana aphis (*Pentalonia nigronervosa*) which, in pursuance of its normal feeding habits, may first suck the juice of a diseased plant and then migrate and carry out the same process on a healthy one, with the result that the latter becomes innoculated with the virus and so contracts the disease. (Plate 118.) This insect is responsible for the spread of Bunchy Top throughout a plantation and between neighbouring plantations. When one plant contracts the disease the other members of the stool usually become infected as a result of the virus making its way through the connections which link up the various individual corms. Suckers arising from an affected plant almost invariably exhibit symptoms of primary infection from the parent.

Control.

When considering methods for the control of Bunchy Top it is necessary to stress the following points:—

(1) Bunchy Top is a disease of a systemic nature. The causal virus being present within the living tissue of the host cannot be destroyed by any chemical or mechanical treatment known at the present time, other than by destruction of the plant itself. In other words, a plant cannot be cured once it has contracted the disease.

(2) Bunchy Top may be introduced into a clean area by means of suckers infected with the virus which have been taken from a diseased plantation, and also, if centres of infection are not too far distant, by the possible influx of infected aphis.

(3) The disease is spread within an affected area and also the limits of that area gradually extended by (*a*) the planting of infected suckers; (*b*) the transmission of the virus from diseased to healthy plants by the banana aphis.

(4) An attempt to eliminate Bunchy Top by complete control of the aphis is beset by so many practical difficulties in the average banana plantation that the method cannot be entertained.

Therefore, since it has not been found possible to either cure a diseased plant or eliminate the means of transmission of the virus, it is necessary to concentrate on a programme of *eradication* whereby all sources of the infectious agent are completely eliminated by destruction of all diseased plants. With this object in view proclamations have been made which prohibit (1) The transfer of any suckers whatsoever from infected districts into those areas still free from the disease. (2) The removal of suckers from any plantation within an affected area unless the plantation in question has been inspected and found free from the disease.

If this proclamation is adhered to conscientiously by all banana-growers—the very existence of the banana industry in Queensland depends on this—then the following objects will be obtained:—(1) Clean isolated areas will tend to remain clean; (2) spread within affected areas will be greatly reduced.

Growers must not think that these regulations alone are going to eliminate Bunchy Top. It should hardly be necessary to stress the point that, owing to the rapidity with which Bunchy Top may spread, all growers within an affected area must consider their position as serious. If they do not wish their plantations to follow the fate of those in the Tweed area the following recommendations must be adhered to:—

(1) Set aside a definite time in every week in which to carry out inspection of the plantation for signs of Bunchy Top invasion. Each plant should be separately examined and special attention should be paid to the youngest leaf on each plant in order that the earliest signs of infection may be detected. The area of the plantation should be reduced if necessary to a size which will enable careful examination of this nature to be carried out. Special care should be taken during the warmer months when the aphis are most numerous and active.

(2) If any plant should be found to be infected, the whole stool must be dealt with as follows:—First spray the stool thoroughly with Black Leaf 40 to kill all aphis present. Particular attention should

be paid to the crevices round leaf bases, &c. Black Leaf 40 should be used at the rate of a dessertspoonful to a gallon of water, to which soft soap has previously been added until a good lather is obtained. After spraying, dig out the whole stool and cut the plant up into small pieces which will quickly dry out. It must always be borne in mind that it is not sufficient to treat only the individual plant affected, as the virus may have already passed to other members of the stool, although its presence there is not yet apparent.

(3) All growers should co-operate in seeing that all diseased plants are eradicated from their district, as it is only by achieving this object that the industry can be expected to again reach a stable basis in the affected areas.

LEAF SPOT.

Although some of the oldest growers consider that Banana Leaf Spot has been present in Queensland for the last half-dozen years, it is only recently that the disease has occurred in epidemics of a sufficiently serious nature to cause the grave concern shown in some districts. Leaf Spot is now widely spread and occurs from northern New South Wales in the south to Cairns in the north, including practically the whole of the area in which banana-growing is practised.

Symptoms.

The first indication that a leaf has become infected is the appearance of indistinct linear markings of a light brownish-green colour. These areas are $\frac{1}{8}$ to $\frac{3}{8}$ inch in length and lie parallel to the direction of the veins, two to four of which may be included in their width. These initial spots increase somewhat in width and length and dry out slightly, becoming dark muddy brown to black, linear, linear oblong, or eliptic areas of $\frac{1}{4}$ to $\frac{1}{2}$ an inch in length and about one-third or less of this in width. (Plate 119.) On the lower leaves of young plants the spots are larger and broader and show as dark-brown oval to almost circular areas up to $\frac{1}{2}$ an inch in diameter. (Plate 119 B.) The spots early become surrounded by a diffuse light-green halo, which soon turns a dark yellow and extends its area into the surrounding leaf surface, more especially towards the margin. The central portion of the dark spot representing the region first to be invaded usually dries out to form a lighter grey area, which is often speckled with the black fruiting bodies of the fungus causing the disease. These grey linear or eliptical areas, bordered with black and surrounded with a yellow halo, are characteristic of the disease. Usually the grey spots can be easily distinguished even after the leaf has completely withered. (Plate 119 C.)

The part of the leaf exhibiting yellow discoloration gradually turns brown and dries out. When the spots are sufficiently numerous several lesions may coalesce so that there is formed large peninsulas of dead and dying tissue extending from the margin in towards the midrib and including further spots as these extend. Finally the whole leaf will shrivel.

In a bad attack the spotting will pass from the lower leaves in succession up the plant until all the leaves are left dead and hanging drooped round the rotting pseudostem. The quality of the fruit is reduced by the loss of leaves. When defoliation is severe the bunch will vary in its development according to the stage of maturity at which the loss of leaves occurred. If this should take place before the

PLATE 117.— A BANANA PLANT EXHIBITING TYPICAL SYMPTOMS OF BUNCHY TOP.

fruit have filled out, the bunch will frequently fail to mature sufficiently to be fit for market. This is specially the case with bunches which normally would be cut during the winter and early spring months.

Cause.

Banana Leaf Spot is caused by a fungus belonging to the genus *Cercospora*. The spores of this fungus are narrow elongate, many septate structures formed on the ends of dusky brown upright fungal stalks or hyphæ which project in clusters from the surface of the brown or grey areas mentioned above.

Spore formation may commence soon after the lesion has assumed the dark brown stage, but the presence of the spore clusters is not easily detected until the central spore-bearing region dries out, when they give rise to a speckled appearance over the lighter area so formed. Spores may be found on both sides of the leaf, but as a rule by far the greatest number are produced on the upper surface. From the diseased areas they are scattered by wind and rain to healthy leaves, where, if weather conditions are suitable, they germinate and produce further spotting. On an individual plant the leaves become infected in the order of their maturity from the oldest upwards, and in many cases there is definite indication of infection from a spotted leaf below.

Varietal Susceptibility.

The Sugar and Lady's Finger varieties appear to be somewhat less affected by this disease than the Cavendish, possibly in part owing to their more open habit of growth.

Seasonal Nature of the Disease.

Leaf Spot is of purely seasonal occurrence. The first noticeable appearance is usually about the beginning of March, and from then on the disease becomes increasingly prevalent until the end of winter. With the advent of spring-growing conditions, the disease quickly disappears, the new leaves coming away free from infection. It is usually possible to find some lesions throughout the year, but during the early summer months these are not abundant except associated with old trash. Preliminary experiments with the *Cercospora* responsible for Leaf Spot have indicated that both vegetative growth and spore development are retarded by temperatures above 80 deg. Fahr. The fact that during the summer months in Queensland the temperature commonly ranges above this point may explain to a certain extent the absence of Leaf Spot during this period. However, the marked slackening in growth of the banana plant as well as other conditions mentioned below are considered to largely contribute to the severity of outbreaks during the cooler months.

Contributing Conditions.

It has not been possible so far to accumulate data regarding the direct relationship between weather conditions and the severity of Leaf Spot occurrence. Mr. S. E. Stephens, Inspector, Diseases in Plants, has recorded for the Innisfail district a marked increase in the disease following cold snaps. An abnormally wet rainy season in January and February appears to allow an earlier development of the disease. Possibly the root rot, which in many cases accompanies these conditions, contributes

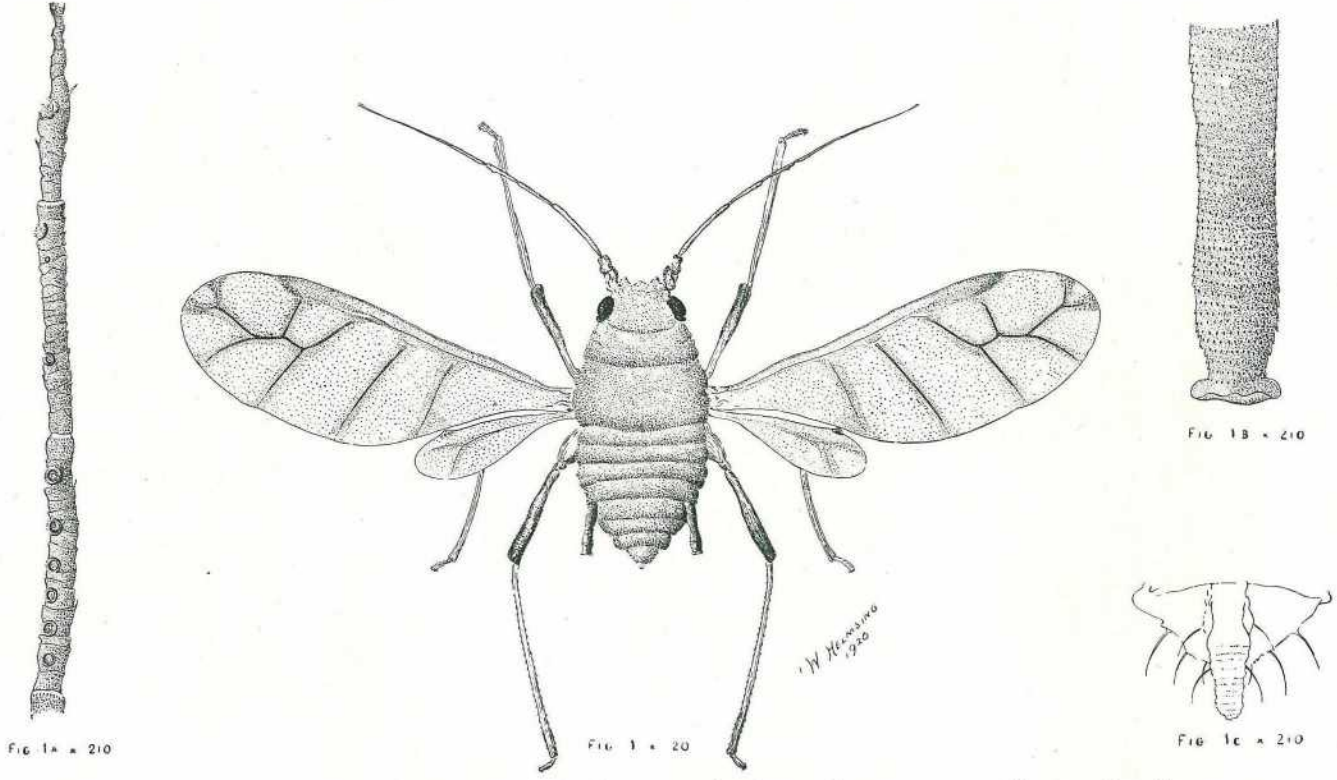


PLATE 118.—THE BANANA APHIS (*Pentalonia nigronervosa* COQ.), THE CARRIER OF THE BUNCHY TOP VIRUS.

Fig. 1. Winged adult x 20. Fig. 1A. Segments 3 and 4 and portion of 5 of antenna of adult, showing sensory organs x 210. Fig. 1B. Cornicle of adult x 210. Fig. 1C. Anal segment of adult x 210.

to the severity of the attack by weakening the plant. Large plants growing under ideal conditions of soil and location may not be affected to the serious extent displayed by those in poorer badly-drained plantations.

Severe individual attacks of Leaf Spot are frequently associated with the presence of beetle borer, and it is possible that the increase in severity of the disease as a plantation ages is in some measure due to the increase of the insect pest.

Apparently a state of lowered vitality brought about by cool weather or other causes is conducive to severe attack. During periods of rapid growth new leaf development keeps pace with the spread of the disease. Infection of all the foliage seldom takes place before the plant has bunched and leaf production ceased. Even then the abundant spotting leading to complete defoliation seldom occurs until the fruit is approaching maturity and no doubt making use of all available food energy.

Control.

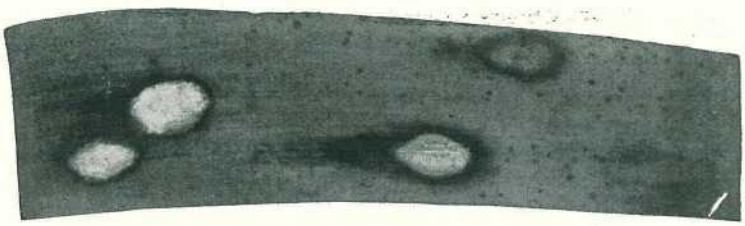
Although Leaf Spot has probably been in Queensland for the last half-dozen years, if not longer, the disease has only recently assumed epidemic form of sufficiently serious nature to attract attention. It is, therefore, not possible at the present time to recommend any certain means of control. Spraying or dusting with a fungicide, which might be advocated for this type of disease, becomes unsatisfactory from the practical standpoint when dealing with a plant such as the banana. However, an experiment to test the efficacy of dusting was carried out during the past epidemic through the much appreciated co-operation of one grower, but the results in this case were not such as would justify the advocation of this method of control. The value of systematic stripping as a means of reducing the severity of an attack is also being tested out on several plantations. The results from this experiment will not be available until next year.

The following suggestions for the control of Leaf Spot are provisionally submitted:—

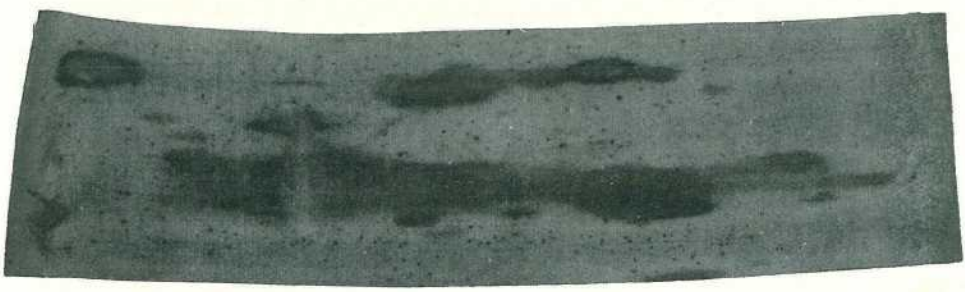
(1) Care should be exercised when selecting a site for a plantation to see that the aspect, soil, and other conditions are those best suited to the vigorous growth of the bananas throughout the year. Good cultivation, and, if possible, manuring should also be practised with the same object in view.

(2) Suckers should be planted as far apart as is economically possible in order to reduce the damp conditions arising in a plantation and lessen the rapid spread of the disease from plant to plant.

(3) The disease appears always to start on the lower leaves. The spores produced on these in enormous numbers are blown or splashed on to healthy ones above, and there germinate and produce further centres of infection. By carefully removing, by means of a series of frequent inspections throughout the year, all leaves or portions of leaf showing the spots, it should be possible to so reduce the amount of infectious spore material present in the plantation as to make it possible to tide the plants over their susceptible period without extensive damage being effected. The leaves on removal should be burnt or buried below risk of disturbance. The leaves should be removed when the spots are in the light-brown stage, as spore formation may commence soon after they have darkened and the dispersal of these may nullify the results desired. Special attention would have to be paid to these sanitary



A.



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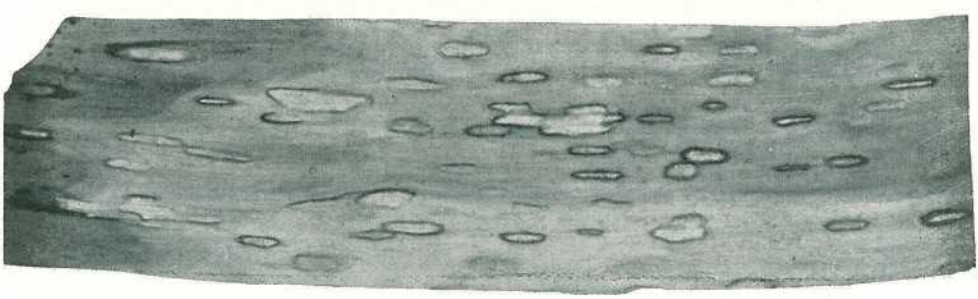


C.

PLATE 119.—BANANA LEAF SPOT.

A, Spots as they appear on the first formed leaves. B, Leaf tissue commencing to die as a result of Leaf Spot attack. C, Spots showing up conspicuously on dry leaf killed by the disease.

measures during the first half of the year when the fungus is on the increase, and the grower might well allocate certain days, at not longer than fortnightly intervals, on which the inspection and destruction would take place. Needless to say, plantations which are heavily infested with Leaf Spot will not show immediate benefit from this treatment. The fact that the amount of Leaf Spot appearing in a new plantation is slight and increases only as the stools age and more spore-bearing material accumulates, would indicate that this method of control is well worth a thorough trial.

Leaf Spot usually first appears in a new plantation as more or less isolated spots on the lower leaf or two of the young plants. Probably these are derived in many cases from spores introduced with the suckers on to which they had fallen in the old plantation. Careful attention given to the removal of these first affected leaves, as soon as the spots appear, may be of special help in reducing the rate of subsequent spread of the disease.

PANAMA.

This disease affects only the tall-growing varieties of banana, including the Lady's Finger, Sugar, and Gros Michel. The Cavendish or dwarf banana appears to be completely resistant under Queensland conditions, and since this is the common commercial variety grown in Queensland, Panama disease has not so far become the serious menace in this State that it has in other banana-growing countries where the Gros Michel is the standard. Very considerable loss has been sustained, however, by those cultivating susceptible varieties, more especially since few of these growers realise that they are dealing with a specific disease, so that methods of exclusion and eradication are seldom practised.

Symptoms.

The first signs of an attack of Panama appear on the lower leaves of the plant. The leaf blade commences to turn a deep yellow colour round the margin and along the edges of any shredded segments. As the yellowing advances inwards the portion first affected turns brown and dries out. After this has progressed to a certain extent, the leaf-stalk collapses near its junction with the sheathing base, and the dying leaf hangs down round the pseudo-stem. The leaves are progressively affected in this manner from the base up, and finally the pseudo-stem may appear devoid of all green leaves with the dry shredded remains of these hanging round it. Frequently the outer sheathing bases of the leaves will split upwards longitudinally.

If the plant is infected in the early stages of its growth a bunch may not be thrown or, if one is produced, this will be stunted and the fruit will not mature properly. Plants less seriously affected will often throw a marketable bunch, but one inferior to that which would have been produced by the plant in a healthy state. This latter state may occur in the case of the Lady's Finger variety, which appears to be somewhat more resistant to the attack of Panama.

The best diagnostic characters of Panama disease are internal. If the butt of an affected plant be dug up and split lengthwise, the base of the corm will be found to be discoloured by numerous reddish-brown to black lines running in all directions through the white tissue, and sometimes so numerous as to cause almost complete blackening of the central region of the corm. These lines represent the vascular strands composed of large water-conducting cells which are here rendered conspicuous by the discoloration brought about by the presence of the

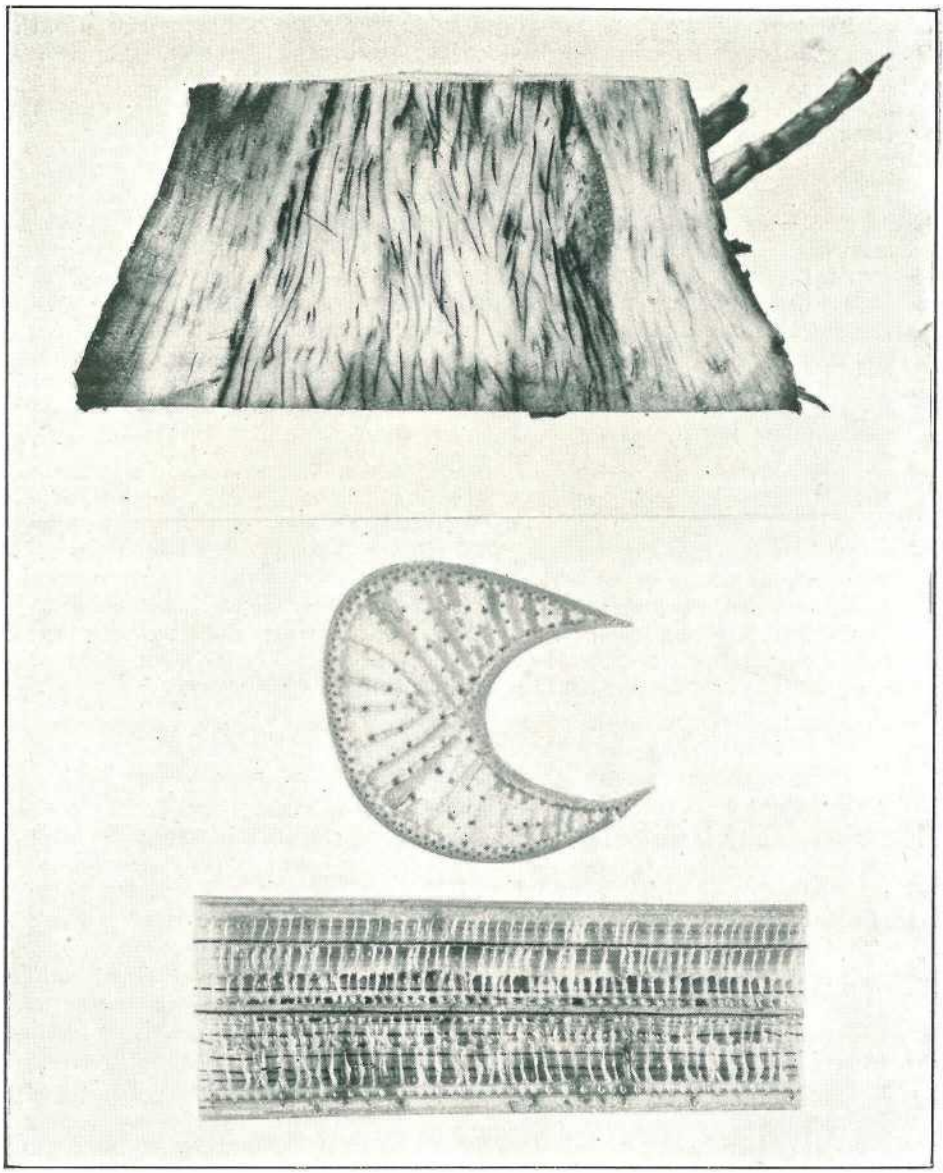


PLATE 120.—PANAMA DISEASE.

Above.—Longitudinal Section of affected corm, exhibiting characteristic blackening of the vascular strands.

Below.—Transverse and longitudinal sections of a leaf stalk, showing the continuance of the discoloured strands into this region.

fungus or its toxic secretions within them. The brown vessels can be followed up through the corm into the sheathing leaf bases, and from there will often be found extending almost to the ends of the midrib of the leaf. (Plate 120.) A quick diagnosis for Panama can often be made by slitting up the base of the stalk of a withered leaf, near its junction with the pseudo-stem, when these affected vessels may be observed as one or more light yellowish-brown, brown, or reddish-brown lines running up the vertical partitions of the stalk.

Cause.

Panama disease in Queensland would appear to be caused by the same fungus (*Fusarium cubense*), as is responsible for the disease in Central America. The fruiting bodies of this fungus are produced on both upper and lower surfaces of the leaf and leaf-stalk. They take the form of minute clusters of branched fungus threads which project through the epidermis and bear numerous small sickle-shaped spores. The spores are washed away by the rain and blown by the wind, and if in the process they reach a suitable situation, they may germinate and infect a healthy plant.

The spores are capable of developing and growing for a certain time in the soil. Infection may take place through young tender roots or through wounds in the corm. Once within the plant the fungus grows up through the vessels, producing the symptoms noted above. Infection of young plants frequently takes place by the fungus present in an old parent corm growing out through the tissue connecting it to the surrounding suckers, and in these setting up the same diseased conditions as obtained in the parent. The planting of such infected suckers is one of the chief means of distributing the disease.

Control.

The only satisfactory way of dealing with Panama disease is by a combination of exclusion and eradication.

(1) Only land which has not previously grown bananas, or land on which Panama disease has never been known to exist, should be planted with susceptible varieties. This precaution is necessary since the fungus may remain for a number of years in the soil even after affected plants have been removed.

(2) Special care should be taken that suckers are obtained only from a district in which Panama disease is definitely known not to exist. Suckers obtained from within an infested area are always liable to be infected, and signs of this might escape detection by the grower.

(3) In spite of these precautions a plantation may become infected by means of wind-borne spores or by infectious material accidently introduced on boots, &c. A careful watch should therefore be kept for the appearance of the disease, and if a plant is observed showing symptoms of Panama, the whole stool should immediately be dug out and the affected plant, together with any invaded suckers, should then be removed carefully so as to avoid spreading spores about, chopped into pieces and burnt. Any instrument used in cutting a diseased plant must be disinfected by washing in a fungicidal solution, or by passing through a flame, before it is again used on a healthy banana. It is important for this eradication process that diseased plants are detected and removed in the early stages of the disease before spore formation has commenced. It is very unwise to replant in the spot from which a stool has had to be removed.

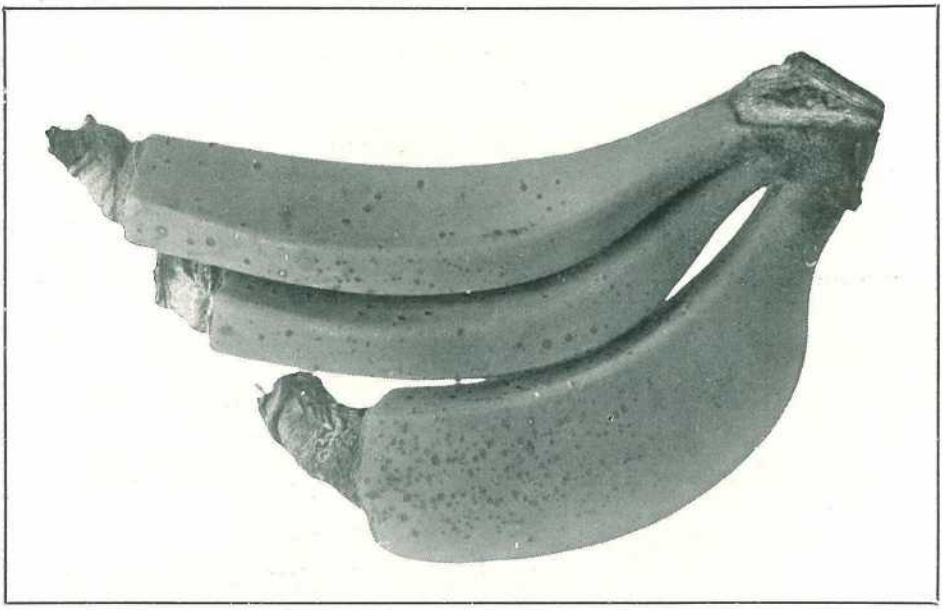


PLATE 121.—CIGAR END.

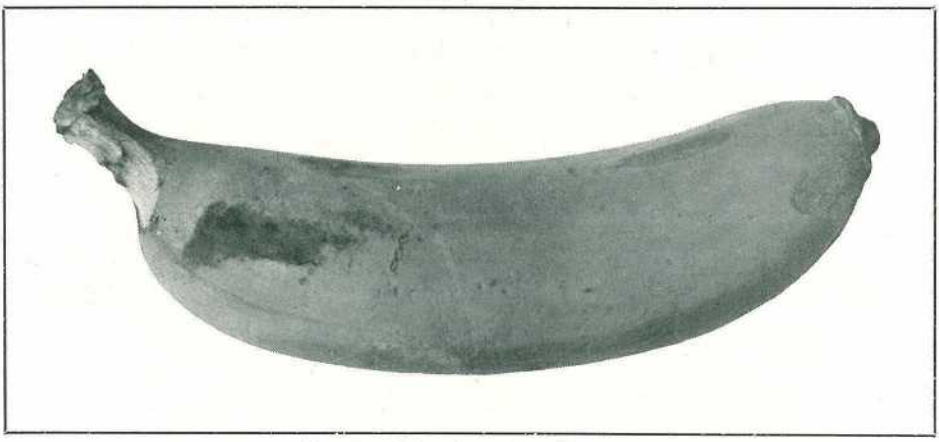


PLATE 122.—STEM END ROT.

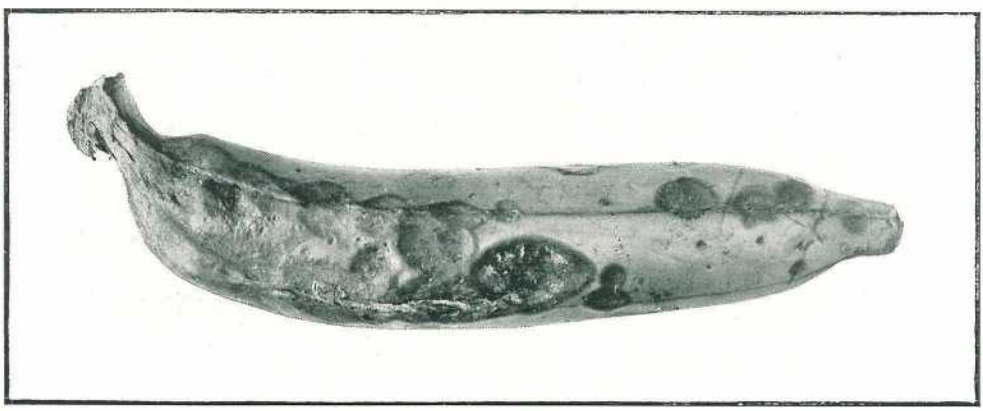


PLATE 123—ANTHRACNOSE.

DRY ROT.

Dry Rot is not a disease of serious consequence owing to the fact that it is only an isolated plant or a small group of plants that is usually affected. However, in the absence of knowledge regarding the disease, its appearance sometimes causes concern.

Symptoms.

An individual plant or stool may exhibit a cessation of vigorous growth and later the leaves commence to die back from the margins. Finally the whole plant dies back and turns brown and dry.

It will be found that the plant so affected may be easily pushed over as it is practically devoid of sound roots. On cutting open the corm a portion or the whole of the interior is seen to have been changed to a substance of a more or less dry, "punky" nature of a dirty white to brown colour. This consists of a mass of closely interwoven fungal threads which have invaded the corm and largely replaced the plant tissue.

Cause.

Dry Rot may be caused by several fungi, including a *Poria*, belonging to the Basidiomycetes or higher fungi. These fungi live for the most part on dead and rotting stumps such as are usually present in abundance in the average banana plantation. From here certain of them are able to pass to a living banana plant, should such be growing in close proximity, and, by invasion of the corm, produce the Dry Rot described above. Growers have noticed that the stumps of certain species of trees are more commonly associated with these dry-rot-producing fungi.

Control.

Often Dry Rot does not spread beyond the original stool attacked, but on some occasions the fungus gradually extends its area of attack to adjacent stools. For this reason it is advisable when a plant is observed to be affected to locate, if possible, the stump or root from which infection has proceeded and remove and burn this together with the affected corm.

FRUIT ROTS.

A. Stem End Rot.

This disease is sometimes known as Black End owing to the fact that affected fruit exhibit a black area of soft rot round the stem end.

Symptoms.

The trouble usually commences as a dark water-soaked area formed in connection with a bruise or other injury to the short fruit stalk or working in from its broken end. (Plate 122.) As the rot progresses the stalk turns completely black and becomes much shrunken and sometimes shredded. From the stalk the soft blackened area extends through the skin of the fruit at a more or less rapid rate, the pulp beneath turning soft and watery.

Stem End Rot is not a disease of the plantation as it usually appears only when the fruit are approaching maturity, especially after long distance consignment.

Cause.

Associated with this rot are usually to be found fungi of the genera *Verticillium, Gloeosporium,* and *Fusarium.* It would appear that under suitable conditions any weak wound parasite of this type would be capable of producing similar injury. Careful examination of affected fruit will reveal the fact that the primary cause of the trouble lies in injuries given to the fruit during the frequent handling to which it is subject. The injury may be due to bending the fruit stalks while the hand is still on the bunch. The bruise resulting from this is sufficient to constitute a point of entry for the rot-producing fungi without a definite abrasion of the skin. The wounds and bruises arising from tearing apart the fingers from the hand will also serve as infection points. These latter are a common source of trouble in cased fruit.

Control.

(1) As regards fruit marketed in the bunch it is essential that the bunches receive most careful handling from the time they are cut until they reach the consumer. When one considers the rough treatment the fruit is often subjected to it is remarkable that not more damage results.

(2) In order to lessen Stem End Rot in cased fruit it will be necessary to pack in hands or half-hands rather than in singles. The hands should be carefully cut off round the collar by which they are attached to the central stalk, and if it is necessary to reduce them in size the division should be made by a sharp knife and not by a tearing process.

(3) The grower should avoid accumulating a heap of rotting banana refuse round his packing shed. This material serves as a breeding ground for the various organisms causing Stem End Rot and spores produced here may serve to contaminate fruit during the process of packing. The discarded fruit and stalks could be thrown into a pit and covered every now and then with a layer of soil.

(4) The same need for cleanliness may be stressed with regard to some ripening rooms. The absence of a regular cleansing programme will increase the chance of infection with rot fungi.

B. ANTHRACNOSE.

Anthracnose is of rare occurrence in the plantation, where it occasionally appears in the form of a leaf and fruit spot. More commonly it is met with as a ripe rot of the fruit on the market.

Symptoms.

The early stages appear on the skin of a ripening fruit as small muddy brown rather diffuse spots. These enlarge rapidly and take the form of slightly depressed areas, rounded or irregular in shape, and dark brown to almost black in colour. The spots may coalesce until large areas of surface present a black, rotting appearance. When subjected to moist conditions, the older parts of the affected areas become covered with minute pink pustules formed by the spore masses of the causal fungus. (Plate 123.) In the early stages the affected area is restricted to the skin, but soon the pulp below the spot becomes invaded and takes on the water-soaked appearance of a soft rot, which rapidly spreads through the tissue rendering the fruit unfit for consumption.

Anthracnose occasionally appears on the leaves as large eliptical brown areas which may extend to include considerable areas of leaf surface.

Cause.

Anthracnose is caused by a fungus (*Glœosporium musarum*). This organism is only of a weakly parasitic nature and is not usually found attacking fruit except in the later stages of ripening. It may considerably hasten what is commonly termed the over-ripe condition. Bruising of the fruits will contribute to the attack of this fungus.

Control.

The control measures for Anthracnose should follow the same general lines as advocated for Stem End Rot. Attention must be paid to careful handling to avoid bruising and to the practice of cleanliness at the packing shed, market and ripening room.

C. CIGAR END.

In contrast to the two previously mentioned fruit troubles, cigar end is a disease to which the fruit become subject in their more immature stages. Commonly only a few of the fingers on a bunch exhibit the symptoms, but records have been received in which the whole bunch has been affected.

Symptoms.

Affected fruit exhibit a firm black rot at the apex. The extent of the decay varies from a scarcely noticeable ring of black tissue round the terminal crown to a regular extension back for half an inch or more. The affected portion shrinks, in many cases becoming more or less rounded in contrast to the angular shape of the immature fruit. (Plate 121.) The blackened tissue then becomes covered from the distal end back with an ashy grey or sometimes pinkish grey coat of fungal spores, which give, in typical cases, the striking resemblance to a burnt cigar tip to which the disease owes its name. The old shrivalled floral organs often persist for considerably longer than the normal period on affected fruit.

Cause.

A fungus (*Verticillium sp.*) is almost universally associated with cigar end, and it is the conidiospores and spores of this organism closely studded over the affected region which gives rise to the grey covering characteristic of the disease. A consideration of the early stages of attack would suggest that infection may possibly take place through the tender floral structures which appear particularly susceptible to fungus invasion.

Control.

Definite recommendations based on a full investigation cannot be made at present. It is suggested that the young bunch be opened up to the light and air and the bracts which sometimes tend to remain attached to the developing hand, especially during wet weather, be removed as soon as possible.

D. SQUIRTER.

Squirter is a trouble of a somewhat obscure nature which shows up mainly in connection with fruit which has undergone long distance consignment to Southern States. After ripening, the centre of the fruit will be found to have turned to a soft, watery mass, which will squirt out when pressed. The symptoms would suggest that Squirter may be connected with physiological disturbances arising out of the present ripening and transport methods. The true nature and cause of Squirter is at present under investigation.

LEAF SPOT OF BANANA IN SOUTHERN QUEENSLAND.

Dr. B. T. DICKSON, Chief, Division of Economic Botany, Council for Scientific and Industrial Research.

AS soon as any plant is grown intensively and extensively as a crop, it becomes liable to suffer from diseases which more or less affect the vitality of the plant and reduce the yield, and to this generalisation the banana is no exception. Some diseases require the interaction of an insect carrier which transmits a highly infectious "virus" from plant to plant, and even the best tended plantations may be devastated by such a disease as the now well-known "bunchy top." In other cases general conditions of hygiene in the plantation, combined with unfavourable climatic environment for the time being, bring into prominence a disease which may in other seasons not be a serious factor. It is to this latter group that the disease at present under consideration apparently belongs.

As a result of the perturbation among banana growers in Southern Queensland occasioned by the prevalence of Leaf Spot, the Hon. W. Forgan Smith, Secretary for Agriculture and Stock in the Ministry of the Government of Queensland, requested the Commonwealth Council for Scientific and Industrial Research to enable the writer to undertake a survey of the situation. In the course of this investigation the following places were visited:—

22nd, 23rd, 24th June: Gympie, Scrubby Creek, Goomboorian, Cedar Pocket.
25th, 26th June: Cooran, Kinkin, Pinbarren, Traveston.
27th June: Eumundi, Belli, Manni road.
28th June: Landsborough, Bald Knob, Mount Mellum.
1st July: Montville.
2nd July: Ormeau.
3rd July: Southport.

Findings.

In every plantation except at Southport (where the bananas were surrounded by salt water) Leaf Spot was prevalent. In most cases it was causing serious loss, and it will have definitely reduced the yield of bananas by the end of the winter season. It was quite common to find plantations where but few of the bunches now formed will fill out and mature because of the complete dying of the foliage. Furthermore, the disease is manifesting itself in young non-bearing plantations, and this naturally causes serious worry among the growers as to the fate of future crops.

During the tour the weather was unpleasantly wet and cold, but it served to show that many of the plantations are on ill-drained and unsuitable soil even though on a steepish slope. Such plants were found to have an extremely poor root system, almost all the roots being brown and rotten. Again, borer was too prevalent, and but little attempt was made in many cases to check its spread. Some growers who had taken precautions to check borer, as recommended by the Department of Agriculture, were satisfied that, although it was not a complete check, it was worth while. Unfortunately, part of the industry is "nomadic," in that after three years a plantation is forsaken and another started. The old plantations must undoubtedly become a great breeding-ground for borer and fungi, from which newer neighbouring plantations may automatically become affected.

Another striking feature was the fact that cold weakened the foliage in some plantations and here Leaf Spot was making rapid headway.

The point in noting the above-mentioned facts is that I feel this season's condition to be the culmination of a series of troubles. The organism causing Leaf Spot is possibly seasonal and not likely to be a very strong parasite. Given poor root systems, borer at work, soil not suitable, cold and wet weather, and there is a combination to suit the fungus which has gradually been gaining momentum in the plantations. Debilitated plants succumb under such a combined attack as one would expect. It is interesting to note that the youngest leaves are not usually seriously affected, even when older leaves are hanging dead, until the bunch begins to mature, and they then become spotted from the tip back until they in turn die.

Characteristics of the Disease.

As the name indicates the chief symptom of the disease is the spotting of the leaves. The lower leaves are affected first, the number of spots appearing depending on the conditions for infection in the plantation. If there is an abundance of

diseased foliage and rains are frequent there is also an abundance of infection, and it appears as if the disease gradually gets up a momentum so that there is a serious increase in its severity.

The middles of the rather oval spots die and become somewhat ashy brown in colour, and later a fungus develops its spore-bearing bodies in that dead tissue. From these small black fungal bodies many thousands of spores are spread during continued wet or muggy weather.

Gradually the spot invasion reaches the upper leaves, those below being now dead and hanging down against the stem. It was a common sight to see a plant with but three living leaves left at the growing point, and when the bunch is attempting to mature fruit it needs all the foliage possible since it draws upon the leaves for its starch. In some cases the bunch was developing sufficiently fast and was already near enough shipping maturity that it would just scrape through, but much more frequently it was just reaching that stage of maturity when the demand on the few remaining leaves was heaviest. At this time they also became infected with Leaf Spot and rapidly succumbed so that the bunch could not mature.

A disease such as this occurring in banana plantations on hillside slopes is not easy to control by spraying or dusting for obvious reasons, and until a thorough study is made none but general recommendations can be suggested. It does appear, however, that the general cleanliness of the plantation, the state of culture, and consequent health of the plants is important. It is worth while therefore for growers to consider cleaning up abandoned plantations, keeping down diseased trash in present plantations, and obtaining clean suckers for future plantings. The provision of a windbreak between plantations might also protect a clean area.

Suggested Investigations.

It must be clear to a thinking grower that some time to study the disease and its attendant conditions must elapse before any definite remedial measures can be proposed.

In view of the above facts and others not given in so general an account, the following points are noted as some of the phases requiring investigation:—

1. Study of the organism causing Leaf Spot to determine its identity, temperature and humidity relations, method and conditions for infecting the leaf, conditions of spore development, longevity of the organism in dead leaves and of the spores when free (wind blown, &c.)

2. Effect of leaf age on infection. Effect of root injury, due to water-logging, or excessive drying; or fungal attack and infection by borer, and the susceptibility of the plant to infection. Effect of cold and of malnutrition from poor soil and the susceptibility of the plant to infection.

3. Amount of spot in summer as compared with winter. First occurrence in autumn and winter. Relation of occurrence to dew or rainfall or generally cloudy conditions.

4. Control measures, such as dusting with copper-lime dust, trimming affected leaves as soon as possible in season (trashing), liming soil, draining water-logged areas, cultural practice modification (chipping, cover crops, &c.), baiting for borer.

5. Relation of "freckle" to leaf death and its possible inter-relation with Leaf Spot.

6. Comparison with possibly similar diseases occurring elsewhere than in Australia.

Recommendations.

As noted above it is obvious that some time must elapse before the full story of the Leaf Spot disease can be set down. A start has already been made by Mr. Simmonds, of the Department of Agriculture. Full time work on diseases of banana and pineapple is quite justified by the economic importance of the industry in Queensland.

The suggestion is made, therefore, that Mr. Simmonds be freed from other duties to concentrate on banana and pineapple diseases. I feel that, given the opportunity and the facilities, he already is sufficiently aware of the problem to make good headway. In so far as my other duties permit it will give me pleasure

to afford such help to Mr. Simmonds as he may from time to time require. I trust also that the growers will back up any investigation with wholehearted co-operation. There is definite evidence of interest on the part of many of them which is most encouraging.

Acknowledgments.

It affords me great pleasure to express my appreciation of the facilities afforded me and of the many personal kindnesses shown during the survey. To Hon. W. Forgan Smith and Mr. Graham for departmental hospitality and help, and to Mr. Veitch and Mr. Simmonds for personal company and field knowledge freely placed at my disposal, to Mr. Ranger and Mr. Ellison for detailing the trip so that the Committee of Direction officers were available in each district, to those officers for their excellent arrangements in spite of inclement weather, and to the growers who were good enough to attend in considerable numbers in spite of work and weather, my thanks are due.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1928.	Sept., 1927.
North Coast.	In.		In.	In.
Atherton	0·70	27	0	0·28
Cairns	1·75	46	0·10	1·45
Cardwell	1·60	56	0	1·37
Cooktown	0·60	52	16	0·43
Herberton	0·51	41	0	0·17
Ingham	1·59	33	0	2·52
Innisfail	3·72	47	0·02	1·70
Mossman	1·64	15	0·11	1·14
Townsville	0·87	57	0	1·07
Central Coast.				
Ayr	1·55	41	0	0·95
Bowen	0·87	57	0	0·97
Charters Towers ..	0·80	46	0	1·02
Mackay	1·67	57	0	1·42
Proserpine	2·35	25	0	2·42
St. Lawrence ...	1·31	57	0	1·12
South Coast.				
Biggenden	1·64	29	0·29	1·47
Bundaberg	1·71	45	0·15	1·00
Brisbane	2·03	77	0·78	1·77
Caboolture	1·95	41	0·20	3·15
Childers	1·90	33	0·57	1·89
Crohamhurst ...	2·79	35	0·25	6·14
Esk	2·24	41	0·82	1·60
Gayndah	1·60	57	0·19	3·13
Gympie	2·17	58	0·24	2·41
Kilkivan	1·76	49	1·21	0·98
Maryborough ...	1·99	56	0·41	2·09

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1928.	ept.,[1] 1927.
South Coast—continued:	In.		In.	In.
Nambour	2·70	32	0·42	6·97
Nanango	1·90	46	0·09	0·54
Rockhampton ...	1·40	41	0	1·39
Woodford	2·29	41	0·60	5·20
Darling Downs.				
Dalby	1·75	58	0·15	0·37
Emu Vale... ...	1·84	32	0	0·29
Jimbour	1·58	40	0·02	0·68
Miles	1·44	43	0·03	0·25
Stanthorpe ...	2·37	55	0 36	0·51
Toowoomba ...	2·22	56	0·26	1·49
Warwick	1·86	63	0·02	0·61
Maranoa.				
Roma	1·52	54	0	0 56
State Farms, &c.				
Bungeworgorai ...	1·17	14	0	0·03
Gatton College ...	1·65	29	0·14	1·27
Gindie	1·11	29	0	0
Hermitage ...	1·61	22	0	0·68
Kairi	0·72	14	0	0·29
Sugar Experiment Station, Mackay	1·63	31	0	2·17
Warren	0·89	14	0	1·25

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

Cotton-Growing in Queensland.

The results obtained in the last six seasons have demonstrated that the Cotton Plant can be successfully cultivated over a large area in Queensland. During this period a variation in seasonal conditions, ranging from drought to flood, has been experienced. In each of the seasons referred to, however, splendid yields have been obtained by farmers in the majority of the main cotton-growing areas. It was only to be expected that at the revival of operations in cotton-growing in this State a number of unprofitable yields should be individually recorded, owing to the inexperience of the growers and the lack of knowledge of the correct methods to be adopted. Decided progress has, however, been made in each successive season, until there are at present many successful cotton-growers in the State.

This article is issued at the direction of the Minister for Agriculture and Stock (the Hon. W. Forgan Smith) in order that the primary producers of the State may be made acquainted with some of the factors which have a direct bearing on the yield obtainable from a crop of cotton. In addition to this feature, several phases of the major problems which confront cotton-growers are discussed, and the activities of the Department of Agriculture and Stock in its aim to assist in the solution of these problems are described.

INCREASE IN THE AVERAGE YIELD PER ACRE.

Problems for the Grower.

There are so many factors entering into the problems of increasing the average yield per acre that it is exceedingly difficult to lay down any "hard and fast" rules for growers to follow. Each has to experiment and determine the value of any particular method when applied to the soil and climatic conditions. The suggestions embodied in this Bulletin have been arrived at as a result of observations made in commercial crops, and in experiments with farmer co-operators, over a wide range of soil and climatic conditions during the past six seasons.

Soils.

In the early stages of the present revival of cotton-growing in this State, there was much confusion of thought as to the most suitable soils for the purpose. Realising this point and taking into consideration the inexperience of the growers, the guaranteed advances of the Queensland Government were made sufficiently high to allow of a test of cotton-growing in all classes of soils, and an excellent demonstration of the suitability of the various soils was thus afforded. At the

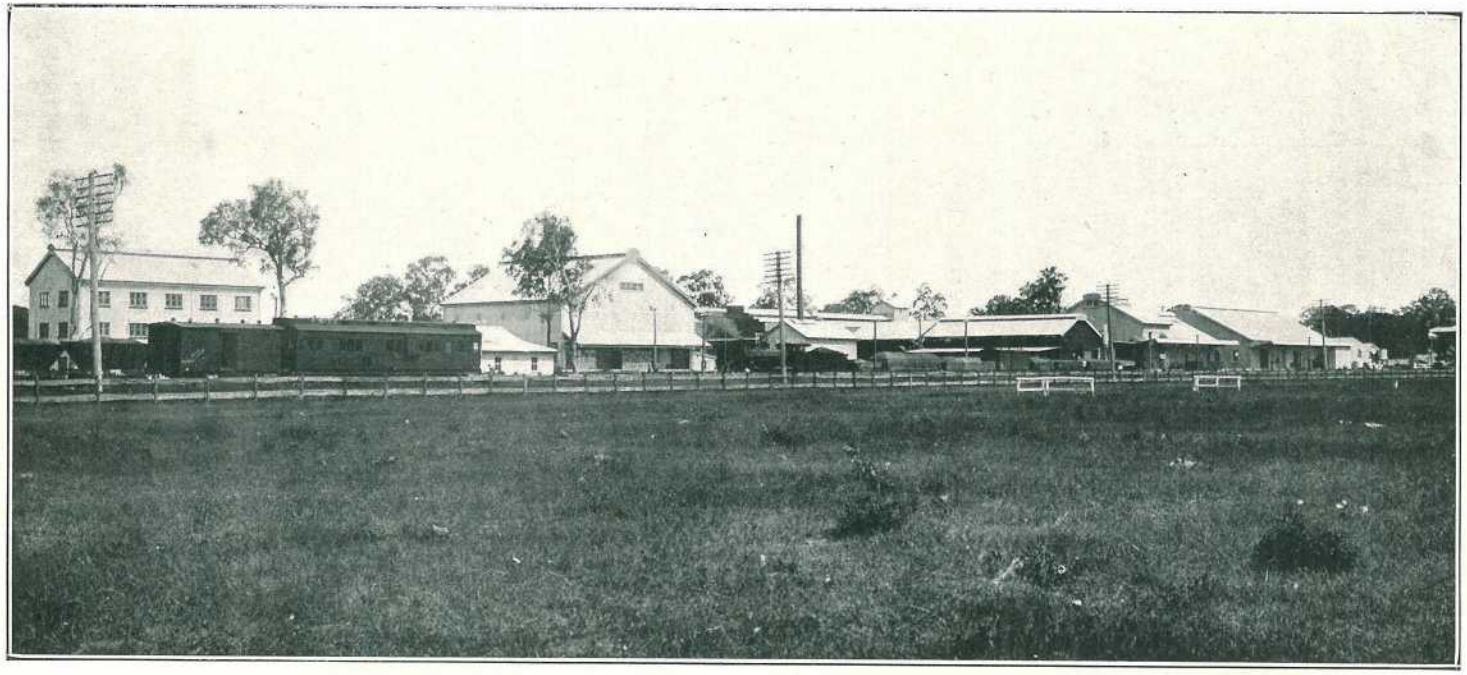


PLATE 124.—COTTON GINNERY AND OIL MILLS, WHINSTANES, NEAR BRISBANE

termination of the system of guaranteed prices, a fairly clear general definition had been obtained of the most suitable districts, and, to some degree, the most suitable and unsuitable soils for cotton-growing.

Broadly speaking, the most suitable soils are those of a loamy nature overlying a clayey subsoil to a depth of 1 to 3 feet. There appears to be a wide range of soils of this type, varying from the sandy and heavy alluvial loams to the heavy loams of the mixed brigalow and soft vine scrubs. Cotton crops grown on such a combination, whilst they seem to have a high degree of productivity under drought conditions, are also able to produce a normally developed plant in a wet season. The explanation appears to be that the clayey subsoils hold the moisture up to the lower lateral root system. In a dry season, the moisture is thus available, whereas in a wet one the tendency to thorough saturation produces what has been described as a "physiological drought effect." Under the latter condition there is so much moisture around the root system that there is a restriction of the amount of available plant-food.

The quality of the soil is an important factor in successful cotton-growing.

It is essential in every type of soil that there shall be a proper balance of readily available plant-food. On some very fertile soils of great depth, where this balance is present rank development may occur at the expense of fruiting, when excessive rainfall is experienced. Generally in the case of any peculiar growth, other than that caused by loss of crop through some external agency such as insect attack, &c., the soils can be suspected to be lacking in some of the plant-foods required by the cotton plant or containing insufficient humus. It is suggested that each grower should check the yields of the various portions of his crop and thus determine which portions are non-profitable producers. An analysis of these sections may show either that the fault can be easily corrected or that the remedy which might be suggested to make it a productive area could not be favourably considered from an economic standpoint.

Preparation of the Seed-bed.

The general experience of most of the cotton areas has been that the early preparation of the seed-bed assists in obtaining a good yield. Several factors appear to be involved in this phase of cotton-growing, the chief of which is the effect on plant growth and insect life. Owing to the light rainfall of the usual autumn and winter seasons in the cotton belt it is often difficult to prepare a proper seed-bed. Consequently, if the preparation is delayed until the early spring months, such a short time elapses before the usual planting rains set in that the seed-bed is of an open nature and is generally lacking in moisture in the lower levels. From results obtained on the Callide Cotton Research Station, growers have had it demonstrated to them that, by the preparation of the seed-bed as soon as possible after the old crop has been harvested, a strike may be obtained on the first planting rains which will be maintained over a dry period of some length.

The old crop should be cut off and burned and the land ploughed by the end of July if possible. Not only does this provide a period of from seven to twelve weeks before planting-time for the seed-bed to firm,

but much destruction of any pupæ of injurious pests is accomplished. It is strongly recommended that the bushes be cut off and burned instead of ploughed out or under, as is done in some cases. A modification of the old slide maize-cutter can be constructed to cut the plants at small expense, and a thorough clean-up is easily effected by dragging the cut bushes together by means of harrows.* This allows of the destruction of large numbers of Stainer insects as well as any pests which may be in the unopened bolls.† The burning of the old plants also allows of the preparation of a firmer seed-bed than is the case where the plants are turned under.

Planting Seasons.

In every one of the last six seasons the general experience has been that early planting gave profitable results. The explanation appears to be that the seasonal conditions during October and November are conducive to the development of a well-fruited plant, where the sowing has been made in the latter half of September or the first half of October. The night temperatures are then generally low, and ordinarily, only light storms are experienced. The seedlings make a slow growing stocky plant with a good root system under such conditions, and after the summer rains commence in December a splendid fruiting system is developed. Such a structure usually produces a sufficient crop of squares and bolls to control the plant's growth during the wet season in late January and February, unless the soils are exceptionally fertile and very heavy rainfall is recorded. Even in cases where these conditions occur, the early planting of crops tends to prevent excessive growth.

Sow your cotton seed in late September or early October.

It appears at present that early planting offers the best and most economical means of escaping serious attacks of the Corn Ear Worm (*Heliothis obsoleta*). In each season excellent yields of cotton have been obtained at the Callide Cotton Research Station from early planted plots, while late planted cotton in close proximity to the early plots has been so seriously attacked that no crop was harvested. It is believed that the controlled growth of the early-sown crops which causes a slow toughened development of the plants, together with the fact that a large amount of squares are being developed when the heaviest broods occur, are responsible for the good yields even when the Corn Ear Worms are known to be present in large numbers. A considerable loss of squares on early-sown plants may result from attacks by this grub, but the heavy rate of setting of squares still permits of the production of a profitable crop of bolls. The reverse conditions generally exist in the late-sown crops where the plants are making a soft sappy growth under the extremely forcing conditions of the hot "wet season" months, and any removal of the light crop of developing squares accelerates the rate of growth without an accompanying increase in the rate of setting of squares. The result is often a tangled mass of rank vegetation with only a light crop of bolls which, in districts where frosts occur, are seldom harvested.

* A description of this machine was published in the June, 1928, number of the "Queensland Agricultural Journal."

† Detailed descriptions of the various insect pests which attack cotton in Queensland are given in the Bulletin "Cotton Cultivation in Queensland," published by the Department of Agriculture and Stock in 1928.

Planting Methods.

The average cotton-grower does not sow a high enough rate of seed. The rate of sowing advocated by the Department, and which is the one adopted by the Cotton Board in the distribution of the planting seed, is 20 lb. to the acre. It is known, however, that large numbers of the growers only plant at rates varying from 10 to 15 lb. to the acre. This is a mistake, as the seed costs only a penny a lb., and though a small initial saving is made by planting at a lighter rate, a much lower financial return is generally secured owing to the occurrence of gaps in the stands obtained. The argument is often advanced that the lighter sowing facilitates thinning and thereby reduces the cost of that operation. The slight saving which may be effected, provided the thinning is carried out at the proper time, is more than off-set by the loss of stand in the lighter sowings. One has but to endeavour to space an experiment requiring an 18 or 24 in. spacing in a crop sown at the rate of 15 lb. to appreciate the large number of gaps in a field where such a spacing cannot be accurately obtained. It is believed, therefore, that 20 lb. should be the lightest rate used, and where there is danger of the soils crusting if rains fall after planting, an even higher rate may be used to advantage.

Thinning.

The thinning of the crop is often looked upon as a very expensive operation and, in some cases, as unnecessary. The results obtained over most of the cotton areas by growers, and also in experiments, indicate that thinning is a necessary operation. It need not be as expensive as many growers make it, however, if the work is done at the proper time and with the correct implement. The writer has seen many growers using amongst small plants heavy unsharpened chipping eye-hoes with crooked "sapling" handles, with an expenditure of energy that would have removed good-sized weeds. If the proper cultivation has been maintained, the thinning can be performed with a light goose-neck garden hoe. This implement is operated with considerably more accuracy and less effort than is the heavy chipping hoe, with the result that an energetic person can thin up to 3 acres a day.

Cultivation.

Cultivation is one of the most important operations in growing a crop of cotton, and yet it is astonishing that so little study is given to this subject by many of the growers. Four cultivations, at least, should be given to the average cotton crop, and therefore every effort should be made to have each operation efficient. Particular attention should be given to the kind of points required at each cultivation and especially to the set of inner points next to the plants, as it is by the proper use of the cultivator that much hand labour can be eliminated.

There are several types of suitable cotton cultivators now obtainable in Queensland, all of which embody the principle of driver-steered machines rather than the rigid tongue machine which is steered by guiding the horses. Much finer work close to the plants can be performed by the former machines, as in this type the steering is done by the driver operating either the wheels or by a movable foot-steered suspended carriage. These machines can be fitted with various points such as diamond-pointed teeth, 8, 10, and 12 in. sweeps or duck feet, half steels, hillers, and on some machines the carriage for attaching points can be exchanged for one with discs. With such an assortment

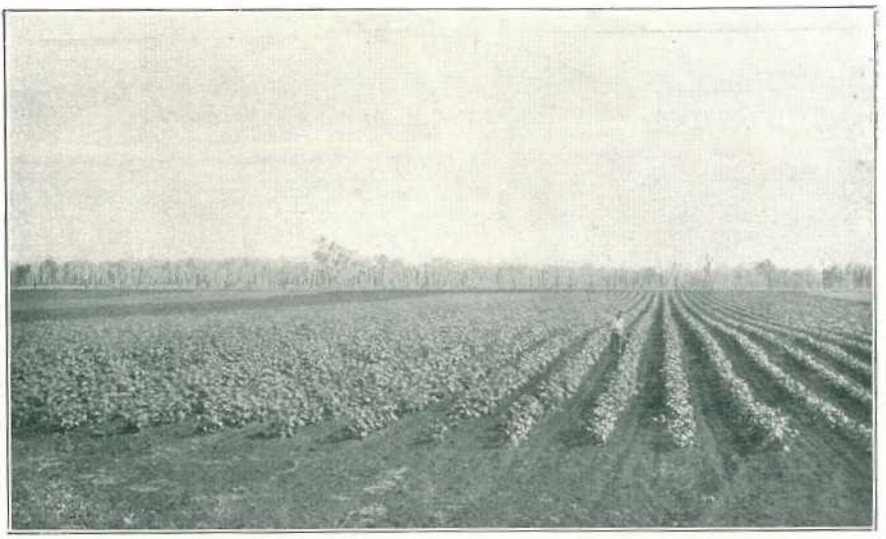


PLATE 125.

Plant long, straight rows and thus improve the efficiency of the cultivating machinery through the class of work performed and by the additional acreage covered per day. Short rows increase the number of turnings per acre with a consequent loss of time. Experiments have failed to demonstrate that there is any advantage obtained by planting the rows according to the compass, therefore plant the long way of the field if the slope of the land allows.

PLATE 126.

Start thinning when the plants are from 4 to 6 inches high and complete the field by the time the plants are from 6 to 8 inches high. The plants in the illustration average 6 inches in height.

PLATE 127.

Illustrating efficient cultivation. The plants in the foreground are velvet bean seedlings, which are very brittle, yet with the equipment being used no damage was done to them. The soil is of a clayey nature and the cultivating is being done three days after a hard rain.

PLATE 128.

Illustrating a well-cultivated field. Note the good stand of plants right up to the end of the rows.

of equipment for the cultivator, a grower can obtain the right combination for each particular operation and thus ensure a maximum of efficiency.

All the factors which have been touched upon contribute to the increase in the yield of seed-cotton per acre, and in several respects to the improvement of the quality of the cotton produced. They are, therefore, of extreme importance, as the increase of the yield per acre offers the most promising means for the reduction of the cost of production, which in conjunction with the improvement in the quality will result in an increased net return to the grower.

COST OF PRODUCTION.

The reduction of the cost of production is the big problem of the Queensland cotton-grower and, while it may be difficult in some instances, it is believed that most of the growers can make substantial improvement in this respect. In the majority of the cotton-growing areas of this State the land values are relatively low to those existing in the districts where other farm crops are grown which would give returns comparable to those obtained from cotton, and the interest on investment in land is thus proportionately less. The amount of machinery required to grow cotton in an economical way, however, totals in the neighbourhood of at least £150, exclusive of the necessary horses. The yearly interest and depreciation on this capital investment therefore amounts to an appreciable amount. Where a farmer is growing only cotton, the whole sum has to be charged against this crop and it is necessary that there should be sufficient acreage under crop to keep the expenditure per acre on a reasonable basis. As one man can cultivate 40 acres of cotton with equipment costing the abovementioned sum, it will be seen that any crop acreage of less than this amount would increase the overhead expense per acre.

Up-to-date methods of cultivation reduce the cost of production and increase the acreage yield.

In most of the main cotton-growing areas where large blocks of suitable land may be obtained, one man, with the help of extra labour at thinning time, can take care of 40 acres if he farms properly. In farming properly, he will need to pay attention to the various factors which have been pointed out as bearing on the yield per acre. As several of these factors may affect the quality of the cotton produced, it would appear that there should be a high degree of correlation between the most efficient use of machinery and the production of yield and quality thereof. As these factors all affect the cost of production and the net return obtained per acre, it is believed that every grower should study the size of his acreage and endeavour to ascertain if he is getting the fullest benefits from cotton-growing that he is able to obtain from his farm.

When the possibilities which cotton-growing offers in this State become more fully appreciated, it is considered that the resultant increased area per individual and acreage under cotton will permit of a substantial decrease in the ginning and marketing charges, and may also assist in obtaining a greater return from the seed. It is to be

hoped, therefore, that the difficulties which have been experienced in the spinning industry in this country will be remedied so that the Queensland cotton-growers will have reason to place every confidence in the future of the industry. When this confidence is established it is anticipated that the various factors which have been discussed in this article will become of extreme interest to cotton-growers, and that the value of the suggestions which have been made will be amply demonstrated.

QUEENSLAND GOVERNMENT ASSISTANCE TO COTTON-GROWERS.

The State Government realised when instituting the system of guaranteed advances to encourage farmers to grow cotton, that a careful study of the problems connected with cotton-growing was necessary if the industry was to be permanently established. A Cotton Section has, therefore, been developed in the Department of Agriculture and Stock to deal with the growing of this crop, and the proper grading of the article harvested from it. The personnel consists of a Cotton Specialist, in charge, assisted by a Field Staff under a Cotton Experimentalist, and a Grading Staff under a Cotton Classer. A Cotton Research Station has also been established in the centre of the Callide Valley, which is one of the largest cotton-growing districts of the State. To meet the annual recurring expenses of conducting the Station, financial assistance has been granted by the Empire Cotton Growing Corporation for a five-year period which terminates at the end of the season of 1928-29.

The activities of the Cotton Section of the Department can be briefly grouped under the following headings:—

(1) Research investigations into the various problems connected with the growth and development of acclimatised strains of cotton.

(2) Ascertaining and demonstrating the application of the results obtained at the Research Station to the various climatic and soil conditions existent in the different cotton-growing areas.

(3) Introduction of the possible suitable varieties of cotton, and the development of acclimatised strains with tests in the different districts.

(4) Assistance in the conduct of entomological investigations relating to insect pests attacking the cotton plant, with demonstration of the application of prescribed remedial measures.

(5) The establishment of standards of seed cotton for grading the cotton as it arrives at the Ginnery.

(6) The classification of the ginned product for marketing purposes.

The Department of Agriculture and Stock invites the co-operation of cotton-growers in an effort to firmly establish the industry.

For administrative purposes, the cotton belt, which roughly extends from the Boonah district in the South to the Rockhampton

district in the North, and includes the inland valleys between the Coastal and the Main Dividing Range, has been divided into three districts with headquarters at Ipswich, Maryborough, and Rockhampton. A Senior Field Officer of the Cotton Section is stationed at each of the centres mentioned to conduct the various activities of the section in the respective areas. During the off-grading season, the cotton-graders attached to the Cotton Section are detailed to assist in the conduct of experiments with the grower co-operators.

Each season a total of 100 to 150 experiments are arranged with growers, dealing with varietal and fertiliser tests, investigations in the spacing of the rows and of the plants in the rows, the effect of different heights of thinning, soil studies, &c. Finality is not reached in many of these experiments owing to varying causes, but each season provides an accumulation of evidence on the various problems which eventually may allow definite answers to be obtained in connection with many of them. The conduct of these experiments and the close study necessary to obtain satisfactory results from them have provided an excellent means for training the Field Staff in the problems incidental to the growing of cotton in this State, and it is believed that the Department has a staff of investigators in cotton-growing which will be able to give increasingly valuable assistance to the growers coincident with the development of the industry.

Establishment of Research Station.

Much of the experimental work of the Field Staff, as has been stated, is based on the study of the application of results obtained at the Cotton Research Station. It was appreciated at the beginning of the organisation of the Cotton Section, that many problems existed which would require such careful study that an Experiment Station would be necessary. Accordingly, a Station of 400 acres in area has been developed, of which about 130 acres is under cultivation. A staff is maintained at the Station to conduct the technical investigations relating to problems connected with the growing of cotton. As a result, the effect of different cultural treatments on such factors as the rate of square setting and flowering, the rate and time of opening of the bolls and the fibres contained in them, and allied subjects, can all be carefully studied to much better advantage than in co-operative plots.

The activities of the staff also embrace the studying of such factors as the effect of the rotation of crops, the determination of which are the best crops and varieties thereof to use in rotation, the effect of green manuring and of soils and climatic conditions on the various parts of the plant, and similar subjects. Such data often assists in explaining any peculiar results obtained in experiments, and the experiences of cotton investigators in other countries indicate that the tabulation of such information is essential.

Activities of Field and Grading Staff.

In addition to these features of the activities of the Cotton Section, a comprehensive system of seed acclimatisation has been developed. Marked improvement has already been effected in the commercially grown variety, and there is little doubt that in each successive season the seed supplied to growers will show improvement in quality.

It has been the policy of the Department of Agriculture and Stock to ensure that, if possible, only one variety of cotton should be grown in

Queensland. The experiences of other countries all indicate the many advantages that are to be obtained where it is possible to concentrate on only one variety. It is especially desirable that such should be the case in this State on account of the comparatively small amount of cotton produced, and also of the fact that the crop is sent to only two or three centralised ginneries. A multiplication of varieties would increase the difficulties connected with the storage of cotton of the different grades and staples, and would also endanger the maintenance of the purity of the plant seed. Accordingly, the endeavour to obtain strains of the one variety acclimatised to the different districts is one of the most important features of the breeding work of the staff.

The Cotton Section also co-operates with the Board controlling the Cotton Pool in the heating of the planting seed for the destruction of insect pests. The Department of Agriculture secured two Simon's heaters, which have been loaned to the Cotton Board, and an officer of the Cotton Section is always present to keep a check on the temperatures during the heating operations. As a check on these operations, a range of samples of the treated seed are submitted to the Seed Investigation Branch of the Department for testing as to germination powers. It can be seen, therefore, that a comprehensive scheme for the development, maintenance, and supply of suitable planting seed has been evolved.

It was realised that in conjunction with the development of a Field Staff to deal with the cultural and breeding problems it would also be necessary to develop a system whereby the cotton crop would be properly graded, if the grower is to obtain the full benefit of his labours. The services of a Cotton Classer, with experience in the United States in handling cotton of similar characteristics to those of the Queensland crop, was therefore obtained from Liverpool. A staff of trained wool classers was recruited for training in cotton-grading under the Cotton Classer. Sets of the World's Universal Standards for American Upland Lint Cotton were also obtained and standards for seed cotton which when ginned would give lint values equivalent to the various lint grades of the World Universal Standards were established.

Cotton-growers would assist the graders if they made an endeavour to blend the contents of each pack.

Uniformity in Grading.

A marked improvement in the uniformity of the grade within the one bale of lint was obtained under this scheme of operations, and as the graders have been employed for the last five crops a well-trained grading staff is now available. It may be pointed out, however, that the cotton-grower must assist the grader if the proper degree of uniformity is to be maintained. It is not expected that the grower should grade his cotton and pack the different grades into separate wool packs for despatch to the ginnery, but it is considered that each grower should endeavour to blend the contents of each wool pack. Many wool packs as they are fed up the suction spout to the gins show layers of cotton of different grades. The containers had been filled by emptying the picker's sacks straight into the pack, thus forming layers of different grades according to the cleanliness of each picker. Efforts are made to

obtain a uniform grade of such cotton by blending the contents of two or three wool packs as the cotton is fed to the spout, but the same uniformity cannot be obtained as in cases where the grower thoroughly mixes the contents of each wool pack before filling it. This is a very important point and every grower should endeavour to eliminate this variation in grade within the one container. With the enlargement of the areas under crop the tendency to empty the picker's sack straight into the wool pack is increasing, and as a result a larger number of bales containing different grades are being produced at the ginneries. These bales of mixed grade represent an economic loss to the Cotton Board, and while the individual grower may not be penalised in his initial advance, he causes a diminution in the amounts of the final advances which are distributed to all the cotton-growers.

PLATE 129.—A QUEENSLAND COTTON FIELD.

Cotton-growing is playing an important part in bringing into cultivation large areas of country which have formerly been devoted only to cattle-raising. The photograph shows portions of a station which ran about a beast to 10 acres. This cotton crop would average a gross return of from £10 to £15 per acre.

As has been stated, during the off-grading season, graders are attached to the Field Staff to assist in the operations connected with the conduct of experiments. This not only ensures the efficient employment of the graders during the whole year, but affords an excellent opportunity for them to study the effects of the different soil and climatic conditions. This training enables them to understand the nature of the various types of cotton which are received at the ginneries, and assists them in the allocation of the consignments to the different grades and staples.

Samples are drawn from both sides of each bale of lint as it is ginned and are forwarded to the Cotton Classer for his inspection and determination of grade and length of fibres, or "staple," as the Cotton trade terms it. This permits of a constant check of the work of the graders at the ginneries and any discrepancies are quickly remedied.

Cotton-growers of Queensland can therefore be assured that their crop will be graded carefully and accurately and any mistakes which may occasionally be made are rectified where possible. Any errors which may be made are generally due to the presence of mixed grades in the one wool pack. The growers must co-operate with the graders by sending only the one grade of cotton within the one container. Where more than one grade is included, it is necessary for the grader to estimate the average value of the contents, which is not only unsatisfactory but slows up the grading operations to an appreciable extent.

It can be seen therefore that the cotton-grower of this State has the effective support of the Government in the solution of problems incidental to success in this activity. Undoubtedly there are many problems to be solved before the full possibilities of cotton-growing are realised. Decided progress can be made, however, if more attention is paid to the points which have been discussed in this bulletin. It is confidently believed that with the passage of time information of decided value to the cotton-grower will be obtained from the comprehensive scheme of operations on which the staff of the Cotton Section is now engaged. Such information, combined with the knowledge of cotton-growing which the farmers have gained by experience, should assist to place cotton-growing amongst the profitable primary industries of this State.

SUMMARY.

Cotton-growing combines excellently with dairying.

Briefly, the situation regarding cotton-growing in this State may be summarised as follows:—

1. Excellent yields of cotton can be produced over a large area of country.

2. The favoured cotton country lies between the coastal and the Main Dividing Ranges and the valuation of much of this country is low in comparison with that of the more closely settled coastal areas. A considerable area of Crown land is also available in the districts suitable for cotton-growing.

3. Owing to the distance of these areas to markets for perishable produce, dairying appears to be the most suitable of the older established industries.

4. Cotton-growing combines excellently with the dairying industry —the cultivation period of the former occurring at such a time as to permit both industries to be practised in conjunction. An attractive feature is that the returns from cotton-growing are received during the period when dairy production is at its minimum.

5. The implements necessary for cotton production can also be used in the production of maize or fodder crops. By a combination of cotton-growing with these industries the overhead expenses are distributed.

6. The general average yield of cotton per acre is much lower than individual average yields of many experienced farmers.

7. The average yield per acre can be appreciably improved if more attention is paid to the selection of suitable types of soil for cotton-growing.

8. The general experience of cotton-growers is that early preparation of the seed-bed and planting as soon as possible after the soils have warmed up sufficiently to promote steady growth gives the best results.

9. Early planting appears to be conducive to the setting of a heavy crop before the "wet season" starts. A reduction of the possibility of loss from attack by the Corn Ear Worm (*Heliothis obsoleta*) seems to be associated with well-fruited early-sown plants.

10. The average grower uses a light rate of seeding under the belief that economies in the thinning operations will be obtained. It is believed that the loss of stand as a result of the adoption of this method more than counterbalances any initial financial gain secured through the limitation of the supplies of seed purchased.

11. The thinning and cultivating operations may be performed more efficiently and economically if the proper implements are used at the correct time.

12. The cost of production in Queensland must be reduced, and the increase of the yield per acre offers the easiest means to accomplish this result. It is considered that if more attention were paid to the different features which have been touched upon in this article, the average yield per acre would show a decided increase.

13. A Cotton Section has been developed in the Department of Agriculture and Stock, to assist the growers in the solution of problems connected with growing cotton in this State. Trained Field and Grading Staffs are actively engaged in the investigation of production and the proper preparation of the crop for marketing.

14. A Cotton Research Station has been established where detailed technical investigations can be made in such problems as the effect on the cotton plant of rotation with different crops, green manuring, cultural operations, and soils. Studies are also conducted in evolving and building up supplies of suitable strains of acclimatised seed.

15. A comprehensive system for the supply of plant seed of suitable acclimatised varieties has been developed for the whole of the cotton belt.

THE VALUE OF MILK.

On account of the amount of water in milk (writes J. A. Ruddick, of the Canadian Department of Agriculture), it is often thought expensive by many who do not know its real food value. This is chiefly because it is in liquid form, and because it is often used as a beverage. Milk, however, has not as high a percentage of water as strawberries, turnips, tomatoes, oysters, and many other foods in solid form. About four-fifths of the human body is made up of water. Although milk contains such a high percentage of water, it is still an indispensable food, because its solids have all the food essentials, which entitles milk and milk products to the main place in the diet of the young and of the old.

THE JOURNAL A GREAT HELP.

A Mulgeldie farmer writes (9th September, 1928)—"I have seen your Journal with one of my neighbours. It will be a great help for me and my family as newcomers to this country."

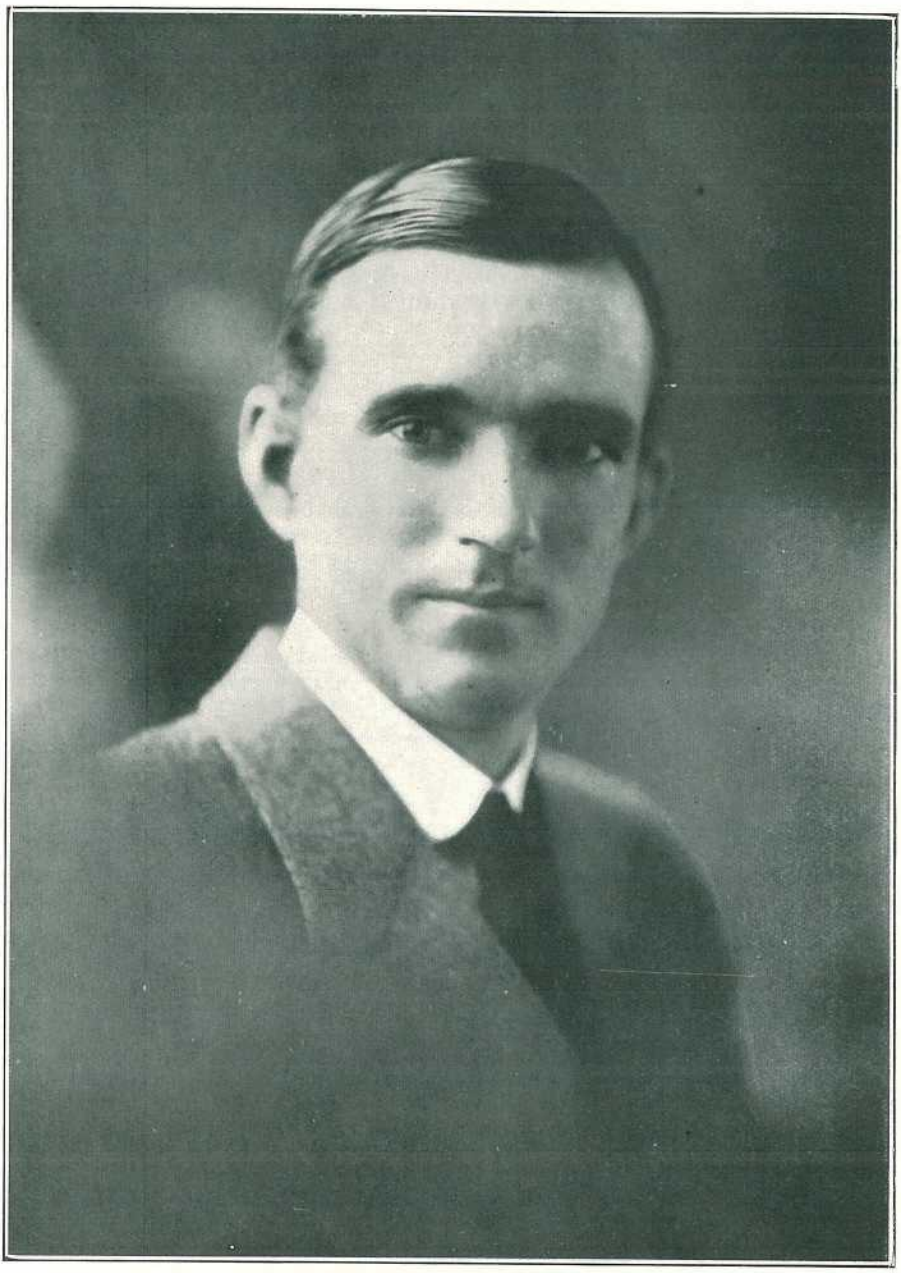


PLATE 130.—THE LATE MR. ANGUS MCTAVISH THORBURN.

OBITUARY.

THE LATE ANGUS THORBURN.

It is with profound regret that we have to record the death, on 2nd October, of Mr. Angus McTavish Thorburn, a Field Officer of the Fruit Branch of the Department of Agriculture and Stock. Although he was only twenty-seven years of age at the time of his death, he had crowded into his life more experiences than usually occur to the average public servant. Joining the Department as a boy he immediately set himself to qualify for admission to the clerical branch of the service, and in less than two years he was able, as a result of night studies, to pass the Public Service Examination. In 1917, when only seventeen years of age, he joined the A.I.F. and proceeded with the 42nd Battalion to France, where a serious wound received on the Somme interfered with his promotion to at least non-commissioned rank. Returning to Brisbane he was attached to the Cane Prices Board, and in the capacity of reporter for that body and compiler of costs of production returns he travelled regularly, until 1923, throughout the whole of the canegrowing districts of the State. He then became associated with the Fruit Branch, and in his usual thorough manner at once started to qualify for the technical side of this section. He passed his examination as an Inspector under the Diseases in Plants Act in 1924, and after five months' service at Rockhampton was detailed for the field staff of Southern Queensland. Here he was regarded as one of the keenest and most efficient members of the Branch. For the past two years he was directly connected with the campaign for the eradication of Bunchy Top.

The late Mr. Thorburn possessed a fine character and was an excellent type of young Australian, mentally alert and physically vigorous. By his devotion to duty he won the high respect of his fellow officers and of those engaged in the industry which he served so assiduously and ably. Added to other excellent qualities was an attractive personality which won for him many friends.

A keen yachtsman, he was the first secretary of the Queensland Yacht Racing Association and a popular member of the Royal Queensland Yacht Club. He was also a member of the Sandgate Yacht Club, under the burgee of which he sailed his own boat, the well-known rater, "Venetia." A skilful skipper and a sportsman in the best sense of the term, he was highly esteemed in aquatic circles. He was also a member of the Sandgate Golf Club.

On 3rd October he was laid to rest in the Lutwyche Cemetery. In addition to his sorrowing relatives and more immediate friends the large gathering at the graveside included many representatives of primary producers' associations and the commercial and official life of the city. Among them were Mr. E. Graham (Under Secretary); Mr. Robt. Wilson (Assistant Under Secretary); Professor E. J. Goddard (Dean of the Faculty of Agriculture, Queensland University); Messrs. E. G. Scriven (former Under Secretary); Richard Short (Chief Clerk); Geo. Williams (Director of Fruit Culture); A. Person, H. Collard, J. Stockdale, R. Prest, H. Barnes, Wilkie Lewis, C. Williams, W. D. Wilson, H. Crofts, A. Green (officers of the Fruit Branch); J. F. F. Reid (Editor of Publications); J. P. Orr (Registrar of Co-operative Associations); John Munro and A. Young (Records Branch); C. McKeon and H. Hunter (Agricultural Branch); M. L. Cameron (Dairy Branch); V. Bohan and W. J. Copley (Accounts Branch); T. A. Powell, E. J. Hoey (Central Cane Prices Board); B. Rice, J. Canniffe (Royal Queensland Yacht Club and Q.Y.R.A.); C. Sheehy and V. Short (Council of Agriculture); G. S. Pratten, S. G. Nevill, R. Miller, G. H. Nash, and J. G. Armstrong (Railway Department).

The casket was covered by the Union Jack, and many of his old comrades of the Australian Imperial Force, including a number of his fellow officers in the Department, attended to pay a last tribute of respect.

The sympathy of the whole community which the late Mr. Thorburn served so well is extended to his young widow and stricken relatives.

ABSTRACTS AND REVIEWS.

"The Timbers and Forest Products of Queensland."

By E. H. F. SWAIN. Handbook of the Queensland State Forest Service—450 pp., 6 plates. Published August, 1928, with foreword by Hon. Thos. Dunstan, M.L.A., Minister for Lands. Price, postage paid—Paper bound, 6s. 6d.; Cloth, 9s. 6d.

"Queensland is a Treasure House of Fine Woods."—Hon. Thos. Dunstan, M.L.A.

Two hundred odd timbers of Queensland are written up in this book. Each tree is fully described, and the principal points of its identification in the field are set forth with a list of the vernaculars in use in various districts. Its geographical distribution is given, with adequate notes upon temperature, rainfall, and soil environment, for the use of silviculturist and acclimatisator. The timber itself is dealt with in extenso; its colour, weight, texture, and appearance described; its characteristic qualities in use discussed; and its applications in industry carefully inventoried. Both its advantages and disadvantages for various purposes are finally summed up.

The two hundred timbers treated are arranged under the Universal Wood Indexing System, so as to permit of ready reference. The System itself is described, and the reader is instructed how to identify wood for himself. An Index itself is appended which enables the wood user and wood lover to critically compare the Queensland timbers with other well-known woods of the world's commerce. Finally, for the guidance of the wood user, prescriptions in Queensland timbers are offered for every possible industrial purpose.

The book is a thesaurus of the most recent information upon the trees and timbers of the State, their availabilities, values, and uses.

But there is a fund of data also in other directions. For the bee-farmer there is a chapter upon the honey flora of Queensland, together with a monthly timetable of the flowering of the native trees and bushes. The charcoal resources of the forests are discussed; the wood pulping pros and cons are set forth, with notes upon the potentialities of the available native material; the tanning materials of the State are scheduled and described; the grass tree gums, nuts, and other forest products are dealt with, and, finally, there are summarised for ready reading the researches which have been made upon the essential oils of the trees and shrubs of Queensland.

The book is a comprehensive compendium of information upon the trees, timbers, and forest products of Queensland. It is a publication for the forest and timber lover, the wood user, the architect, the timber merchant, the sawmiller, the carpenter, the tanner, the bee-farmer, the arboriculturist, the timber-getter, the chemist, the forester, and the acclimatisator.

It should be used in every school in connection with Nature Study, Rural Economy, and Manual Training. It is very readably written, and the average man will find it interesting and informative. It may be obtained through any book-seller or forest officer or from the Secretary, Provisional Forestry Board, Executive Buildings, Brisbane.

GRAPE FRUIT.

By GEORGE WILLIAMS, Director of Fruit Culture.

Several varieties of grape fruit (*Citrus paridisi*) have been introduced into this State, and have been found well adapted to local conditions. Unfortunately there has been some confusion in what really constituted a grape fruit, and the "poor man's orange" of various types has been frequently sold under that name much to the detriment of future sales of the genuine fruit. A Japanese variety catalogued as *Citrus natsumikin* has also tended against the improvement of market prospects. Though resembling the real grape fruit in shape and size, the skin is coarse and the flavour and texture more resembling those of the rough lemon. The difference in general appearance may be noted in the illustration in which Marsh's seedless depicts the typical commercial grape fruit. In California this is practically the only variety grown, and so that standardisation may be reasonably effected it is desirable that a similar course be followed here. Triumph possesses a slightly different flavour which may be more appealing to some palates, but the large number of seeds contained is a disadvantage. Several pink-fleshed varieties have more attractive appearance when cut, but are considered deficient in other important respects. The fruit only requires to be better known to be widely appreciated. It is profusely produced from an early age on trees of hardy constitution and good habit.

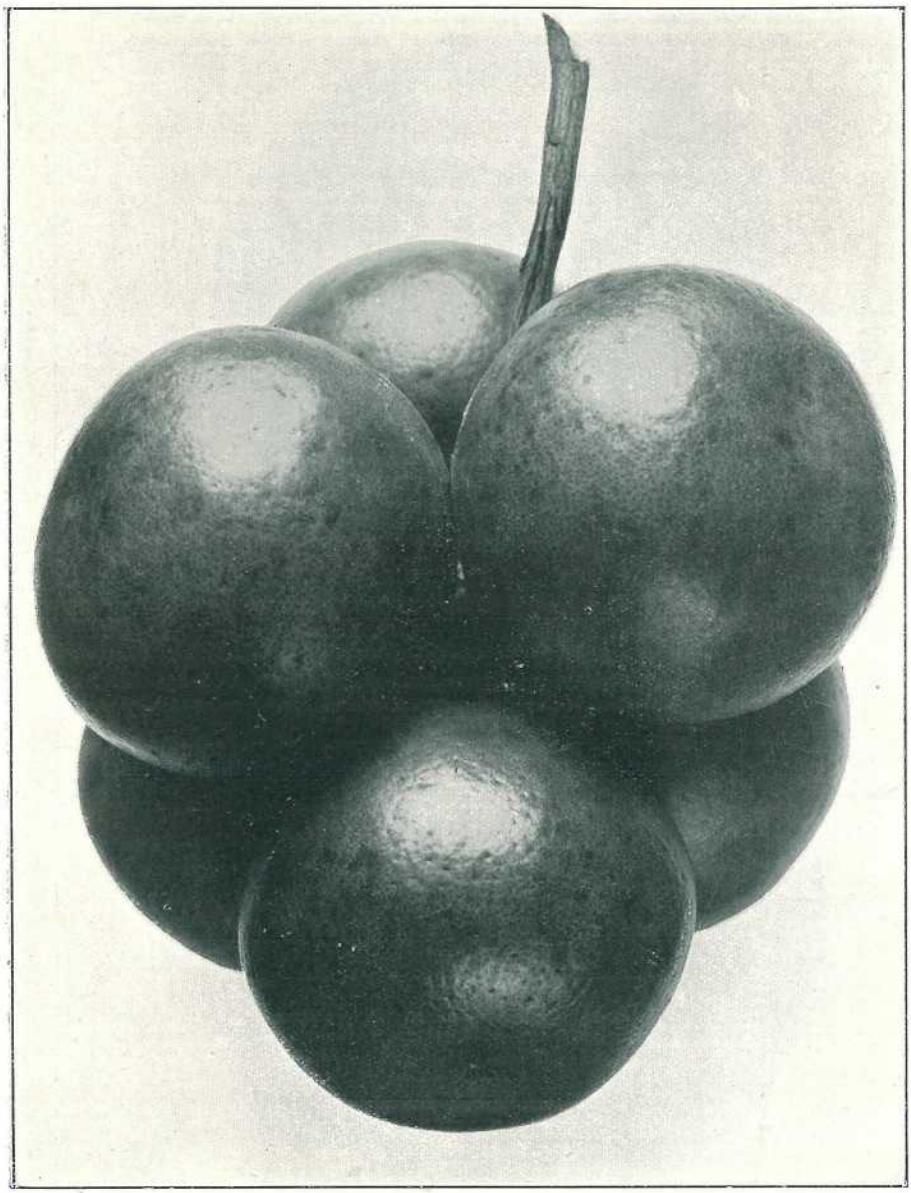
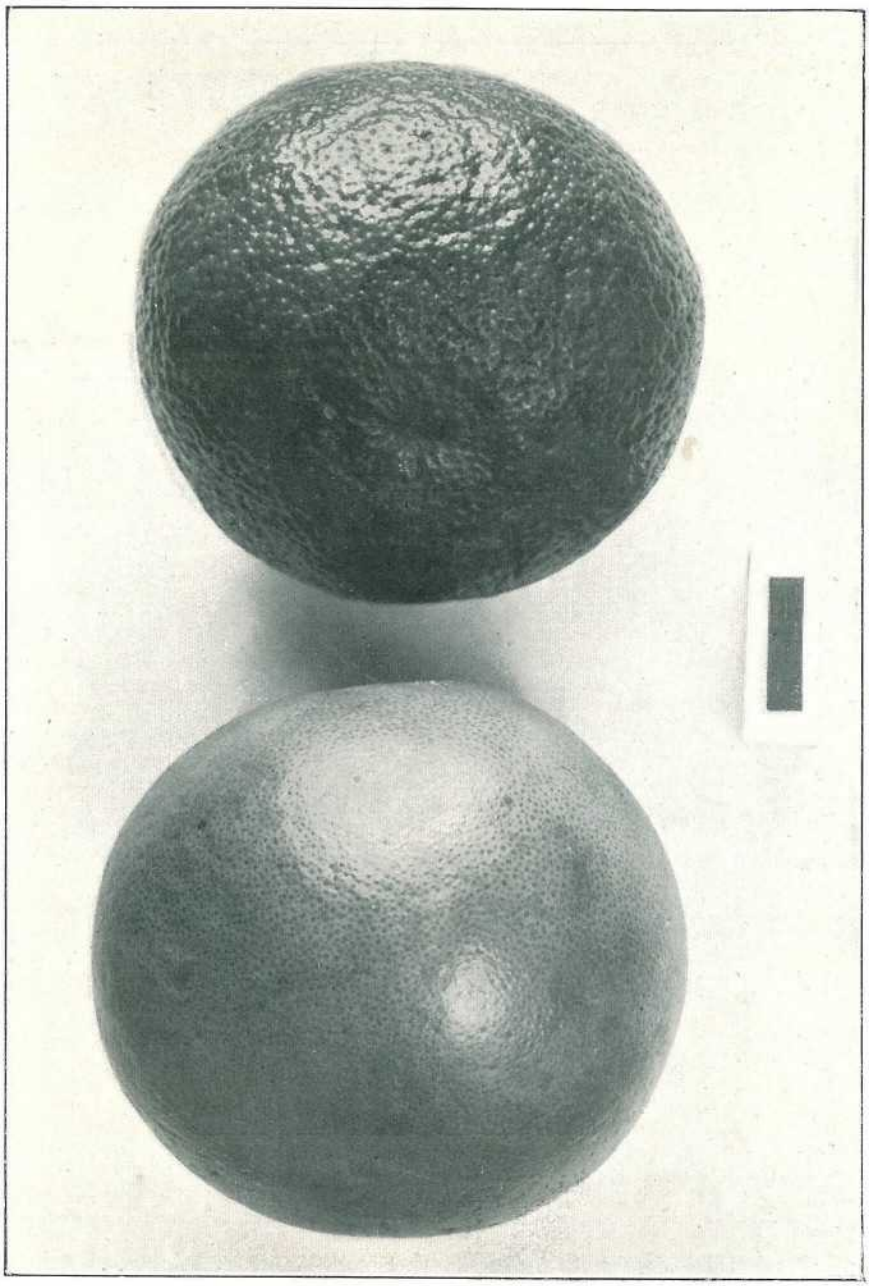


PLATE 131.—MARSH'S SEEDLESS GRAPE FRUIT—HABIT OF FRUITING.



Citrus paradisi (Marsh's). PLATE 132. *Citrus natsumikin.*

QUEENSLAND TIMBERS FOR FISHING-RODS.

By C. J. J. WATSON, Queensland Forest Service.

THERE is an old proverb which says that "a prophet is not without honour save in his own country." Queensland has many such misjudged "prophets" in timber form. Our native timbers are often thought to be inferior to those imported when used for special purposes, and to many people the name "scrubwood" means "useless."

These impressions are entirely wrong. Because a fishing-rod is made of imported Greenheart or Lancewood, it is not necessarily better than the local product. Provided that the same care is exercised in selecting the best trees, and then cutting and seasoning the timber in the correct manner, Queensland timbers will give better results than the imported ones.

A number of Queensland timbers, mostly scrubwoods, which give excellent results when made into fishing-rods are described below. When it is considered that Maple Silkwood (*Flindersia Brayleyana*) and Red Cedar (*Cedrela australis*) (both kings among cabinet woods) are scrub woods, the term "scrubwood" will not be used in a belittling manner.

Saffron Heart (*Halfordia scleroxyla* and *Halfordia drupifera*).—These two woods, also known in different localities as Ghittoe and Kerosene Wood, are so much alike in general appearance and character, that they are sold together as Saffron Heart.

Trees of Saffron Heart occur in coastal rain forests from the border to the Atherton Tableland, with diameters varying from 1 to 3 ft. in mature trees. The best trees occur in the vicinity of the National Park, and in the Atherton district. Supplies for the Forest Service are obtained from Atherton.

Saffron Heart is a hard, heavy, close-grained, highly-elastic and very strong timber. It is saffron-yellow in colour, from which it has been named.

Carefully selected, straight-grained Saffron Heart is more than twice as strong as the best English Oak. Pieces which are sold for "middles" by the Forest Service only $\frac{5}{8}$ in. square and 3 ft. in length, will carry a weight of over 1 cwt. at the centre, when supported at each end.

Saffron Heart is of a greasy nature, and requires a long time to season properly. If made into a rod when unseasoned, it is much weaker, and will not return to its original shape after being bent. This is common to most timbers. Saffron Heart should not be oiled, as it is already naturally oiled. When finished, all that is necessary is a coat of polish or hard varnish to exclude the air. The wood can be made harder and more "steely" by case-hardening the outside of the piece by twirling it over a flame. This hint has been borrowed from the aborigines of North Queensland, who employed this method to harden their spears. It must be remembered that timber shrinks in drying, so that the "middles" and "tips" should be left a little oversize before placing over the flame. If this is not done, the ferrules will afterwards be found to be too big.

Large supplies of fully-seasoned "middles" and "tips" of this timber may be obtained at a cost of 1s. 6d. each at the Fancywoods Section of the Queensland Forest Service, in William Street. All supplies are guaranteed, and pieces which are broken through faulty grain will be replaced, if returned, free of charge.

Queensland Greenheart (*Endiandra compressa*) is a small tree reaching a diameter of about 1 ft. in the coastal rain forests of Southern Queensland. The wood of this tree is extremely hard, close-grained, heavy, and very strong, being equal to Saffron Heart in this respect. The inner heartwood of the tree is a dark-greenish-grey colour when seasoned, and is preferred for rod tips.

Green Satinheart (*Geijera Muelleri*) is also known to bushmen as Greenheart, Axe-breaker, Gap-axe, and Glasswood. The heartwood is very hard, close-grained and heavy, and when fully seasoned is highly elastic and very strong. A large number of the trees of this species are cross-grained and very tough, and are useless for rod tips. Only selected timber should be used.

Brown Spearwood (*Acacia rhodoxylon*) is another timber which was prized by the aborigines for spears on account of its great strength.

The tree grows slowly in very dry country, and seldom reaches a diameter of more than 10 in. It is common in the Rockhampton district, where it is known as Rosewood Wattle.

The wood is dark chocolate-brown in colour, and is very hard, close-grained, and heavy. When dry it has an enormous strength, excelling even Saffron Heart at times, but retaining its elasticity.

Brigalow Spearwood (*Acacia harpophylla*) is similar in character to Brown Spearwood, and occurs in similar districts having a low rainfall, but it is slightly paler in colour, lighter in weight, and more open-grained.

The remarkable strength and elasticity of Brigalow Spearwood is clearly shown by the following details, kindly supplied by Mr. Cross, who is an expert angler and professional rodmaker. He says:—"A light two-piece rod tapering from 5/16 in. to ⅜ in. at the tip, and 8 ft. long, landed a jewfish 14½ lb. in weight. A similar rod 8 ft. long with a cork butt and weighing only 6½ oz. was sufficient to lift a bream 1¼ lb. in weight from the water, and bream struggle hard. Three-piece rods 9/16 in. at the first ferrule (at the top of the butt), 7/16 in. at the second ferrule, and tapering to a 3/16 in. tip will safely lift 7 lb. at the tip."

This is supported by a test carried out by the Queensland Railways, which showed that in bending, Brigalow Spearwood has a modulus of rupture to 25,000 lb. per square inch, which is almost a quarter again as strong as the best Ironbark.

Spotted Irongum (*Eucalyptus maculata*) when straight-grained will give fair service in a rod, but it is not nearly so strong as Saffron Heart and the Spearwoods.

Brown Tulip Oak (*Tarrietia argyrodendron*) makes a good rod if carefully seasoned and made up when it has reached correct stage of dryness. When green, this timber is not elastic, and when too dry it becomes brittle. This tree is very common in coastal scrubs.

Brown Salwood (*Acacia aulacocarpa*) makes a very strong, light rod. The timber is brown in colour, open-grained, and very strong. It is not nearly as heavy as Brown Spearwood.

Trees are fairly common in Southern Coastal Queensland, and are usually found along scrub edges or near creeks. The stems are seldom over 9 in. in diameter, of which a good proportion is pale-coloured and not suitable for rods.

Rod butts may be made from any fairly strong timber which is heavy enough to balance the middle and tip. Those timbers which have a handsome figure are preferred by many fishermen.

One of the most handsome of hard timbers for this work is Tulip Plumwood (*Pleiogynium solandri*), which when polished shows a striped-brown figure like Tulip.

Other timbers with a good figure are Rose Walnut (*Cryptocarya erythroxylon*) and Red Satinay (*Syncarpia Hillii*), while plain-figured woods which work easily and finish with a smooth surface are Orange Boxwood (*Celastrus dispermus*), Rose Marara (*Weinmannia lachnocarpa*), and Yellow Boxwood (*Sideroxylon Pohlmanianum*).

Most of these timbers can be purchased from the Forest Service in butt size for 1s. per piece.

QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Grey Handlewood or Native Elm attains a height of about 60 feet and a stem diameter of nearly 2 feet. The tree shown in the accompanying field photograph is a comparatively small one. The species is known in botanical terminology as *Aphananthe philippinensis*. As the name indicates, the species is found in the Philippines. In Australia it is distributed as far south as the Manning River, according to J. H. Maiden, and has been found as far north as Herberton in Queensland. The wood has been used for axe handles. The leaves are very harsh to the touch, and, on account of the fine, rigid asperities on their surfaces, could be used as a substitute for sandpaper.

Photo.: W. D. Francis.]

PLATE 133.—GREY HANDLEWOOD, *Aphananthe philippinensis.*
A tree in the "scrub" near Goodna.

PLATE 134.—GREY HANDLEWOOD, *Aphananthe philippinensis*.
A, flowering twig; B, fruit-bearing twigs; C, coppice shoot.

THE ALGAROBA OR MESQUITE TREE IN CENTRAL QUEENSLAND, *Prosopis juliflora.*

G. B. BROOKS, Senior Instructor in Agriculture.

REFERENCE has been made in previous issues of the "Queensland Agricultural Journal" to this tree, the pods of which are of considerable value as a stock fodder. As showing the interest readers of the Journal take in the subject-matter appearing therein, as a result of an article contributed by the writer on the Algaroba, over 300 applications were received for seed.

This particular distribution was made just prior to the 1902 drought. Many reports have been received from applicants in which they have advised that they either failed to germinate the seed, or were unfortunate in that through adverse conditions the plants perished after transplanting.

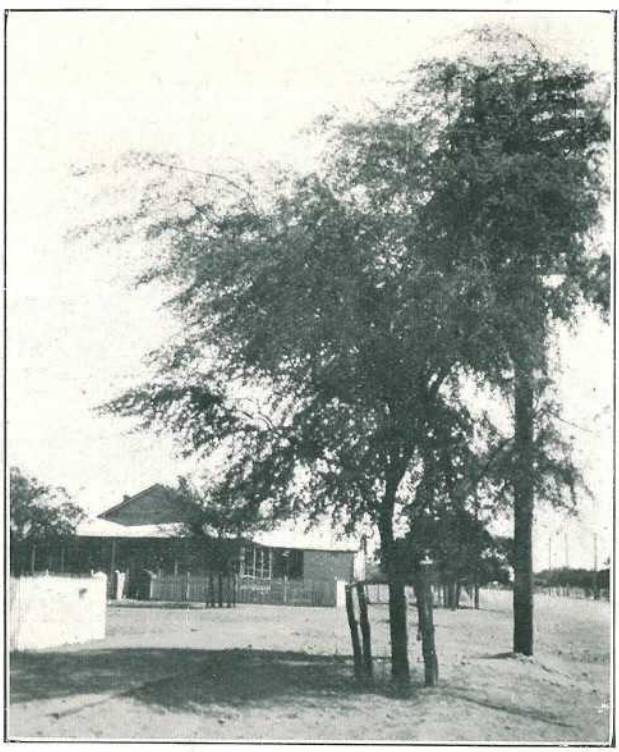


PLATE 135.—ALGAROBA BEAN TREE, GROWING OPPOSITE WINTON CLUB, WINTON.
Planted 1921, from seed brought from Honolulu. Note height of tree as compared with the post beside it. (Photo. taken 6th March, 1927.)

Subsequent distribution of seed was made by Dr. Reid, of Cairns; and by Mr. Fergus McMaster, Winton. In a communication received from Mr. McMaster it would appear that his efforts to establish this useful tree in Western Queensland are meeting with much success. He says:—"I am herewith enclosing snaps taken of the Algaroba trees growing in the streets in Winton. These are trees from the seeds brought by myself from Honolulu and the trees were planted early in 1921. They have grown exceptionally well and practically without assistance from water, and being planted as they are on a kind of embankment they get very little assistance from what little rain is sent Winton way. The trees are very popular, and I dare say I have distributed 3,000 seeds this year from the trees growing on this place and those at Devoncourt, and the other day I had application for more seeds. Many

of the graziers are planting them about their homesteads. The way that the trees have grown during the last few years, with the sub-normal rainfall that we have had, leads me to believe that over a series of years, when they would have the advantage of heavier rains, the trees would be valuable both as shade and fodder trees.''

In addition to the fifty trees planted at Winton the Algaroba is fairly well distributed throughout the Central Coastal areas. Several trees are to be found in the Gladstone, Baroom, Mount Larcom, Alton Downs, and Rockhampton districts.

From their rapid development when planted in uncultivated land, it is evident that conditions of soil and climate are well adapted to their growth.

The Algaroba usually comes into bearing at the age of four years, when a fair crop of pods is produced. In subsequent seasons the production increases very considerably with the size of the tree.

In the accompanying photographs the respective ages of the trees are, Alton Downs, six years; Pink Lily, five years; and Winton, six years.

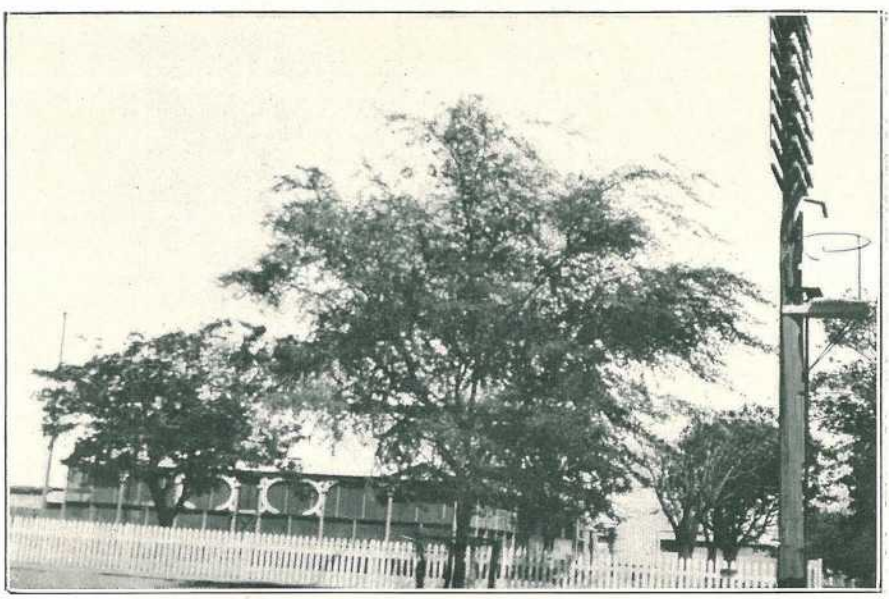


PLATE 136.—ALGAROBA BEAN, PLANTED AT WINTON IN 1921, FROM SEED BROUGHT FROM HONOLULU.

The tree on the right is an Acacia, planted about 1905. This Acacia is looked upon as a good tree and this particular one has had considerable attention which the Algaroba has not had. (Photo. taken 6th March, 1927.)

The pods commence to ripen during early summer and drop to the ground when mature. A valuable characteristic is that the tree remains in bearing for a period of some four months.

As evidence that the cattle relish the beans the grower of the tree at Pink Lily, Mr. Edminstone, mentioned that his cows on leaving the milking sheds in the morning go direct to the Algaroba tree and pick up the beans that have fallen overnight. One heifer was so fond of them that she invariably camped under the tree all day and fed on the pods as they dropped.

Characteristics of the Algaroba.

In addition to its economic use it is ornamental, and also of value as a shade tree. In regard to its natural habit Mr. L. H. Bailey, Cornell University, in dealing with forage plants, says:—''This small tree is the most common woody plant of the South-western arid region. It is often found in groves with a short trunk like an

apple-tree. It is very valuable as a honey plant, as its period of bloom extends over two months. Its forage value lies in the pulpy edible pods, which are 6 to 10 inches long, containing about a dozen hard seeds."

The pods are very nutritious and are eaten by natives and travellers as well as by stock. The bean pods and bark are rich in tannin. The seeds are said to be the next in value to barley for fattening horses, cattle, sheep, and hogs.

Baron von Muller, in his work on "Select Extra-Tropical Plants," gives the following analysis:—"25 per cent. to 25 per cent. grape sugar; 11 per cent. to 17 per cent. starch; 7 per cent. to 11 per cent. protein; 14 per cent. to 24 per cent.

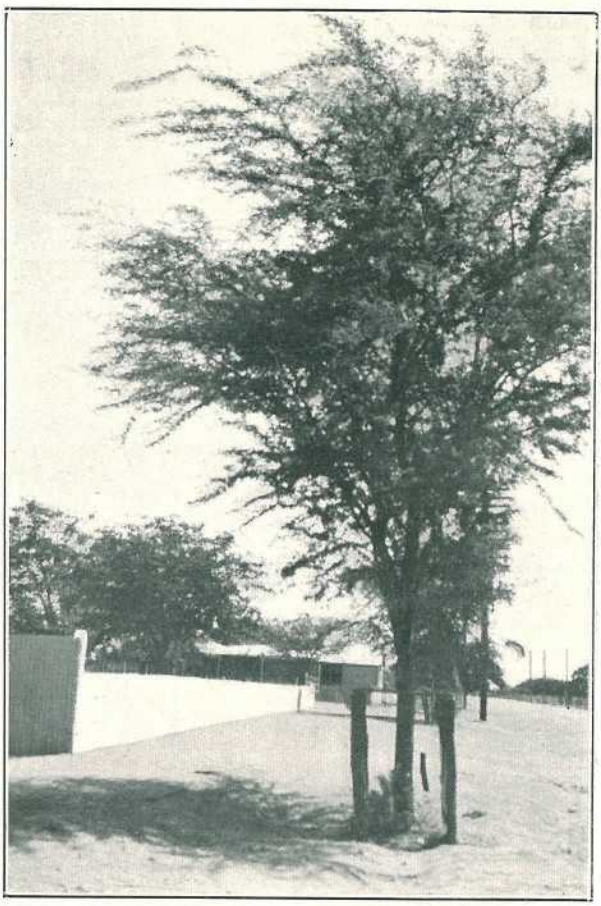


PLATE 137.—ALGAROBA BEAN, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU. (PHOTO. TAKEN 6th MARCH, 1927.)

organic acid, pectin, and other non-nitrogenous nutritive substances. They are also comparatively rich in potash, lime, and phosphoric acid."

The timber is very hard and durable, resembling Lignum Vitae, and takes a polish like mahogany. Fences made of this timber have been known to stand in a perfect state of preservation for more than fifty years in Southern Texas.

A description and illustration of the Algaroba were given by the Government Botanist (Mr. C. T. White) in the "Queensland Agricultural Journal" for June, 1921. It is described as:—

"A tree attaining from 60 to 70 feet, branches usually armed with straight spines, either solitary or in pairs. Leaves bi-pinnate, usually occurring in little tufts or fascicles, pinnae 1, 2, or rarely 3 pairs; leaflets usually 10 to 12 pairs, oblong,

3 to 4 lines long. Flowers small and numerous, borne in long slender spikes of 3 to 5 inches. Pod yellow, shortly stalked, 5 to 8 inches long, marked between the seeds with transverse lines, fleshy with a sweet, sugary, more or less spongy pulp; seeds light brown, enclosed in a hard, parchment-like casing (endocarp).

"A native of South America, West Indies, Central America, Mexico, and the Southern United States."

It is now widely cultivated in tropical countries as a fodder and ornamental tree. Speaking of its introduction into the Hawaiian Island, J. F. Rock in the "Leguminous Plants of Hawaii," states:—The Algaroba is the most common as well as the most valuable tree introduced into the Hawaiian Islands. All the waste lands, which previous to the introduction of this valuable tree were absolutely barren, are

PLATE 138.—ALGAROBA BEAN TREE, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU.

The tree on the left is a Cedar, and probably 25 years old, growing under the same conditions as the Algaroba. (Photo. taken 6th March, 1927.)

now covered with green forests made up exclusively of this tree. The tree was introduced by Father Bachelot in 1828, the seed having come from the Royal Gardens at Paris, France.

Propagation.

Seeds should be sown in the spring or early summer. The pod contains up to about twenty seeds. Each seed is surrounded by a hard parchment-like casing. This should be removed with a sharp knife before the seeds are sown. C. S. Judd, writing

in a recent number of the "Hawaiian Forester and Agriculturist," found that pouring hot water over the seeds and letting them soak for twenty-four hours greatly accelerated their germination, but they may be sown without any treatment at all, germination then, however, being considerably slower. They should be sown in pots or boxes, and when strong enough the young trees can be planted out into their permanent quarters.

This tree succeeds well in the Brisbane district and fruits well. It is doubtful if it would succeed much further South, as it is more particularly adapted for growing in the warmer parts of the State.

A Good Fodder Plant.

In view of the prominence that has been given recently to the matter of providing fodder supplies to tide stock through dry periods, more particularly in our western areas, it is somewhat remarkable that more attention has not been given to the propagation of trees and shrubs that provide edible material. It would appear that this subject is receiving some attention in the United States of America.

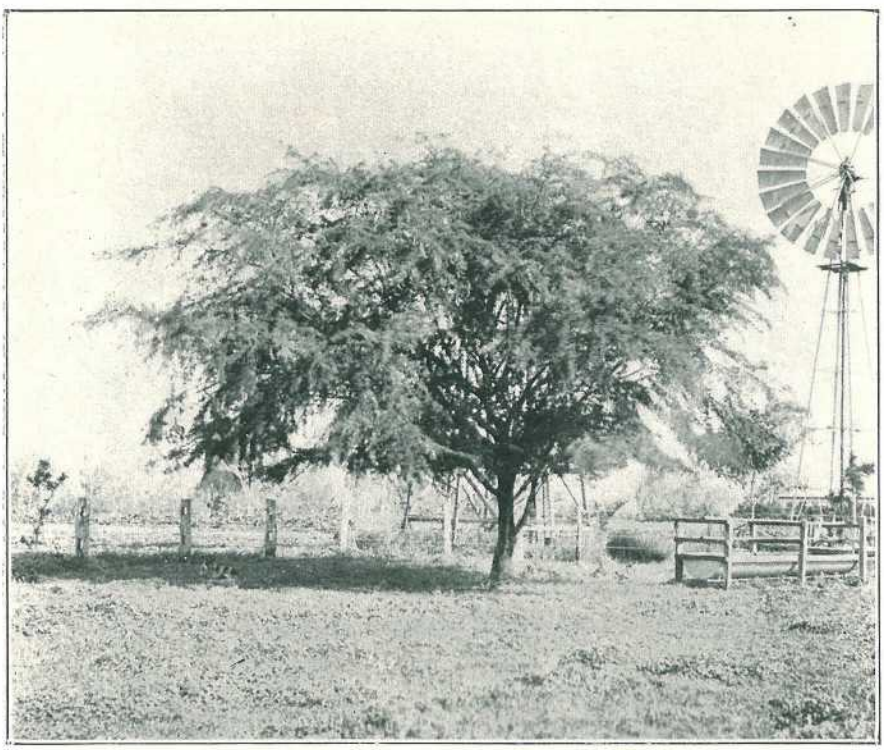


PLATE 139.—AN ALGAROBA TREE. MR. J. EDMONSTONE'S PROPERTY AT PINK LILY.

The Honey Locust Tree.

In the September, 1926, issue of the "Journal of Heredity," a publication devoted to plant and animal breeding, a prize of 50 dollars is offered for the discovery of the best honey locust tree. The explanation given for carrying out such a contest is of much interest and worth quoting:—

"WHERE ARE THE BEST HONEY LOCUST TREES?

"We need to have trees on our hills, and crops on our trees—crops to harvest every year—*a tree crop agriculture*. We can have this by applying known science and a little common sense to some of our native trees. In the eastern United States is the Honey Locust, a neglected tree of great promise. Its bean and pod have an

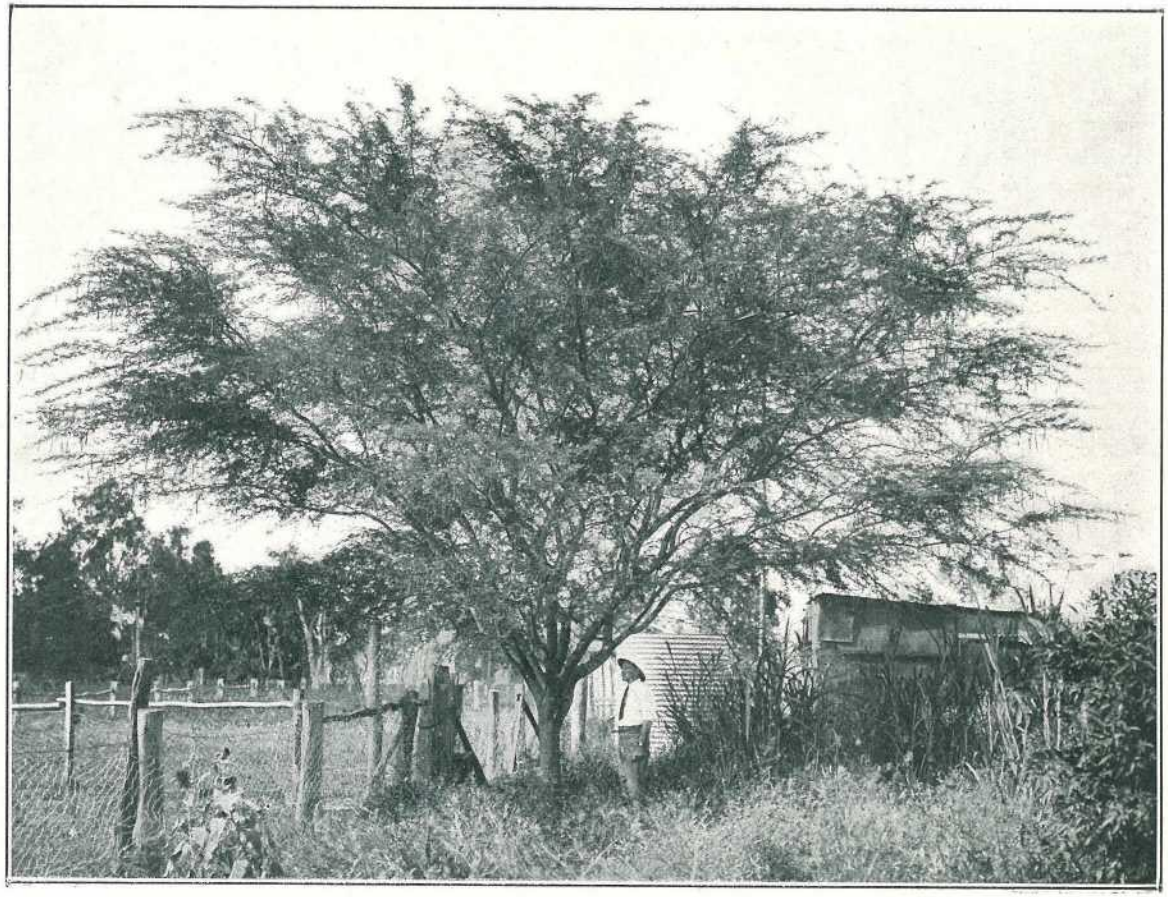


PLATE 140.—AN ALGAROBA TREE AT ALTON DOWNS, QUEENSLAND.

analysis as good as that of many commercial grain feeds. Cattle eat the beans of some trees greedily. Trees are known that bear many bushels of beans.

"Here is a possible crop of great value, both as a harvest and as a soil saver through letting tree roots stop gullies. We need to have the best wild trees with which to begin, just as the naval orange business began with finding one tree that happened to bear that kind of fruit.

"Enter this contest and help to start a Tree Crop Agriculture in America."

In the last issue to hand (May, 1928) is an account of the Honey Locust contest, with photographs of the winning trees and pods. Reference is made in the article to the Algaroba stating—

"That the United States Department of Agriculture, in 1923, made extensive milling tests to determine its feeding possibilities. By separating the seeds and the pods (which contain the sugar-bearing tissue) it was possible to make two kinds of meal—one high in sugar, and the other in protein. Actual feeding tests with the mesquite in the South-West and Hawaii have proven its value as a stock feed. In fact, in Hawaii the mesquite, which was introduced in 1828, has assumed an important place in the agriculture of that island.

"The pods are everywhere recognised as one of the most important grain feeds of the islands, and are greatly relished by all kinds of live stock, including chickens. The feeding value of the beans has long been recognised from the practical results obtained. As a feeding material there seems to be only one objection to them, and that is a slight flavour given to milk when fed in excess to the dairy cows. The objection could, however, be overcome by feeding the beans after milking rather than before milking."

The result of the mesquite bean contest was so encouraging that a new contest is being arranged to learn whether trees can be found that exceed those prize winners in yield, hardiness, and food contest.

THE FAT LAMB.

Grow Fodder Crops.

Over the bulk of the State where fat lambs are raised, an autumn lambing is found the best, but in the cold districts of the State the lambing takes place in the spring, and the lambs grow during the summer; so that suitable summer crops should be selected and sown to supplement the natural pastures and stubble. In these cold districts fodder crops or extra feed will have to be supplied to produce a satisfactory export lamb, as, besides the fact that the natural pasture in these districts is not of the best, the climatic conditions tend towards slow maturity and a small-framed animal.

In average seasons in the western and south-western districts there is usually sufficient rain in the autumn to ensure a certain amount of growth in the pastures, but for the raising of fat lambs this feed should be supplemented by green fodder crops. In this way every opportunity is given the lamb to get a fair start. The crop should be ready for the ewes to be put into just prior to lambing. This will increase the milk supply, and if alternated with natural pastures there should be abundant feed until the usual spring growth, when the fodder crop can often he allowed to grow up for hay or silage.

Suitable Crops.

In deciding what crops to grow for fodder, the general farm practice should be considered. It should be made to work in as part of a rotation of crops on the farm, and for that reason a crop other than wheat is advisable. Of those available, the most satisfactory is oats, which, besides being an excellent fodder, helps to control such wheat diseases as "take-all," &c. There are several early varieties which should give excellent results, and which provide more feed, perhaps, than Algerian, but the latter is very satisfactory.

Skinless barley is another fodder crop recommended, and it provides particularly good feed. Rape, or a mixture of rape and barley, will give a great bulk of feed if the season is suitable for a good germination of the rape seed. Rape alone should be fed off with care or losses may occur from "hoven." Lucerne and Sudan grass are two other very valuable fodder crops which the wheat farmer, who combines the fat lamb business with his farming, should find little difficulty in fitting into a suitable rotation.—"A. and P. Notes," N.S.W. Department of Agriculture.

FLUSHING THE BREEDING SOW.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In perusing the pages of several of the older established text-books on "Animal Husbandry," one frequently comes across the term "flushing" as applied to "flushing the mare" or the ewe or the sow or cow or as the case may be, in each instance prior to the time the female is mated.

This "flushing" is not a common term in Australian live stock literature nor is it a regular practice on our farms, consequently an explanation of the term "flushing the sow" before mating will be of interest to readers of this Journal.

The term flushing simply means a general stimulation of the whole of the internal organisation of the animal, the object being to increase the number of pigs produced at farrowing time. The purpose is accomplished by increased feeding of grain or by the use of fresh or more succulent pastures than have previously been available.

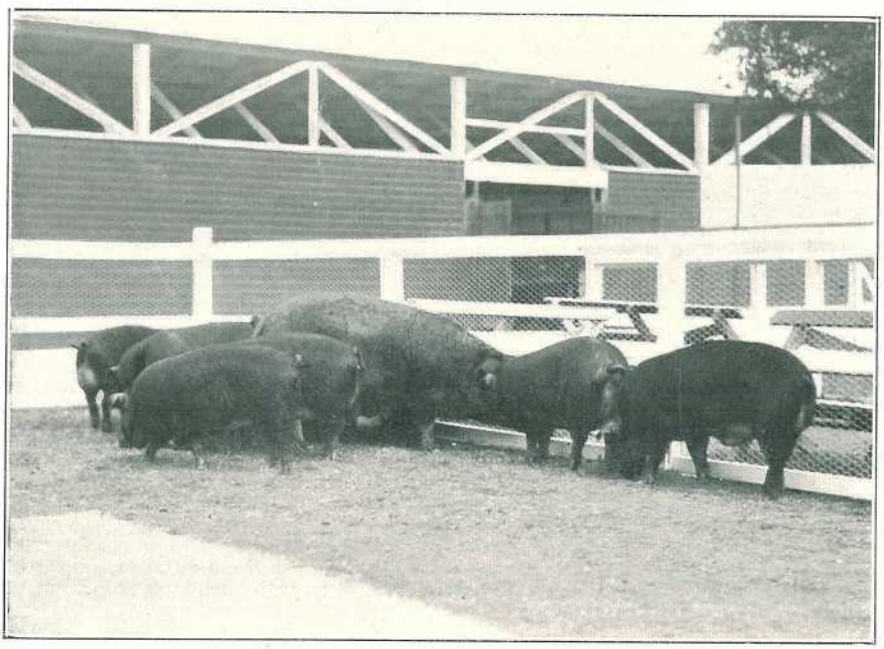


PLATE 141 (Fig. 1).

Duroc-Jersey sow "Lawn Hill Lorna" and a group of her "ton" litter of ten pigs which (not including the sow), weighed 2,000 lb. live weight when one week less than six months old. They were exhibited at the recent Royal National Show at Brisbane by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, and created considerable interest. This litter indicates what can be done by properly flushing the sow and keeping the feed up to the young pigs from birth. See also Fig. 2.

The practice is understood and practised more by the sheep man than by the breeder of pigs or of most of the other classes of live stock; still it is a well recognised old time as well as modern practice. The sheep man practises it by turning the breeding ewes into a fresh succulent pasture just prior to "joining the rams," the time when the ewes are to be mated, the objective here being to secure a larger percentage of twins or a higher general average at lambing time.

There is no reason why the pig breeder should not adopt the same practice with his breeding sows, especially with sows that are advancing in age and that might otherwise produce rather unsatisfactory litters.

The most beneficial results are obtained when the flushing begins two or three weeks before the breeding season opens or the stock are to be mated. Supposing that the sows have been running on pasture alone during the greater part of the "off" season; at the beginning of the breeding season, or when it is desired to prepare the sows for mating, they should be turned into a fresh patch of rape, lucerne, or other green stuff that would furnish an abundance of the most succulent forage.

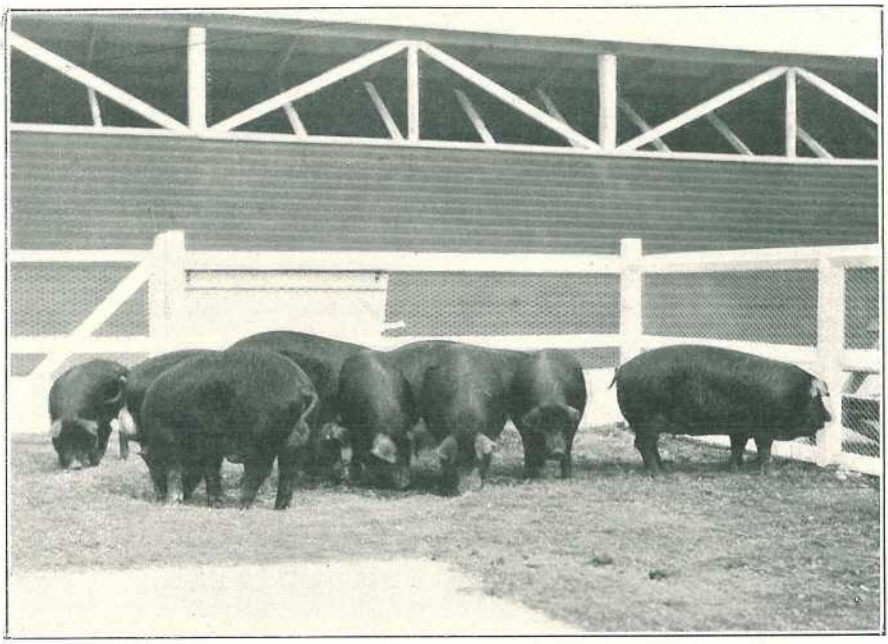


PLATE 142 (Fig. 2).

Representatives of the Ton Litter of Duroc-Jersey pigs exhibited at Brisbane Show, August, 1928. Note good type, quality, and evenness throughout.

PLATE 143 (Fig. 3).

Group of Duroc-Jersey Berkshire Cross pigs, winners of the Litter Weight Contest at the Brisbane Show, 1928. That it pays to follow the practice of flushing the breeding sow is again evidenced in this photograph. Bred and exhibited by Mr. Percy W. Campbell, of Lawn Hill, Lamington.

In the case of a single sow, the breeder might begin by feeding a slop composed of milk and barley or wheat or maize meal, &c., and give more than the usual supply of green food. The idea is to stimulate the whole system without putting on any great amount of fat. It is, of course, expected that the animals will begin to gain a little more rapidly in early spring or as the breeding season opens, and the majority of breeders will see to it that their stock put on flesh at this time, but it is important that the sows should be in medium breeding condition only and be gaining in weight and flesh at the time when they are mated. After the sow has been mated, continue the practice for a week or two before turning her out to pasture again.

All sows should, of course, be kept in good breeding condition during the gestation period, but there is no necessity that they should be "rolling" in fat.

Care should also be taken to see that as soon as possible after service the sow is removed from the boar's pen and placed in a clean pen away from other sows or boars for at least five or six hours, during which she should be liberally fed and kept quiet and in a comfortable condition. It is quite impossible to expect good results by allowing innumerable services and by allowing other sows, mated or otherwise, to interfere with the newly mated sow.

Attention should be paid to these details for the purpose of obtaining better and stronger litters. Many breeders who were not altogether sure about this "theory" in stock breeding have been favourably impressed. Further, the additional care exercised protects the boar and enables him to mate with a larger number of sows with more reliable results than would be possible if the mating were neglected.

Pig production costs are so high these days that no effort should be spared to ensure the production of larger and more vigorous litters. It is quite evident that farmers who have given the most attention to the system of "flushing" above referred to are its most constant advocates.

PRECAUTIONS AGAINST SWINE FEVER.

The most potent factor in the spread of swine fever among pigs is undoubtedly the infected pig, which may even pass on the disease to others several days before symptoms are exhibited, says Major C. G. Saunders, in an interesting article in the current issue of the "Pig Breeders' Annual." It must also be remembered that this infectiousness remains during the whole course of this disease. The virus of the disease is also spread through the medium of urine, fœces, eye and nasal discharges; and the floors, bedding, and manure in the pens or stys where infected pigs are housed become saturated with the virus which may be carried from one farm to another, or to different parts of the same farm on the feet of men and animals, or on the wheels of vehicles, and probably by birds. Stock attendants may also, by medium of their hands and any instruments or tools they may use, be the means of spreading the disease far and wide. The chief danger is, however, the infected pig, and attention is specially drawn to the fact that unthrifty pigs may have swine fever without showing any definite symptoms of the disease, and may be moved from one farm to another under the impression that they may only be suffering from some non-contagious disease. Another danger is the pig that has apparently recovered from the disease but is, in reality, suffering from it in a very chronic form, as such pigs may be infective to others for eighty days or longer. Carcasses of pigs which have died from swine fever may retain the virus for months, and even cured meats are not always safe in this respect. Hence the necessity of boiling all offal and garbage before feeding to pigs.

The following precautions will reduce the danger of an outbreak of swine fever:—

(1) Quarantine all newly purchased stock and all pigs returned from show or market for three weeks in a remote section of the farm, and admit to the main herd only after careful scrutiny has revealed nothing suspicious.

(2) Locate pig yards and stys away from streams, highways, and keep strangers away from them, and especially pig dealers and persons who have unthrifty pigs upon their premises.

(3) Buy only from herds that are known to be healthy.

(4) Do not visit a farm where there are sick or unthrifty pigs.

(5) Cook all swill and offal before feeding, and make the man that has handled the raw material disinfect himself immediately after.

(6) After an outbreak of swine fever see that all carcasses are burned or buried deeply with quicklime.

It is well to remark here that in Australia stock regulations compel pig breeders to immediately report to the nearest stock inspector, police officer, or other Government official any suspected outbreak or serious trouble amongst pigs, and to carry out the instructions issued by these officers so that there will be no possible chance of disease spreading from herd to herd. Heavy penalties are imposed upon those who neglect or fail to carry out instructions issued under the Acts controlling these diseases, and the premises concerned may be quarantined for whatever period is deemed necessary. There is everything to gain and nothing to lose by reporting the matter immediately it is suspected there is anything seriously wrong with the pigs. The Departments of Agriculture in the various States will supply all information relative to these matters upon application free of cost. In any case it would be very unwise to introduce other pigs into such premises that were suspected of being infected until the matter was cleared up and only healthy stock remained on the property, and all buildings and stys, yards, paddocks thoroughly cleansed and freed of infection.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

PIG RAISING.

COSTS OF PRODUCTION VARIES.

The cost of producing pork varies widely on different farms. Cost records for a period of five years on representative farms in Greene County, Ohio, United States of America, kept under the direction of John F. Dowler, Assistant in Rural Economics, Ohio Experiment Station, show variation on the different farms ranging from 6.50 dollars to 15.02 dollars for each 100 lb. of pork.

The farms that were most successful in the production of pork seemed to have a number of managerial practices in common, which resulted in lower cost. The sows were well fed before farrowing. Separate houses or shelter-sheds were provided for each sow, and these were placed on new pasture or ground each season.

The young pigs were kept away from straw stacks and feed lots about the barns and other buildings. They were given the run of large fields for pasture in summer and exercise in winter.

Much labour was saved by hogging down corn, using self-feeders, and feeding unhusked corn in the fodder. Plenty of drinking water was provided at all times, and it was prevented from freezing in winter.

Preventive measures were taken against cholera, and treatments were given for the round worm. The pigs were given comfortable quarters, and were kept thrifty and contented from the start.

On the whole, the farms with high cost of pork production were less efficient in feeding and care, and required more labour and larger amounts of feed per unit of gain. The sows on these farms were often too fat or too poor. Straw stacks, stables, and other unsuitable places were often provided for the farrowing sows, and most of the pigs were fed around the barn and in feeding-lots that could not be ploughed.

CHOOSING A DAIRY BREED.

By C. F. McGRATH, Supervisor of Dairying.

The question of what breed of dairy cattle is the best has been asked by a number of persons either about to enter or engaged in the dairy business.

It is not so much the question of breed that requires consideration as does the question of profitable producers.

There are good dairy animals that are profitable at the pail in all dairy breeds, and it is true also that poor producers are found in each breed. The selection of animals within the breed chosen is the matter of most importance. The breed chosen should be the one that appeals to personal taste, and that is suitable to the conditions under which the animals are to dairied. Any one of the dairy breeds are worthy of a place on our dairy farms.

The sure way to determine the dairy animal's value is to test it for production. The progeny of animals whose production has been recorded should be secured when possible. The milk producing trait is hereditary, and selected females should be bred to sires with production on paternal and maternal sides.

Answers to Correspondents.

Supplying Phosphorus for Cattle.

"FARMER" (Gordonvale)—

There is no need to bother about bone meal as supply of phosphorus for cattle, as we have in crushed Nauru phosphate a cheaper and richer source of phosphoric acid. Make a mixture of one part of coarse salt and two parts of crushed Nauru phosphate, and give the cows about 3 oz. of this mixture in their food every day. Some of the mixture can also be left in addition in troughs, so that the animals can get more if they want it.

BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Specimens Determined.

"DESIROUS" (Clear Mountain)—The specimens forwarded with your letter of the 8th instant have been determined as follows:—

No. 1. *Eugenia Ventenatii.* Weeping Myrtle. Family Myrtaceæ.

No. 2. *Dysoxylum rufum.* A small or medium-sized tree, for which I have not heard a common name. It is allied to the Rosewood and Red Bean. Family Meliaceæ.

No. 3. *Litsea dealbata.* Family Lauraceæ. Allied to the Camphor Laurel.

No. 4. *Backhousia myrtifolia.* Carrol.

No. 6. *Nyssanthes diffusa.* A "Needle." Family Amarantaceæ.

No. 7. *Verbena bonariensis.* Purple Top.

No. 8. *Commersonia echinata.* Brown Currajong. Family Sterculiaceæ.

No. 5 (but no number on label).—*Solanum auriculatum.* Called Wild Tobacco. Family Solanaceæ. A native of South America naturalised in Queensland. A similar plant with white flowers—*Solanum verbascifolium*—overruns scrub farms in the same way.

Marsh or Yellow Watercress.

J. McG. (Moombra)—

The specimen forwarded with your letter of the 21st instant is *Nasturtium palustre*, the Marsh or Yellow Watercress, a soft, rather succulent, weed of the cress family (Cruciferæ), widely spread over the temperate regions of the world. It has no particular value as a fodder, and like most cruciferous plants, would taint the milk of dairy cows feeding on it.

Freshwater Algæ.

A.H.W. (Laidley)—

The green growth in your dam represents a heavy growth of freshwater algæ. The method of dealing with freshwater algæ in dams and ponds is, when they are surface species, to spray the surface with Bordeaux mixture of half the usual strength. Bordeaux mixture can be obtained in tins in concentrated form from most of the nurserymen.

For submerged algæ, copper sulphate may be put in a coarse sack and dragged backwards and forwards from the bank, or towed up and down in a boat, until it is all dissolved. Copper sulphate is poisonous, and for the water to be safe for water birds and for drinking purposes by man or animals, the copper sulphate must not exceed 1 part in 1,000,000 parts of water by weight (i.e., 1 lb. in 100,000 gallons): The contents of the pond may be estimated by roughly calculating the cubic capacity in feet, and multiplying the result by 6¼. This gives the number of gallons, and a division by 100,000 gives the lb. of copper sulphate required. A second application should be made a week or two later.

Algæ give a good deal of trouble in ornamental ponds in colder countries, such as England and the Continent, but here they commonly seem to die with the approach of hot weather.

PIG RAISING.

Replies selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.

Isolation of Sick Pigs.

J.A.H. (Winegrove)—

The use of cod liver oil in the treatment of pigs affected with a peculiar trouble in the ear is specially recommended. This trouble causes the pig to carry its head on one side and to lose condition. The oil appears to have a very beneficial effect, but it must be carefully handled, care being taken that each pig receives its proper share. The isolation of sick pigs away from healthy stock and special treatment while isolated is always recommended. All treatment must be accompanied by a thorough cleansing of the surroundings, and an improvement in the methods of housing and feeding, for the appearance of disease of this description in the herd is a sure indication that there is a deficiency of mineral matters and vitamins in the food. The supplying of green food, charcoal, bone meal, protein or meat meal, and clean drinking water, and the feeding of readily digestible nutritious food are items requiring special attention. The animal should also be forced to take exercise in the sunshine.

Feeding Fruit to Pigs.

T.S.A. (Palmwoods)—

Fruit is of little feeding value for pigs; hence it is not profitable to rely on the products of the orchard as pig food. This is especially so with reference to citrus fruits, for the pig only consumes the juice. Pigs consuming large quantities of fruit are subject to certain gastric troubles, particularly if the food is fed in an overripe or damaged condition, or in too large a quantity at a time. Small quantities of fruit can be used to advantage when fed with other more concentrated foods, such as barley meal or pollard.

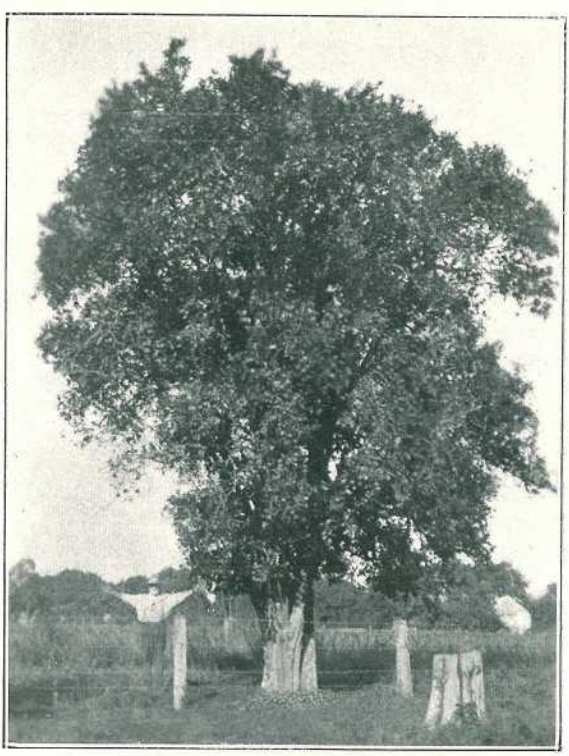


PLATE 144.—W. HENRY'S SEEDLING ORANGE TREE GROWING AT MOORLAND, N.S.W.

Heigth, 33ft.. greatest limb spread, 36 ft. 9 in.; Girth, 3 ft. up trunk, 8 ft. 3 in.; Narrowest Girth, (1 ft. up trunk) 7 ft. 2 in.; Approximate Crop, (1928) 20-25 bushels. About 69 years old. (Note sound oranges (windfalls) on ground piled up.)

BANANA PROPAGATION.

There is an impression amongst many banana growers that where the plants are raised from the single eye, as is done at the State Nursery at Bribie Island, the quality of the fruit is not equal to that obtained from a well-developed corm or sucker. That this is not the case has been proved by samples of Cavendish fruit recently submitted to this Department, which were 9½ inches in length by 5½ inches in girth, and the largest of which weighed nearly ½ a pound. (See Plate.) Further confirmation is also to hand from a grower at Marian, near Mackay, to whom a number of small banana plants, raised from the single eye at the Bribie Nursery, was sent a couple of years ago. The writer states:—"It may interest you to know the suckers you sent me have done remarkably well, and as we have this season grubbed up a number of them and divided the clumps and planted same we are in a position to state that they are absolutely free from beetle borer or any other disease. This encourages us to extend." This information is very satisfactory, as it shows that even where clean banana plants are set out in a beetle-infested area there is a chance of their keeping free of this pest for some time.—GEO. WILLIAMS, Director of Fruit Culture.

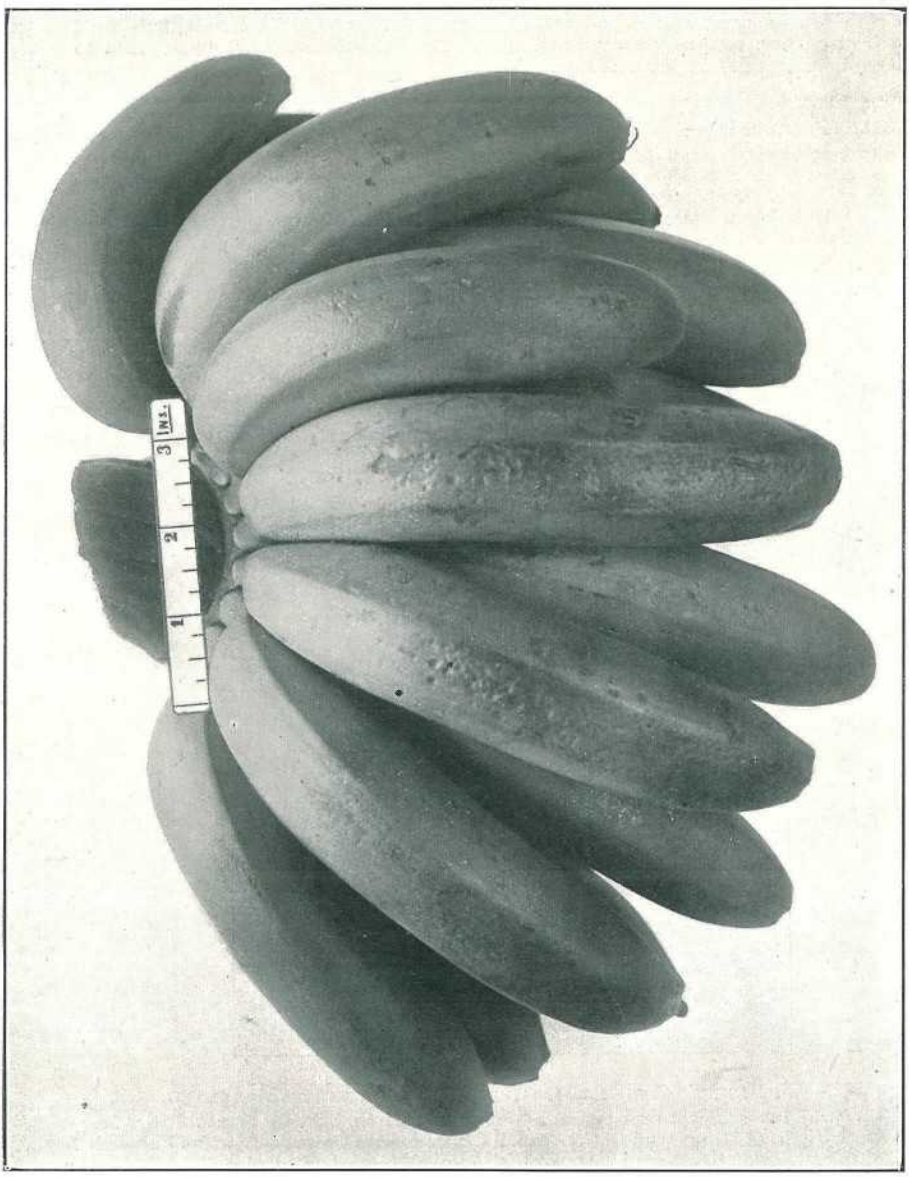


PLATE 145.

A "HAND" OF CAVENDISH BANANAS FROM A PLANT RAISED FROM THE SINGLE EYE, AS PRACTISED AT THE STATE NURSERY, BRIBIE ISLAND. (See note on Banana Propagation.)

General Notes.

Staff Changes and Appointments.

Mr. G. Sutton, of Camp Mountain, Samford, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. F. J. Watson, Dairy Instructor, Bundaberg, has been attached to the Brisbane District, and Mr. C. L. Moran, Dairy Instructor, to the Toowoomba District.

Transfers of the following Inspectors of Stock have been approved:—Mr. S. C. O. Jessop, from Crow's Nest to Helidon; Mr. S. J. Monaghan, from Julia Creek to Crow's Nest; Mr. L. P. Doyle, from Cloncurry to Julia Creek.

Mr. G. R. I. Anderson, Inspector of Slaughter-houses, Innisfail, has been appointed also Inspector of Stock and Brands.

Mr. F. G. Marks, of Alberton, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. W. B. Smith as Sales and Possessions Officer, Agricultural Bank, has been accepted as from 17th October, 1928, and Mr. Smith has been appointed Inspector, Agricultural Bank, as from 18th October, 1928.

The resignation of Mr. A. W. Burne as Cinematographer, Chief Office, has been accepted, as from 31st October, 1928, as tendered.

The following have been appointed Members of the Southern District Stallion Board:—Messrs. A. H. Cory, M.R.C.V.S., E. Baynes, P. Short, and J. Sprott.

Mr. J. Harold Smith, M.Sc. (Agric.), Assistant to Entomologist, Cairns, has been appointed Assistant Entomologist, as from 22nd August, 1928.

Messrs. F. C. Shaw and P. J. Short have been appointed Temporary Inspectors of Stock, as from 13th and 31st August, respectively.

Mr. J. R. McKinstry, Inspector of Stock, Helidon, has been appointed Officer in Charge, Tick Cleansing Area, South Burnett, with headquarters at Kingaroy.

The appointments of Messrs. A. Dick and S. C. Smith, Inspectors of Slaughter-houses at Ayr and Mareeba, respectively, have been confirmed, as from 20th February, 1928.

Constable N. T. Briskey, of Clermont, has been appointed Inspector of Slaughter-houses.

Messrs. H. G. Springer and W. J. Adderley, of Wolvi, via Gympie, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. W. R. Winks, B.Sc., Assistant to Analyst, has been appointed Analyst, Agricultural Chemical Laboratory, as from 10th September, 1928.

It has been approved that the designation of the present position of Instructor in Agriculture be changed to that of Senior Instructor in Agriculture, and Messrs. G. B. Brooks, A. E. Gibson, and N. A. R. Pollock, Instructors in Agriculture, have been appointed Senior Instructors in Agriculture, as from 1st July, 1928; that the designation of the position of Instructor in Pig Raising be changed to that of Senior Instructor in Pig Raising, and Mr. E. J. Shelton, Instructor in Pig Raising, has been appointed Senior Instructor in Pig Raising, as from 1st July, 1928; that the designation of the position of Instructor in Sheep and Wool be changed to that of Senior Instructor in Sheep and Wool; the designation of the position of Assistant Instructor in Sheep and Wool be changed to that of Instructor in Sheep and Wool, and Mr. Jas. Carew, Assistant Instructor (and Acting Instructor) in Sheep and Wool has been appointed Instructor (and Acting Senior Instructor) in Sheep and Wool, as from 1st July, 1928.

The Officer in Charge of Police, Millmerran, has been relieved of his appointment as Acting Inspector under and for the purposes of "*The Diseases in Stock Act of* 1915," as from 31st October, 1928.

Mr. L. F. Reinke, of Monto, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

Mr. L. B. Christian, of Waterloo, Yandaran, has been appointed Honorary Inspector under and for the purposes of the Diseases in Plants Acts.

Mr. E. C. Olive, Manager of the State Farm, Kairi, has been appointed Dairy Instructor, Department of Agriculture and Stock.

The Inspector of Stock at Gayndah has been appointed Government Representative on the Burnett Dingo Board.

Mr. C. F. Adermann, of Wooroolin, has been appointed Chairman of the Peanut Board.

Mr. F. C. Coleman, of Grantham, has been appointed Inspector of Dairies, as from the date of taking up duty; his appointment is on probation for a period of six months.

Mr. T. Raymond, of Mirriwinni, Gordonvale, has been appointed an Officer under and for the purposes of the Animals and Birds Acts.

Pastoral Districts Visited—Proposed Tour of South Western Queensland.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) stated that, in pursuance of the policy of the Government to make the services of qualified technical officers available to the pastoralists and agriculturists, he had recently arranged for a tour of the Northern and Western cattle and sheep districts by the Agricultural Chemist (Mr. J. C. Brünnich) and the Instructor in Sheep and Wool (Mr. J. Carew). Addresses were delivered by these officers, and were apparently greatly appreciated by the stockowners. Lectures were arranged for at Charters Towers, Ashton, Hughenden, Winton, Isisford, Longreach, Springsure, Emerald, and Capella, and these lectures were well attended by owners concerned. In the course of the visit to these districts much information was obtained in connection with the use of licks and the artificial feeding of sheep and lambs, and this information will be utilised in publications proposed to be issued by the Department on the sheep industry.

Orchardists and dairymen were also visited in the Charters Towers district, and the departmental officers were consulted on many problems incidental to their activities.

Arrangements have been made for Messrs. E. H. Gurney, Senior Analyst, and J. Carew, Instructor in Sheep and Wool, to make a similar visit to the South-western areas of the State, and it is intended that these officers should leave Brisbane on the 5th November. In the course of their tour the following districts will be visited on the dates mentioned:—Jondaryan, 5th November; Dalby, 6th to 8th November; Miles, 8th to 10th November; Roma, 10th to 13th November; Mitchell, 13th to 17th November; Charleville, 17th to 24th November; Cunnamulla, 24th to 28th November; St. George, 28th to 30th November; Goondiwindi, 30th November to 3rd December.

On their return they will visit other Downs centres, and are expected to return to Brisbane about the 6th December.

In connection with these visits, the Minister expressed his appreciation of the excellent arrangements made by pastoralists and outlying settlers for the conveyance of the officers through the areas visited.

Wheat Board Election.

The annual election for the appointment of a member for each of the five State Wheat Board Districts was conducted at the Department of Agriculture and Stock with the following results:—

District No. 1 (Maranoa-Dalby)—

Aaron Hoskin (Mount View, via Jimbour)	273 votes
*Robert Swann (Wallumbilla)	120 votes

District No. 2 (Old Pittsworth Electorate)—

Arthur Carl Krieg (Brookstead)	487 votes
*Edward Fitzgerald (Felton)	405 votes

District No. 3 (Warwick-Killarney)—

*Bergittinus C. C. Kirkegaard (Freestone)	286 votes
Thomas Braithwaite (Warwick)	127 votes
Joseph James Booth (Junabee)	60 votes

District No. 4 (Allora-Clifton)—

W. J. T. Neale, Allora (Unopposed)

District No. 5 (Toowoomba and Lockyer)—

*John Archibald (Oakey)	182 votes
Patrick McNee (Kingsthorpe)	126 votes
William Garvey (Gowrie Little Plain)	80 votes

* Retiring member.

The successful candidates will hold office for a term of one year as from the 1st September.

Levy on Growers of Papaws.

Regulations under the Fruit Marketing Organisation Acts have been approved, empowering the Committee of Direction to make a levy payable by growers of papaws at the rate of 1d. per bushel case of papaws sold by them. The sums raised by the levy shall be expended only upon advertising in the interests of the growers concerned.

Canary Seed Board.

An Order in Council under the Primary Producers' Organisation and Marketing Act has been passed, the effect of which is that the present members of the Canary Seed Board shall hold office only until the 30th November, 1928, instead of 22nd December, 1928. Members appointed from the 1st December, 1928, will hold office until the 28th February, 1930. Nominations will be received by the Returning Officer, until 7th November, 1928, for election as Growers' Representatives on the Canary Seed Board to hold office from 1st December, 1928, to 28th February, 1930. Two such representatives are required.

Sugar Levies.

Regulations under "*The Primary Producers' Organisation and Marketing Act of* 1926" have been approved, providing for levies by the Queensland Cane Growers' Council, District Cane Growers' Executives, and Mill Suppliers' Committees, on suppliers of sugar-cane to mills during the season 1928. The total of the levies per ton of cane supplied to each mill is as follows (total levies for 1927 are given in parentheses for comparison):—Mossman Central, 5⅝d. (6¼d.); Hambledon, 2⅛d. (2½d.); Babinda Central, 1⅝d. (2¼d.); Mulgrave, 1⅞d. (2¼d.); South Johnstone, 4¼d. (5¼d.); Goondi, 3¼d. (5¼d.); Mourilyan, 3⅜d. (5¼d.); Tully River Central, 4¼d. (5⅜d.); Macnade, 2¼d. (3d.); Victoria, 2¼d. (3d.); Kalamia, 2⅜. (3½d.); Pioneer, 2⅜d. (3½d.); Inkerman, 2¼d. (2½d.) Invicta, 2⅜d. (4d.); Proserpine Central, 3⅜d. (4½d.); Cattle Creek Central, 2⅜d. (3d.); Plane Creek Central 2⅜d. (3d.); Marian Central, 2⅜d. (3d.); North Eton Central, 2⅜d. (3d.); Pleystowe, 3⅜d. (4d.); Racecourse, 2¼d. (3d.); Farleigh, 2⅜d. (3d.); Qunaba, 2d. (2⅜d.); Bingera, 2⅜d. (3d.); Fairymead, 2½d. (3¼d.); Gin Gin Central, 2⅜d. (2½d.); Millaquin, 2½d. (2⅜d.); Isis Central, 2¼d. (3½d. Booyal, 4d. Pialba); Childers, 2d. (2¼d.); Maryborough, 2½d. (2⅜d.); Mount Bauple Central, 2½d. (2⅜d.); Moreton Central, 3⅞d. (4⅜d.); Rocky Point, 2⅜d. (3d.).

No poll will be taken in respect of the general levy by the Queensland Cane Growers' Council (⅜d. per ton), but before the other levies are made, growers are given the opportunity of petitioning, before 1st October, 1928, for a poll to decide whether or not any particular levy shall be made. In the case of the levy of 1d. for a Defence Fund for the Queensland Cane Growers' Council, the petition must be signed by at least 100 canegrowers. In the case of the levies of various amounts for the District Executives and Mill Suppliers' Committees, petitions must be signed by at least 100, or 50 per cent. (whichever shall be the less) of the cane suppliers to any particular mill. The levies by District Executives and Mill Suppliers' Committees will be utilised for administration purposes of the respective Executives and Committees in the respective districts.

Additional Sanctuaries.

By Order in Council under "*The Animals and Birds Acts,* 1921 *to* 1924," the lagoon and one-mile depth of land surrounding same on the property of Mr. A. J. Hay, Taroom, has been declared to be a sanctuary for animals and birds.

An Order in Council has been approved under the Animals and Birds Acts, declaring the properties of Frank Fraser, Ltd., and of Thomas and Honoria Kirkwood, both properties being in the Herbert River district, to be sanctuaries for animals and birds.

Advances to Maizegrowers on Atherton Tableland.

By Order in Council under "*The Primary Producers' Organisation and Marketing Act of* 1926," the Atherton Tableland Maize Board has been empowered to make harvesting advances (including advances for picking, shelling, and carting) to maize-growers on the Atherton Tableland, on growing crops or on shelled or unshelled maize already harvested but still in possession of the maizegrowers, or on maize delivered to the Board's silos. Such advances shall not exceed £2 per acre of any one grower's growing crops or £2 per ton of his shelled or unshelled maize.

Foxes a Pest in Sugar Districts.

A Regulation has been issued under the Sugar Experiment Stations Acts, making foxes a pest for the purposes of that Act.

For Good Quality Cream.

To make certain of always producing the highest quality of milk and cream, care is essential during all stages of production. The cardinal requisites are enumerated as follows:—

(1.) Healthy cows and attendants.
(2.) Wholesome feed and pure water.
(3.) Strict attention to cleanliness.
(4.) Prompt cooling.
(5.) Protection in transportation.
(6.) Frequent deliveries to factories.
(7.) Absence of feeds and weeds that produce objectionable odours and flavours.

Victorian "Reso" Tour.

Following on the success of the recent "Reso" Tour of Victorians to Queensland, the Commissioner for Railways (Mr. J. W. Davidson) has received many requests for the organisation of similar tours to Victoria.

In conjunction with the New South Wales and Victorian Railways, arrangements have, therefore, been made for a "Reso" Tour of Queenslanders to Victoria to commence from Brisbane on Saturday, 1st December. The tour, which will occupy ten days from Brisbane to Brisbane, will be confined to men only, and will provide a unique opportunity for Queenslanders to enjoy a personally conducted tour to Victoria and the new Federal Capital.

The organisation of "Reso" Tours, which are run at an all-inclusive fare, is of high standard, and no effort is spared to ensure the comfort and welfare of those participating. Apart from the facilities afforded for inspecting the various industries and resources of the districts visited, Resonians have the privilege of meeting representative citizens, and the resultant interchange of ideas and discussion of mutual interests, which is to the advantage of both parties, has been found to be of inestimable value in bringing about a better understanding and a spirit of closer co-operation between the people of the different States and districts.

The Victorian tour is of particular interest to farmers, graziers, and fruitgrowers, the itinerary being specially arranged for their benefit. Preliminary arrangements are now being made for the reception of the visitors in Victoria, and everything possible is being done to ensure a most interesting and enjoyable tour.

The itinerary, as will be seen from the following brief particulars, is most varied and comprehensive in its scope, and is one which should appeal very strongly to Queenslanders.

The Resonians will leave Brisbane by the Sydney mail train on Saturday morning, 1st December, and will spend Sunday in Sydney. Early on Monday morning they will arrive at Corowa, on the Victorian border, a district noted for its sheep and wheat, and in the afternoon they will reach Rutherglen, famed for its vines and wines. On the Tuesday morning the party will visit Shepparton, the centre of Victoria's fertile Goulburn Valley, and one of the largest fruitgrowing areas in Australia. Here is situated one of the most modern canneries in Australia, capable of processing 100 tons of fresh fruit daily. The afternoon will be spent among the sheep and citrus fruits at Echuca, the principal town and port on the Murray, and the centre of a prosperous agricultural area and of a big irrigation scheme. The next day the party will visit Horsham, the heart of the wealthy Wimmera district, and renowned for its wonderful wheat crops, its wool, and fat lambs. On Thursday, 6th December, the morning will be spent among the beef cattle at Hamilton, in the western district of Victoria, and in the afternoon the rich pastoral district of Casterton will be visited. The Resonians will spend Friday, 7th December, in Melbourne, and on the following day they will make an inspection of Canberra, the new Federal Capital City. After a short stay in Sydney on Sunday, 9th December, the party will return by mail train to Brisbane, where they will arrive on Monday evening, 10th December.

The number in the party will be limited to sixty, and the price to be charged for the tour is £45, which includes first class fare by rail, sleeping berths, meals, accommodation, motor car hire, &c. Those desirous of participating in this tour should communicate immediately with the nearest station-master or the Secretary to the Commissioner for Railways.

Diseases in Stock Act.

Orders in Council under the Diseases in Stock Act have been issued, declaring:

(1) That Westmoreland shall no longer be a crossing-place for stock from the Northern Territory.

(2) That the Buffalo Fly is and shall be a disease under and for the purposes of "*The Diseases in Stock Act of* 1915."

The Royal Society of Queensland.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre on Monday, 27th August, 1928, at 8 p.m.

The President, Professor T. Parnell, in the chair, and about thirty members present.

Mr. L. L. S. Barr and Dr. John Bostock, M.B., B.S., D.P.M., M.R.C.S., L.R.C.P., were elected ordinary members of the Society.

The President referred to the death of Mr. W. R. Colledge, and expressed the Society's appreciation of his work.

Professor H. C. Richards communicated a paper entitled "A Geological Reconnaissance of Part of the Aitape District, Mandated Territory of New Guinea," by H. G. Raggatt, B.Sc., of the Department of Mines, Sydney. The general geographical features of the area are as follow: (1) The Coastal plain is about one mile wide at Ulau, and reaches a maximum of approximately 12 miles at Sissano. It is so little raised that the streams which flow through it inevitably meander as they approach the sea, in some places forming deltas with numerous distributaries. With the exception of Vanimo, there are no deep water bays of importance. (2) The Coastal foothills are a well-defined area between the plain and the main dividing range, and have an average height of about 500 feet. The streams are relatively swift flowing and deeply entrenched. (3) The Dividing Range here does not exceed 5,000 feet in height and is enclosed in thick jungle. (4) The Inland slopes, populated by the Wa-pi tribe, are little known.

The rocks exposed were provisionally classified. They include pre-Cretaceous schists and gneisses of the main dividing range; pre-Miocene (possibly Mezozoic) altered sediments; Tertiary (probably Miocene) beds of blue micaceous mudstone alternating with shale and sandstone, and of limestone; late Tertiary (probably Pliocene) beds of limestone, volcanic rocks, conglomerate, sandstone, and agglomerate; recent and Pleistocene estuarine and river beds, river gravels, sands, and muds. Palæontological notes were supplied by Messrs. Tom Iredale and W. S. Dun. It was suggested that the search for oil be confined in the first place to locating suitable structures in beds of Miocene age which have not been too highly folded or much intruded by igneous rocks. The paper was discussed by Sir Edgeworth David, Mr. J. H. Reid, and Dr. E. O. Marks.

Professor H. C. Richards exhibited a specimen of clay shale with a curious chocolate iron-staining pattern. The specimen, which was forwarded by Mr. T. Blatchford, the Government Geologist of Western Australia, has a very unusual pattern which, owing to its regularity and nature, suggests a possible organic origin. It came from a locality 80 miles south-east of Wyndham, Western Australia, and underlies the Salterella beds. Mr. Blatchford has obtained other specimens of similar pattern in the Braeside area from the Nullagine series. The finder is anxious to have an adequate explanation of the origin of the pattern, and hopes that such may possibly help in fixing the age of the Nullagine beds more accurately.

Professor Richards also exhibited precious opal from a quarry in the Brisbane tuff at Kedron. This was forwarded by Mr. Huxham, an engineer of the Brisbane City Council, and had been obtained during quarrying operations from "porphyry" metal. The exhibits were commented on by Dr. Bryan, and an informal discussion took place.

The Council wishes to draw the attention of members of the Society to an announcement by the Royal Society of New South Wales that a prize, known as "The Walter Burfitt Prize," has been established by that Society. The prize is awarded at intervals of three years to the worker in pure or applied science, resident in Australia or New Zealand, whose papers and other contributions published during the past three years are deemed of the highest scientific merit, account being taken only of investigations described for the first time, and carried out by the author mainly in these Dominions. The prize consists of a medal and the sum of £50, and may be awarded to two authors working in collaboration. The first award will be made in May, 1929, and nominations and publications should be submitted to the Royal Society of New South Wales not later than 28th February, 1929.

Parakilya.

The Minister for Agriculture (Mr. W. Forgan Smith) stated to-day that he had received the following comments from the Government Botanist, Mr. C. T. White, on the recent report in the "Courier" of an interview with the Rev. J. Andrew Barber, Patrol Organiser of the Australian Inland Mission:—

"The plant 'Parakilya' is well known to Queensland pastoralists. It is fairly common in parts of Western Queensland extending through Central Australia to the eastern parts of Western Australia. The actual fodder value has not been ascertained by chemical analysis, though the fact that stock do well on it seems fairly well established; it is not known, however, what other fodder is picked up with the Parakilya. It is one of those succulent plants, characteristic of arid regions, that is able to store water by virtue of a protection of a tough skin or cuticle. Such plants when fed on enable stock to go for a long time without drinking. Although the collection of Parakilya seed presents no great difficulties, it is just a moot point as to how the plant will lend itself to being artificially spread; in its native state it favours sandy soils. However, the experiments to be carried out by the Australian Inland Mission will be followed with great interest by the Department and by pastoralists of Queensland.

"Sir Arnold Theiler, the noted South African Veterinarian, when he was in Queensland recently, spoke of the possibilities of what they know in South Africa as Spekboom. It is like the 'Parakilya' and is a member of the Pigweed Family, but in place of being a small herbaceous plant it grows to a fair-sized shrub. It has been grown to a limited extent in Queensland, but more as a curiosity in gardens than as a possible fodder. In South Africa it has been recorded that this succulent plant along with the Australian Saltbush, makes a valuable mixture for stock; it would seem advisable to make trials with this plant at the same time as the 'Parakilya.' "

The Buffalo Fly.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) views with apprehension the possibility of the extension of the Buffalo Fly into Queensland. This fly, which is a menace to the cattle industry of the States, has been known to exist in the Northern Territory and in the northern portion of Western Australia for some years. The trend of the spread of the fly from the Northern Territory is in an easterly direction, towards the Queensland border, and the extensive movement of stock from that Territory increases the possibility of the introduction of the pest into this State.

In 1925 the Council for Scientific and Industrial Research appointed a veterinary officer to investigate and report on the incidence of the fly in the Northern Territory and Western Australia, and his report indicated its extension towards the border of this State, north of the 18th parallel.

The danger was promptly realised by the Queensland Government, and the possibility of the introduction of the fly into this State was emphasised in a communication addressed to the Prime Minister, in which it was suggested that he should exercise every effort to prevent an extension of the pest.

As 1927 was a drought year in the Northern Territory and North-western Queensland and there were practically no stock movements, special action was not taken to deal with the matter, but during the present year, as the Commonwealth Government did not appear to realise the urgency of protective measures, the Queensland Government detailed a veterinary officer to make a survey of that portion of the Northern Territory contiguous to the Queensland border. In his report, this officer verified previous information available, which was to the effect that the fly had materially extended and had now become a direct menace to the cattle and horses in this State.

Mr. Forgan Smith is strongly of the opinion that a national effort to deal with the pest should be made, and that the Commonwealth Government should take urgent action, not only to combat the pest in the Territory under its administration, but also to prevent an invasion to the Eastern States of the Commonwealth of the fly. The Minister stated that he was prepared to co-operate in a reasonable manner in any efforts which might be made to prevent the introduction of the pest into Queensland, but emphasises the obligation of the Commonwealth Government to treat this matter from a broad, national standpoint in order to afford protection to the cattle industry of the Commonwealth.

Higher Interest on Savings.

An announcement of more than passing interest has been made by the Commonwealth Bank.

From the 1st October, the rate of interest on Commonwealth Savings Bank deposits will be 4 per cent. up to the first £500, the old rate of 3½ per cent. still to be paid on excess of that amount up to £2,000.

As the majority of savings accounts probably have balances of less than £500, the announcement will come as very good news to most Savings Bank depositors, and as a distinct invitation to those people who do not yet use this useful aid to thrift—the savings account.

Another feature of the Commonwealth Savings Bank service is the Purpose Account. Any number of Purpose Accounts may be opened at any branch of the Bank, and the nature of the purpose need not be disclosed. The objective may be provision for holiday expenses, Christmas extras, medical expenses, higher education for the children, or the purchase of expensive articles, such as pianos, cars, wireless sets, &c.

Any sum from 1s. per week or per fortnight may be deposited for a period of not less than three months, and the interest will be added at the end of the period at the rate of 4 per cent. per annum.

The Public Curator Office—a Profit of £4,065.

From the annual report of the Public Curator to the 30th June, 1928, it is ascertained that the year ended with a profit of £4,065, bringing the total profits earned by the office since its inception in 1916 up to £53,863, which sum is credited to the Reserve Fund. As the office functions under the guarantee of the State, this Reserve Fund is available to cover any losses (if any should, unfortunately, be made) before the Government will be called upon to honour its guarantee.

For the first time in the history of the office, the total cash receipts have exceeded the million sterling mark, viz., £1,110,280, and the disbursements amounted to £1,099,004, or a gross turnover of £2,200,000.

The number of Wills and Trusts administered and taken over during the year was 1,778, of the estimated value of £2,009,765, being an increase of £189,480 over the previous year.

The number of Intestate Estates administered and Elections filed was 2,222, of the value of £917,143.

The Unclaimed Money Fund has increased from £121,371 to £140,346, and the amount invested in Government Debentures aggregates £139,500.

In 1916, the first financial year of the Office, the Cash Investments amounted to £97,071, whereas for the year ended 30th June, 1928, they amounted to £870,757.

The progress of the Office is most marked, and is steadily mounting upward year by year. No complaints of any substance have been received, but on the contrary many letters of a highly appreciative nature, concerning the good work of the administration, have come to hand.

The most careful attention has been given to economical management, and notwithstanding the large volume of new business and the distribution of so many estates, there has been only a slight increase in the working expenses of the previous year, and this is accounted for by the statutory increments to the salaries of the staff.

Further evidence of the remarkable confidence shown by the public in the Office is afforded by the constant inflow of Wills completed by living persons appointing the Public Curator executor. On the 30th June last, the total number of Wills made by the Public Curator exceeded 25,000.

The management of such a large number of estates as the Public Curator controls, entails great activity in the investment of money. Up to the present a sum of £657,843 has been invested out of the Common Fund on mortgages and in Government Debentures.

The Public Curator Office is self-contained, accepts responsibility for its own finances, and has always been able to pay its own way and to meet its obligations. While the Office enjoys the guarantee of the State, it has made no call on the Consolidated Fund for any help, and with its strong reserves built up out of its own profits, it is unlikely that it ever will.

The Home and the Garden.

HARMONY OF ASSOCIATION.

By A.K.W.*

The garden glows,
Against its wall the city's heart still beats,
And out from each summer wind that blows,
Carries some sweetness to the tired streets.

Whether your home is built on a small city allotment, or on a large suburban piece of ground, by careful planning and consideration the beauty of both may be enhanced. The house and garden should make a complete picture, and this is achieved by keeping a natural or landscape appearance, with simplicity the main object.

It is always desirable to build a home on the highest elevation, and the main front of the house facing north-east. Where the ground is sloping the possibilities of a garden are boundless. Terraces and steps leading from one level to another make a pleasing feature, especially if the terraces are walled up, and creeping, flowering plants grown in a bed along the top edge of the wall, where the plants will fall over and make an array of colour from the terrace below.

The garden should be laid out in relation to the doors, windows, verandas, and steps of the house. The path leading from the front gate should be so designed that the open door is not visible from the street. By careful planning, a garden may serve many purposes. A distant view may be improved by a foreground of shrubs or flowers; unsightly buildings may be hidden by care in planting.

It may not be possible to lay out the garden when building a home, but it should be planned from the beginning, so that there is no wasted labour in rearranging a garden. A most attractive garden may be made on a small scale on a small piece of ground, and often it is the small garden which produces the greatest number of flowers. During the summer the rich colouring of flowers, the green of grass and trees, and a certain amount of shade will prove a never-ending source of delight to the home-lover, and will add considerably to the value of the dwelling.

All natural features must be considered, and generally the smallest gardens must be the most formal. Where there is a long, narrow path from house to gate, the length of the path is apparently reduced by beds of gay flowers on each side, or its long straight line may be broken by a creeper-covered arch. The lawn of a small home should not be broken up by beds of flowers or shrubs. Shrubs may be planted to hide the boundaries of the ground, and curving paths disappearing behind beds of high-growing flowers tend to make a small garden appear larger.

There is so much outdoor life in sunny Queensland, and so much time may be spent in a garden, that it should be made a restful, beautiful part of a home—a vital part, not merely an adjunct to residence. Most gardeners do not express individuality in their gardens. Very often each garden in a street is laid out in much the same way. Year after year the same annuals are planted in the same beds, as most amateur gardeners do not care to grow plants they know little about.

Garden features, such as seats, summer-houses, pergolas, and sundials should receive more attention. A well-built, substantial garden seat would add considerably to the comfort and beauty of a garden. Such a feature would raise a garden from the common-place, and its beauty would be increased as the seasons pass—gay annuals and roses in the spring, and gold and tawny chrysanthemums and dahlias in the autumn, blooming in the surrounding beds.

Fences may be covered with creepers, which will give an old-world walled appearance to a garden, and form a background for tall growing, old-fashioned flowers, such as hollyhocks. One can imagine such a garden with beds of pinks, heliotrope, petunias, and mignonette. A back gate framed and covered with one of our many beautiful flowering creepers would make a pleasing picture from the roadway and grounds.

The joy of a home with a garden is found in watching its development and growth to a state of perfection, be it just a home surrounded by grass and shrubs, or by a garden full of gorgeous blooms. Sunlight and shade, bright flowers against dark foliage, curving paths and shrubs, quiet corners with garden seats all gain added beauty from each other. Do not let the seasons pass without erecting in your garden some feature from which it will gain individuality and restfulness.

* In the Brisbane "Sunday Mail."

PLATE 146.

This fibrolite bungalow was one of the most interesting exhibits at the recent Brisbane Show, and was a centre of attraction. It embodied many modern features, including rough-cast exterior walls, a variety of artistic interior treatments, and new panel suggestions and wall-paper effects.

VEGETABLES.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are

to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every

berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

INSPIRED BY THE JOURNAL.

A North Arm farmer, renewing his subscription for a further three years, writes (4th September, 1928)—"At the same time I would like to express the joy and inspiration I receive with each number, and trust its circulation is being continually extended amongst those who, like me, can appreciate it."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1928.		December, 1928.		MOONRISE. Nov., 1928.	Dec., 1928.
Date.	R'ses.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.3	6.9	4.50	6.32	10.9	10.44
2	5 2	6.10	4.50	6 32	11.12	11.30
3	5.1	6 11	4.50	6.33	...	...
					a.m.	a.m.
4	5.0	6 11	4 50	6.34	12 10	12.8
5	5.0	6.12	4.50	6.35	1.1	12.41
6	4.59	6.13	4.50	6.35	1.42	1.12
7	4.58	6.13	4.50	6.36	2.17	1.42
8	4.57	6.14	4.50	6.36	2.49	2.12
9	4.57	6.15	4.50	6.37	3.19	2.41
10	4.56	6.15	4.51	6.38	3.48	3.15
11	4 56	6.16	4.51	6.39	4.19	3 48
12	4 55	6.17	4.51	6.40	4 49	4.28
13	4.55	6.18	4.51	6.40	5.21	5.14
14	4 54	6.18	4 52	6.41	5.58	6.3
15	4 54	6.19	4.52	6.41	6.40	6.56
16	4 53	6 20	4.52	6.42	7.27	7.50
17	4 53	6 21	4.52	6.43	8.17	8.46
18	4.53	6 21	4 53	6 43	9.10	9.46
19	4 52	6.22	4.53	6.44	10.6	10 43
20	4.52	6.23	4.54	6.44	11.4	11.49
					p.m.	p.m.
21	4.51	6.24	4.54	6.45	12.3	12.40
22	4 51	6.25	4.55	6.46	1.3	1.42
23	4.51	6.26	4 55	6.46	2.4	2.47
24	4.51	6.27	4.56	6.47	3.6	3.55
25	4.51	6.28	4.56	6.47	4.12	5.8
26	4 50	6.29	4.57	6.47	5 20	6.17
27	4.50	6 29	4.57	6.48	6.33	7.24
28	4.50	6.30	4 58	6.48	7.37	8.26
29	4 50	6.31	4.59	6.48	8.54	9.19
30	4.50	6.31	5.0	6.49	9.58	10.2
31	...	...	5·0	6.49	...	10.40

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 somewhere 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.

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 Nov.	☽	Last Quarter	12 6	a.m.
12 ,,	●	New Moon	7 35	p.m.
20 ,,	☾	First Quarter	11 35	p.m.
27 ,,	○	Full Moon	7 5	p.m.

Apogee, 14th November, at 6·6 p.m.
Perigee, 27th November, at 11.30 p.m.

The nearness of Venus to Saturn on the 6th, 7th, and 8th will be interesting to notice between 7 and 8 p.m. a little before they set.

While the Sun is partially eclipsed on the 12th at Madras and many other places in Asia as well as in Europe, including the British Isles, it will be serenely shining here, unaffected by the Moon, which, however, will be remarkably near the Line joining the Earth and Sun.

Unfortunately the occultation of Venus by the Moon on the 15th will be unobservable throughout Queensland. Had the time been a few hours earlier it would have been a highly interesting spectacle.

Jupiter will be occulted at Sydney and Melbourne on the afternoon of the 25th, but this interesting sight will be unobservable in Queensland.

On 27th November the Moon will rise completely enshrouded in the shadow of the Earth and therefore entirely cut off from the direct rays of the Sun. From the commencement of totality at 6·33 p.m., for 56 minutes, the Moon will be eclipsed. From 7·39 to 8·39 it will be slowly recovering its usual brightness and will pass through all the phases from new to full in seventy minutes, but will still be in the penumbra or fainter part of the earth's shadow till 9·37; after which it will occult two stars in Taurus, Kappa, and Epsilon. It will be interesting to observers to notice how Kappa will be so close to the southern edge of the Moon as to be occulted for a few minutes only.

The conjunction of Mars with the Moon at 10 p.m. on the 29th will be an interesting sight throughout Australia as Mars will be remarkably near the southern edge of the Moon. In the northern half of China, Mars will be occulted.

The two finest planets, Venus and Jupiter, will be evening stars; Venus in the west, apparently in the constellation Orphincus from the 1st to the 15th, and after that in Sagittarius. Jupiter will be in the east and apparently moving slowly backwards amongst the Stars of Aries.

Mercury, in Virgo, near Spica, will rise 42 minutes before the Sun on the 1st; on the 15th it will be in Libra and rise 52 minutes before the Sun.

Saturn will be in the western sky, setting nearly an hour before Venus on the 15th.

4 Dec.	☽	Last Quarter	12 31	p.m.
12 ,,	●	New Moon	3 6	p.m.
20 ,,	☾	First Quarter	1 43	p.m.
27 ,,	○	Full Moon	5 54	a.m.

Apogee, 11th December, at 7 18 p.m.
Perigee, 26th December, at 12 30 p.m.