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PART 2.

Event and Comment.

Dairying at Mackay.

ROUND about Mackay, particularly out towards the Eungella Range and beyond, there is some excellent dairying country and already the foundation of a sound industry has been laid there; and, with the establishment of a modern butter factory there is every reason why the industry should extend and that cream should be added to sugar as a sound economic combination. That dairy farmers in the Mackay district have started on right lines was evident at the recent show. With the cattle section the Minister for Agriculture and Stock, Mr. Harry F. Walker, who opened the show, was strongly impressed. After congratulating the farmers assembled on the general excellence of the exhibits, especially the cane, he expressed particular interest in the stock parade. Speaking of herd improvement he remarked that some people might not realise its importance, but he assured his hearers, who were mostly canegrowers, that successful dairying depended just as much on science as successful sugar cultivation. Through the greater care and attention now given to the essentials of his industry the Australian dairy farmer was able to produce butter of unexcelled quality. The market for good butter was anything but oversupplied, and farmers of the Mackay district who had suitable land and were otherwise in a position to do so could engage in dairying without any immediate fear of overproduction. Their market was assured and the industry provided a fair living. In the Gympie district last year 1,800 suppliers had averaged over £330 a man for butter; in addition, they had also produced pigs, maize, and other crops. He urged local farmers to interest their boys in the possibilities of dairying in their home district, to get them out on to the Range and help to keep their own butter factory going. He was big enough to give credit to the late Government

and his predecessor in office, Mr. W. Forgan Smith, for many of the improvements brought about in dairying as well as in the sugar industry. They must, however, continue their efforts at herd improvement and create for Queensland further production records. Local production and manufacture would obviously bring more money into the district and that would also appeal to local commercial interests. With the good roads they had already, and other highways under construction and already planned, with motor transport and mechanical milking, there was nothing to prevent anyone with the necessary means and experience from engaging in an industry that was at once interesting and profitable. He appealed to the young men of the Meakay area to remain on the land where they were better off, where they could live an independent life and acquire a competence, instead of worrying about getting a city job in which not only their usefulness, but very often their opportunities were unduly limited. He urged the farmers present to take advantage of the Better Bull Scheme and other facilities at their disposal for the improvement of district herds. Mr. Walker commended the quality of the dairy cattle exhibited which were equal to the stock paraded in Southern show rings, and which would provide a sound foundation for district herds when dairying developed to the extent that the great natural advantages of the back country of Mackay warranted.

Agriculture from an International Aspect.

HELPING to clear away the fog of misunderstanding that has, in recent years, enveloped many of the more important questions as between nations in the two hemispheres is a group of associations, such as the Royal Institute of International Affairs in Great Britain and the Council of Foreign Relations in the United States, which devote themselves to a sympathetic study of the world's affairs. They are quite unofficial, yet they are already beginning to influence for good the factors that govern affairs in the world to-day. They watch the formation and trends of international policy, and help to create that atmosphere of sound judgment and goodwill so essential in modern international relationships. They encourage the taking of the longer view that comes from sober consideration of any problem that arises and that may threaten the continuance of international amity. Through them the powers that are may be made aware of national tendencies before they reach a point of international tension. They help to break down the barriers that unduly restrict mutual understanding and appreciation of differing points of view.

As well as to the larger affairs of statesmanship these associations also encourage the study of industrial relationships, and the value of this study is evident from an address* by Sir Daniel Hall, K.C.B., on the dependence of agriculture on international factors, which we now have before us. In it he reminds us that we are accustomed to think of agriculture, though having some national significance, as more or less a local or parochial affair; and that many of the features which characterise modern agriculture are by no means purely national, but are world-wide, and may have to be met by international action. And he presses the point that we cannot consider merely our own agriculture when trying to find out the cause or origin of our own difficulties, but must regard the problems of primary production from an international aspect if we are to attain any reasonable solution of those difficulties. From the findings of the World Economic Conference at Geneva last year on the results of a world-wide inquiry into the economic situation, we get a confirmation of the fact that agricultural depression is world-wide—though there is a tendency, even in the address under review, to rather exaggerate some of the causes and extent of that depression. It is accepted, however, that there must be some general underlying cause which is affecting primary industry universally, and that is responsible for the fact that the man who is growing food and clothing—the world's first necessities—is anything but satisfied with what he gets for his outlay and his labour. The Economic Conference attempted to diagnose the cause of this, and arrived at the conclusion that it was the general lowness of price for primary commodities. The term is, of course, comparative, but on this question of low values it was agreed that in every producing country there is a disparity against the farmer.

Low prices, of course, are the natural corollary of over-supply. The question therefore arises: To what extent is the world over-supplied with the necessities of life? The lecturer had this to say about it:—

It seems rather ridiculous to talk about over-supply of food when at the same time one hears of great populations all over the world who are confessedly short of the prime necessities of life. Therefore, the Economic Conference concluded that the over-supply was of a relative and not of an

*Extract from the "Journal of the Royal Institute of International Affairs," Jan., 1929.

absolute character. In fact, if you come to analyse the figures a little more carefully; if you analyse, for instance, the relation between the world's population in the years immediately preceding the War, say, the years 1909 to 1913, and the amount of agricultural production during that period compared with the population and the agricultural production at the present time, you will find that the population has increased faster than the food supply. There is not a real over-production of food; but there is an over-production of food in relation to the consuming capacity of the peoples. By "consuming capacity" I do not mean their appetites, I do not mean their desire for food, I mean the amount of money that they have in their pockets wherewith to pay for food.

That is the real diagnosis of the situation. Because over Europe in particular there are so many millions of people unemployed, unable to exercise their normal purchasing power, the demand for food has fallen below the supply, and we have over-production with consequent low prices for all the producers of food. The essential need for the food remains, but because the world is disorganised and out of joint, because there are so many people here and in other disturbed regions of the world, like China, who cannot exercise their old purchasing power, the effective demand is below what we took as the average human demand in the years immediately preceding the War.

The Rural Exodus.

AFTER analysing the position from many angles, and reviewing the factors affecting the prices of primary products in various parts of the world, Sir Daniel Hall concluded his very informative and suggestive address with a reference to the rural exodus that is going on in every agricultural country. If no alternative can be found to the present unsatisfactory marketing methods there is a danger, he averred, that the destructive power of unrestricted competition among the farmers of the world will tend to destroy the agriculture of the world. There is in every country at the present time a tendency to leave the land. The young ones go whenever they get a chance and wherever they see an opening. Even in an agricultural country like France there is an extraordinary city-ward movement of the French peasant notwithstanding his own traditional attachment to his own bit of soil. All over the world the same phenomenon may be observed. The annual returns of abandoned farms in the United States show that the farmer, under the present prevailing conditions, is not prepared to stick it out. This is the slow change by which agriculture responds to low prices. You cannot adjust production quickly; but it does slowly adjust itself by the retreat of men from the land. "We cannot afford," continued the lecturer, "to go on letting these men go. I began by saying that the actual production of food in the world is, in relation to population, less than it was in 1914. We are actually in a short position, though the shortage cannot declare itself because of the difficulty that so large a proportion of the population experience in making their demand for food effective. Therefore, it is necessary for States like our own to consider what steps they can take to arrest this flow, lest we suddenly slip over the danger point and find ourselves in a real scarcity because there are no longer the people on the land to produce food for us."

The Welfare of Agriculture—An International Question.

THE world position of agriculture and its present day trends constitute something more than a national question; they have become of international concern. There are already in existence international organisations which give some consideration to the conditions of primary production from a world-wide standpoint. One of these is the International Institute of Agriculture in Rome, whose business it is to collect and disseminate information as to statistics, markets, economic relationships, land tenure, and other factors. But the only international agency that views this world problem from the standpoint of the farmer is a body that grew out of an International Congress of Agriculture in France, and which calls itself the International Commission of Agriculture. Its aim is to unite tentatively, slowly, but in the end effectively, farmers' organisations throughout the world. It has already a considerable and representative membership of various rural bodies of most of the continental countries of Europe, and judged on its present standing and efforts it has all the components of a good and sound international organisation representing not the official or scientific points of view, but the actual economic demands of the farmers themselves. The attention that is being given to the problems of primary production that are common to most countries is a healthy sign, and any movement calculated to strengthen the farmers' economic position will, it may be safely assumed, meet with the sympathetic support of the industry in Australia.

Bureau of Sugar Experiment Stations.

INTERNATIONAL CONGRESS OF SUGAR-CANE TECHNOLOGISTS.

Subjoined is a report by the Director of Sugar Experiment Stations, Mr. H. T. Easterby, on the Third Congress of the International Society of Sugar-cane Technologists held at Sourabaya, Java, June, 1929, and on some phases of the sugar industry in Java, which will be read with interest by Queensland producers.

PART I.

THE SUGAR CONGRESS.

THE Third Congress of the International Society of Sugar-cane Technologists, by far the most important yet held, was opened at Sourabaya on Friday, 7th June, by an inaugural speech from Dr. H. Jelgerhuis Swildens, President of the General Syndicate of Sugar Manufacturers in the Dutch East Indies, and responded to by the President of the Congress, Dr. Jesweit.

Representatives from the following cane countries were in attendance, viz.:—Australia, Hawaii, Indo-China, Japan and Formosa, Java, Mauritius, Philippines, Trinidad, United States of America, British India, and Egypt.

Outside of Java, Hawaii had the strongest representation, thirteen members attending—five from the Experiment Station and eight from plantations.

The hospitality extended to the foreign members was beyond praise, and everything possible was done to make the stay of members in Java enjoyable and instructive.

Valuable Bulletins were read in Congress, which have been brought back for the use of the Sugar Experiment Station, but in my opinion the greatest value of these meetings lies in the personal exchange of views between the representatives of different countries and the cordial relationship thus engendered.

Papers were read at the general meetings on the development of the Java sugar industry, the development of selection and breeding of the sugar-cane in Java, irrigation, its organisation and importance for the Java sugar industry, and the economic advantages and drawbacks of the sugar-cane industry in Java.

In the Agricultural Section which I attended, papers were read or summarised on cane cultivation in Java, India, Mauritius, Fiji, Louisiana, and Queensland, and discussions took place on these as well as on soil surveys, chemistry of sugar-cane, and other cognate subjects. Other sections comprised factory operation and chemical control (upon which Mr. Bennett will supply data) and the diseases of cane, and insects pests.

On Wednesday, 12th June, a number of papers on varieties of cane were dealt with, and considerable discussion ensued which should be of much benefit to the industry.

On behalf of the Government of Queensland, the Minister's letter, containing a cordial invitation to hold the next meeting of the society in our State, was presented and supported by addresses by myself and Dr. Gibson, who represented the Australian Sugar Producers' Association; and who spoke also on this particular matter, on behalf of the Queensland Cane Growers' Council. After considerable discussion it was stated that the aim of the Congress was to hold the conferences alternately in the two hemispheres, and it was decided that Porto Rico should have the honour of the place of meeting in 1932, while in all probability Queensland would be selected in 1935.

At the final meeting, Dr. F. W. Zerban was appointed President of the next Congress, and various committees were then appointed. At my request Mr. A. F. Bell was placed on the Quarantine and Disease Committees, Dr. Kerr on the Agricultural and Soils Committees, and Mr. Bennett on the Factory Operations Committee.

The following resolutions were then carried:—

Resolutions.

“Whereas the discovery by Dr. E. W. Brandes of the transmission of sugar-cane Mosaic by *Aphis Maidis* has proved of immeasurable value to all sugar-cane countries for making possible the development of effective control measures and the systematic breeding of resistant varieties, the section of cane diseases of the Third Conference of the International Society of Sugar-cane Technologists proposes that this Conference send to Dr. Brandes its sincere thanks and appreciation for this fundamental discovery.”

“Whereas, exact knowledge on the influence of irrigation and drainage is still very incomplete, it is voted that a resolution be adopted that in all canegrowing countries more attention should be paid to these problems and that more scientific experiments should be carried out on this subject.”

“Whereas, soil surveys and the classification of soils are fundamental for the proper study of soil fertility and manuring for the improvement and maintenance of sugar-cane soils, it is resolved that the Standing Committee shall—

- (a) Secure as far as practicable uniformity in the classification and in the nomenclature of soils;
- (b) Collect data on soils and fertility experiments on sugar-cane soils of the various countries concerned.”

“Whereas at the present time many identical varieties occur under different names and also different varieties are cultivated under the same name, and whereas rational studies on sugar-cane need a reliable identification and description, and whereas cane breeding work needs the availability of all original canes and of those canes, which played a part in cane husbandry, and whereas further investigations on genetics and taxonomy of sugar-cane are of prominent importance, for further development of the sugar-cane industry, it is resolved that the assembled delegates of the Java meeting of International Society of Sugar-cane Technologists recommend that in two or possibly three different countries collections should be made of all cane varieties mentioned above; and be it further resolved that the executive committee take the necessary steps for the establishment of such collection gardens.”

“Whereas, it has been demonstrated that there is considerable risk in the unwary introduction of new canes into any country, and whereas it is desirable to keep track of the proper nomenclature of all importations and prevent further confusion in names, it is resolved that the assembled delegates of the Java meeting of the International Society of Sugar-cane Technologists recommend that new importations be allowed only in small quantities and to recognised institutions, and that steps be taken to record at the time of importation at some central place in the country, preferably under a botanist, full details about the variety such as the name, country of origin, a short description and specimens of canes, buds and leaves, and whenever possible it is further desirable to keep the cane growing at the central place at least for a time to render its subsequent identification easy and certain; and be it further resolved that copies of this resolution be sent to all Government and other institutions interested in the sugar-cane industry and to the standing committee.”

“Whereas, the current technical literature on sugar-cane and beet is published in a large number of periodicals and often is written in a language which is only understood by a minority of the technologists or is not available in the local libraries, whereas further reinforcement of the interest of organisations and of the personal members of our association is desired for further development of the activities of the association, be it resolved that a new periodical be started or an existing periodical be requested to publish adequate abstracts in the English language, submitted by the authors themselves, of all technical papers of more general importance; and be it further resolved that a committee be appointed by the chairman to devise ways and means for carrying this resolution into effect.”

“Whereas, at the present time different countries report their field and factory results in many different and unrelated units, thus making mutual comparisons extremely difficult and time-consuming, and whereas, the metric system is based entirely on the decimal system of numbers, and relates logically measures of volume to measures of mass, has been legally adopted by most countries, and is in universal use throughout the scientific world, be it therefore resolved that the cane sugar industries of the countries represented in this society be urged gradually to introduce the metric system, and that until that is accomplished, they publish all field and factory results in metric units, either exclusively or along with the customary units.”

“Whereas the International Committee for Uniform Methods of Sugar Analysis has not held a meeting since 1912 and has practically disbanded, and whereas there exists at the present time a great deal of confusion owing to the use of different analytical standards in different countries, be it therefore resolved that a committee consisting of Messrs. F. J. Bates, C. A. Browne, Noel Deerr, P. Honig, and W. R. McAllep be appointed, which committee shall approach prominent sugar chemists

in all important countries producing sugar from the beet or cane, for the purpose of reviving the International Commission for Uniform Methods of Sugar Analysis."

In the course of the meetings and at their conclusion, a number of excursions were arranged for members to

- (a) View institutions of general interest;
- (b) Excursions for factory experts; and
- (c) Excursions for agriculturists and soil experts.

These were of a highly interesting character, especially the one to the Paseroean Experiment Station, which will be commented on later.

The Government of Java and private railways granted a free pass over their lines to each member.

The final function was an official dinner at Bandoeng, at which the hospitality, kindness, and courtesy shown to members of the Congress by Java was suitably acknowledged by the representatives of the other countries.

In concluding this part of the report it may be said that it will be exceedingly difficult for any country in which the Congress may, in future, be held, to reach the high standard set by Java. The cost of the Congress to the General Syndicate of Sugar Manufacturers must have been very great, including as it did all the printing of papers, &c., and the various excursions and entertainments which were given. Strong committees were formed, including Honorary, Executive, Preparations, and Accommodation. Such committees will be necessary in the case of a visit to Queensland at a later date, and all sections of the industry will need to be strongly represented and to work hard in order to make the Congress as successful as it was in Java in 1929.

PART II.

SOME PHASES OF THE SUGAR INDUSTRY IN JAVA.

(a) GENERAL.

It may be said that the sugar industry in the Dutch East Indies is confined to Java. Sugar-growing on a small scale has been carried out in Sumatra and the Celebes, but the relative scarcity of labour precludes its present success.

The output of sugar in Java has been steadily increasing, as the following figures will show:—

							Tons.
1922	..	..	..	..	..	..	1,808,000
1923	..	..	..	..	..	..	1,793,000
1924	..	..	..	..	..	..	1,997,000
1925	..	..	..	..	..	..	2,300,000
1926	..	..	..	..	..	..	1,973,000
1927	..	..	..	..	..	..	2,309,000
1928	..	..	..	..	..	..	2,950,000

Java now ranks second to Cuba in cane-sugar production. Its average production per acre is 6 tons of sugar.

The total cultivated area of Java is given as 16,700,000 acres, of which 480,000 acres are under cane—or not 3 per cent. It can be seen, therefore, that the yield of sugar per acre is very high. All the sugar-cane is grown on the eastern side of Java.

The Land System in Java.

Practically all the land used for canegrowing is rented from the natives of Java. The Government protect the natives against themselves as they would be willing to sell their lands for any slight sum, and as one Java man put it, "Buy a fountain pen with the proceeds, with which he could not write." The rent is fixed by the Government on the basis of the probable maximum rice production of the land in question.

For the same reason land cannot be rented by Europeans for longer than three and a-half years unless a minimum rent is paid, fixed by the Government. In 1926, over £2,000,000 was paid for supplies of materials and rent of land, while the wages paid to native labour in the same year is given as being £8,000,000. The amount of taxation, direct and indirect, paid by the sugar industry and its employees, amounted to £2,000,000 in 1926.

The Present Position of the Industry.

There are stated to be 179 plantations in Java, the area of cane supplying these mills varying from 1,750 to 5,000 acres; the bulk of the mills, however, were supplied from areas of cane of 1,750 to 2,800 acres. It will be seen from this that the mills in Java depend for the greater part on smaller acreages than in Queensland, the much higher yield of cane and sugar per acre accounting for this. Practically all the plantations grind their own crops. Of the 179 mills, over 100 are owned or managed by seven companies. Outsiders seldom start sugar mills, only the established concerns with long experience of Java conditions, and possessing adequate capital, making new ventures. The larger mills have latterly been increasing both by extension and amalgamation. It is necessary to obtain permission from the Government in order to build a new mill or to extend the area of an existing plantation, and this permission may be withheld if there is a probability that a new mill would endanger the welfare of the native population in the district.

The value of exports from Java in 1926 was £63,000,000; of this the sugar industry accounted for £23,000,000.

Transport conditions are in many cases crude, the buffalo-drawn two-wheeled wagon being still largely used, but this is gradually being superseded by locomotive and motor traction.

Only plant crops are grown, as after one crop of sugar-cane the land has to be returned to the native owner for the cultivation of native crops, such as rice and maize. Sugar-cane is only allowed once in three years, so that a legally enforced rotation becomes imperative. It is for this reason, combined with the intensive cultivation of small areas by hand labour, that the yield per acre is so high. It also means that the area of an estate is at least three times larger than its annual plantation.

There are about 900,000 unskilled labourers, mostly in the fields; children and women earn from 4d. to 6d. per day, and men from 10d. to 1s.—all on piecework. When a native considers he has earned sufficient for his wants he will very often sit down for the rest of the day. This class of labour is mainly employed between April and October; they have other means of support during the months of November to March. In addition to this large mass of unskilled labour, the sugar industry in Java employs some 56,000 regular native employees, most of whom are more or less skilled, and are paid according to their position from 1s. to 7s. per day—the average running from 1s. to 2s. 6d. per day.

The General Syndicate of Sugar Manufacturers practically comprises all the companies owning or managing sugar mills in Java, and its principal work is controlling the agricultural, fiscal, irrigation, and educational problems—e.g., the experiment station. The United Sugar Producers' Association of Java controls the sales of sugar. It is somewhat remarkable that the island of Java with its immense population of 40,000,000 consumes less sugar than does Australia. The principal buyers of Java sugar are British India, Japan, and China. Two-thirds of the manufactured sugar is plantation whites. No refined sugar, as far as I know, is made in Java.

(b) CANE CULTURE.

The price paid to the natives for leases, and the forbidding of growing ratoon canes, compels the plantations to get the highest possible yield of cane and sugar per acre, and for this reason the cultivation has necessarily to be of the most intensive character. The intensive cultivation is made easy for the sugar planter in Java, because of the abundant and cheap supply of labour; hence the tillage operation is carried out almost entirely by hand, and planters say that hand cultivation is cheaper for them than mechanical cultivation.

Methods of Cultivation.

The cultivation of the cane is mostly carried out on what is known as the "Reynoso System." After the rubbish from the previous crop of rice, &c., has been removed, the drills to receive the cane are dug in the land by hand, and the earth or clods are piled up symmetrically at the sides so as to form a comparatively deep channel, the interspaces being left entirely untilled. It is thus possible to plant the cane much deeper than is done by any ploughing system, and the cane can later on be filled up higher, obviating the risk of lodging by affording more support to the roots of the cane.

Ploughing the soil is not much used in Java, though it is applied in some districts to lighter soils, where it does not give much less output in sugar.

As the greater part of the land on which cane is grown has had a previous crop of rice under water for months it is imperative that the land be drained, and, accordingly, drains are dug in the shape of trenches, including a ring drawn round the field, so that at the lowest point any superfluous water is removed as quickly as possible. It is usual to try and lay out the drills for cane in a north to south direction, so that the plants will obtain as much sunlight as possible. After the drainage trenches are dug, the digging of the planting drills commences. The soil is usually saturated with water from the previous crop, but the natives are used to working the soil in this manner. It may be pointed out here that, while there are large numbers of canefields, none of them are very big in area. Considerable attention is given to the proper piling up of the clods removed from the planting drills. The depth of the drills varies from 12 inches to 18 inches, and may be from 16 inches to about 2 feet in width. The distance from centre to centre of the drills is usually about 3 feet to 4 feet 6 inches in width. Sometimes the depth of the cane drills is made by digging twice, or by digging once and then by forking out or chipping out the bottoms. The field is then left fallow for some time, being exposed to air and sunlight. Frequently before planting, some of the oxidised earth is taken from the sides and placed at the bottom of the drills. Some planters, however, put the plants on the untilled bottom of the drills. As a rule, some earth is placed in the drills so as to get a desirable planting depth.

The System of Planting.

When planting in the bottom of the drills the soil is first made wet by watering it; when the water has drained away the cane cuttings are pressed into the ground to the desired depth. This is usually done by women or children. Other methods are laying the sets in the bottom and covering by earth, while single budded cane is sometimes planted in holes in the drills made with a stick. These plants consist of part of the stalks of cane in the fields that have sprouted buds. The tops are cut off to provide seed cane and the lower parts left on the field till the buds have sprouted; these are then also cut for planting material. In order to get the plants spaced properly ropes with knots at measured intervals are sometimes used and stretched along the drills, the women placing the plants where the knots coincide. When cuttings are used lying horizontally, care is always taken that the eyes lie on each side and are not put underneath the plant, which gives rise to poor germination. Sometimes the cuttings are placed obliquely in the ground. Planting material is taken from the top seed of the standing cane, cuttings of the under portion which has sprouted, cuttings from hill nurseries, and cuttings from specially laid out nurseries on the plains. Formerly much cane planting material was brought from the hills owing to its superior resistance to the Sereh disease, but the almost universal planting of the variety P.O.J. 2878 has made this superfluous. What is known in Java as "rajoengans" or sprouted cane is much used, and pieces with two buds sprouted are usually recommended for planting.

Usually the cane is covered in three times, the earth which lies on the sides being used for this purpose. Often the earth which lies on the sides of the cane drills is turned over before applying the second covering in, so as to better aerate it, thus exposing the hard clods to the effect of the air and sun. This turning over generally puts some loose soil into the drills. Finally, all the soil at the sides of the drills is removed and laid against and between the cane stalks. A large quantity of water is desired then in the heavier soils, as otherwise the clods cannot be made fine enough, and the soil will not fit sufficiently close to the cane stalks. As the final hilling up is usually done at the beginning of the wet season when the cane is from four to six months old, little or no irrigation water is then available, and it is usually left till the first rains of the west monsoon. Before beginning with the final hilling up—which, of course, too, is done by hand—the lower leaves, mostly trash, are removed, so that the earth may fit closely to the stalks, and the earth is stamped against and between them.

Irrigation Practice.

During five months before the rainy season the cane is periodically watered by women throwing water into the drills by means of pails or cans fixed on handles with which they dip the water out of the irrigation channels.

Irrigation plays a large part in the cultivation of cane, and the different irrigation works in Java are on a scale of considerable magnitude. Only a very small percentage of the cane is cultivated upon unirrigated soils. In fact, this is said to be only possible in recent volcanic soils having a high capillarity.

Fertilising.

The manure principally used in Java is sulphate of ammonia, and this is applied to practically every acre under cultivation. Superphosphate is only used on about 79,512 acres of the total area (about 480,000), while potash is hardly used at all, as it is stated that, with one exception, it nowhere had any beneficial effect on the sugar yield, not even on soils poor in potash. Molasses and stable manure have been used to some extent. Green manuring is not practised, as it has only been found to have a beneficial effect occasionally. The results have always been found to be irregular, but it has been admitted that the green manures used have not always been wisely chosen.

Sulphate of ammonia is generally given in two to three doses, generally at the same time as the hilling up is being done, and takes place from three to four and from six to eight weeks after planting. This is done by native women who make a small hole near each stool of cane and pour an accurate measure in from a carefully adjusted spoon. The manure is thus concentrated and does not contribute to the growth of weeds. The whole dose is given within two months after planting. The amount of sulphate of ammonia used averages about 4 cwt. per acre. The weeding is all done by hand.

(c) THE EXPERIMENT STATION.

The Sugar Experiment Station at Pasoeroean is acknowledged to be the finest in the world. It is the property of the General Syndicate of Sugar Manufacturers, and possesses its own governing board, and its own revenue. The annual contribution of the sugar factories is at the present time equal to about 4s. 8d. per acre, the revenue amounting to more than £116,000 per annum.

The work of the Experiment Station in Java is carried out by three departments—the Agricultural, the Technological, and the Engineering—each having its own director. The aims of the institution have been summarised as follows:—

“The search for the best condition in each step of planting and manufacturing beginning with the tillage of the soil and ending with the shipment of the manufactured sugar.”

The permanent staff of this Experiment Station at the present time consists of about 45 Europeans, 10 Chinese, and 250 natives, in addition to which there are fifteen European local agents in the Extension Service of the Agricultural Branch. There are thirty-four houses for the European staff, and eight of the fifteen houses occupied by the Extension staff are also the property of the station.

The library contains 20,000 volumes, and is one of the largest in the Tropics. It also does its own bookbinding, &c. There is also a fine museum. Medical attention to the staff is provided free.

The Agricultural Branch.

The main objects of the Agricultural Branch of the Station are the study of cane from the botanical, taxonomic, and physiological point of view, internal and external morphology, entomology, cytology, and genetics, breeding of new varieties of cane, studies of the soil, drafting of agro-geological maps of the estates, investigations into weeds on the sugar-cane soils, elaboration of field experiment results, most advantageous manures, times of planting, suitable spacing, studies of diseases and pests, and gathering of statistical data. The local agents doing extension work give advice to factories, collect material for the agro-geological mapping of the sugar estates, control field experiments and make reports furnishing miscellaneous information.

Field Experiment Service.

The object of the field experiment service is to study by the aid of field experiments all questions connected with sugar-cane cultivation. Last year, 153 factories took part in the field experiments, and about 2,400 of these trials were harvested. The experiments are carried out by the factories on the advice of the Agricultural Branch of the Experiment Station, and remain under its supervision until they are harvested. It was by the work of the field experiments, in which the yields of newer varieties were compared with the older ones, that the superiority of P.O.J. 2878 was demonstrated in so short a time. In four years—viz., from 1926 to 1929, this variety spread from $\frac{1}{2}$ per cent. to 93 per cent. of the total sugar-cane area of Java.

In order to obtain reliable results the experiments are repeated at least ten times in the same field, the small plots being arranged in chess-board fashion, and

are harvested and milled separately. The averages are based on the theory of probability, and render an immense amount of calculations necessary. This work is done in a special office with the help of modern calculating machines, some of which are electrically driven.

Laboratories are provided for soil investigations, entomological, pathological and physiological researches.

The cane breeding and selection section occupies four rooms, and in order to have sufficient material for crossing purposes, the Station has brought together a large collection of cane varieties, which amount to 650. The collection is planted out in the fields of the Experiment Station, while duplicates exist at Malang where a different climate is experienced.

The cane breeding work will be referred to again later on.

The Technological Department.

The Technological Department of the Experiment Station comprises a sugar laboratory, where differences between buyers and sellers are adjusted, an analytical laboratory where special analyses of materials used in the sugar industry are made, also samples of boiler scales, waters of condensation, &c., are analysed. Research work covers the study and improvement of usual and new methods of analyses. There is also a chemico-technical laboratory where investigations are made into the various mill problems, a research room, physico-chemical laboratory, organic and chemical laboratories and rooms where the factories' control are governed. The factories taking part in this control numbering 164, out of a total of 179, send in their data fortnightly, and these are worked out and compiled in such a way that all data is comparable.

The Engineering Department studies the design and operation of the machinery and apparatus of the sugar factories.

Altogether, there are 92 rooms in the Experiment Station, including stores and workshops where instruments are repaired, and, in many instances made. Thermometers, hydrometers, pyrometers, manometers, water meters, and electrical apparatus are repaired and verified on behalf of the factories contributing to the Station.

From this brief résumé it will be seen that the Experiment Station plays a highly important part in the sugar industry of Java, and it is undoubtedly due to this institution that the industry is in the efficient state it is. No one who visits that Station can avoid paying a high tribute to the splendid work of its scientific staff.

As the factory owners in Java are the planters of the cane there is no conflict of interests. Hence it is not alone in the factory side that the Station has contributed to the raising of efficiency, but on the agricultural side it has played a great part in the creation of new seedling canes and in its field experiment work.

(d) SEEDLING RAISING.

It may be said that the work of raising seedlings in Java is at the present time on a higher plane than in any other country in the world. This is largely due to the adoption of new methods and the high scientific training of those in charge of the work. Hitherto, it has been the practice to raise seedlings from what are termed "noble" canes only. Owing to the prevalence of the Sereh disease in Java it became imperative to pay more attention to the breeding of canes resistant to this disease. This was attempted by the crossing of the so-called noble canes with resistant "wild" canes, and it has been in pursuance of this line of propagation that the now famous P.O.J. 2878 has been produced. The "Kassoer" cane which is resistant both to Mosaic and Sereh was found growing wild in Java, and Dr. Jesweit considered it to be a cross of the noble cane "Black Cheribon" and a wild cane "Glagah" (*Saccharum spontaneum*) which contains no sugar. Further support for this view has been furnished by Dr. Van Bremer in his cytological investigations, but final proof was obtained by artificial crosses between the noble cane and *Saccharum spontaneum*. For this reason crosses with Kassoer hybrids have strongly come to the front in recent years. The best of them are stated to have inherited from their "noble" parents the high sugar yields and from Kassoer the resistance to the principal diseases affecting sugar-cane in Java. Special investigations are now being made by the cytologist in the examination of the chromosome numbers within the nuclei of the generative cells of the pollen-mother cells, and it is considered that this will have an important bearing on the work, as it appears there is a correlation between the number of chromosomes and the

size of the cells, and by these observations it may be possible to breed canes still more robust.

In the later series of canes bred after 2878 the wild blood has become more diluted and they have proved to some extent not quite so resistant to Sereh disease, so that it is hoped by crossing canes with higher chromosome numbers to obtain more valuable sugar-cane plants.

(e) FIELD EXPERIMENTS.

The Experiment Station state that they have now at their disposal the results of so great a number of field experiments as no other culture on earth can boast of. Up to last year no less than 21,676 complete field experiments had been conducted. These embrace variety, cultivation, and fertilising trials, and all advices issued by the Station are based on the results obtained. Particulars of the lay-out, treatment, and calculation of results from these experiments have been secured, and it may be said that the Queensland Bureau of Sugar Experiment Stations is now engaged in laying out trials of a similar nature in various parts of the sugar areas.

CONCLUSION.

It has been many times asked and will be asked again, what lessons can Queensland learn from Java? To this it may be replied that as far as the culture of the sugar-cane is concerned the conditions in the two countries are so radically different that it would be impossible to apply Java methods of cane culture to Queensland. As a matter of fact, cane culture in Java is not "agriculture," but has been aptly described as "horticulture."

Imagine our farmers digging all the cane drills in a field and neatly piling the clods at the sides. Imagine their wives and children planting the cane and irrigating by pouring pails of water over the plants by hand from the neighbouring irrigating ditches, and making holes and pouring carefully measured spoons of fertiliser against each stool. Imagine the different hillings up, and the care taken in the final hilling up when the trash is pulled off the cane and the earth fitted closely up to and between the stools, all by hand labour. Imagine all these operations which actually take place in Java, and then ask—Would it be possible to carry them out in Queensland? Cane so grown in Java is on an immense number of small areas and the crop being all the same variety is marvellously uniform in appearance at maturity.

But we can learn much from Java on the scientific and experimental side. We can learn a great deal about seedlings and field experiments and we can try to copy their amazing scientific thoroughness as far as circumstances will permit. The Dutch people recognise the value of science applied to the sugar industry and are willing to pay for it.

I have to thank the various officers of the Pasoeroean Sugar Experiment Station for many courtesies, and also for very much of the information I have been able to give in this report. I found a whole-hearted desire on the part of the syndicate and its officials to give as much information as they could on the various questions submitted to them.

JAVAN SUGAR MILLS.

Following is the Report of the Sugar Technologist, Mr. Norman Bennett, on the Sugar Mills of Java.

I HAVE to submit the following report on Javan Sugar Factories as seen during a tour of some five or six factories during the trip arranged by the Java Sugar Syndicate during the third Conference of Sugar-cane Technologists, June, 1929.

The time available for the inspection of the individual factories was short, and the number visited not large. However, I was enabled, through the courtesy of Mr. Ch. Nielsen, of the Handelsvereniging Amsterdam, to make a visit to one of that company's new factories Goenongsari. The design of this factory and two others of recent construction embody many new features in machinery installation.

Much of the data available on Java sugar factories has already been commented upon in a detailed report to the Department of Agriculture, at the end of 1924, after a three months' trip among the Javan mills. A further short report was made last year at the completion of the scholarship period. The information contained in these reports is to be taken in conjunction with this report which will

merely cover the essential reports briefly and include newer ideas developed during the past few years.

In this respect, the policy of the Javan industry in relationship to the research work of the Experiment Station must be particularly noted. The technical department is divided into two sections—viz., Chemical section and Engineering section.

Research Work.

The research work of the Chemical section is done at excellently equipped laboratories at the Experiment Station at Pasoeroean. The application of the results obtained is then applied to factory work proper. At the same time, the section has attached to its staff several practical men whose advice on matters pertaining to chemical control or factory procedure is available at any time.

The research work of the Engineering section is done both in miniature at Pasoeroean and in actual practice at the mills.

At the present time the Chemical section is investigating the following problems:—

1. The structural alterations to the cane fibre as affected by various methods of preparatory devices and the subsequent effect of maceration with both cold and hot water.

The most interesting point brought out to date is that ordinary methods of preparation for milling leave many of the juice cells of the cane unbroken. This must naturally affect the time factor and the efficient use of maceration water. The thermal death point of the cells has been determined at 130 Fahr.

This research has a very definite bearing on our Queensland system of preparatory treatment followed by hot water maceration.

2. An investigation of Javan sugars with a view to improving colour quality, refining value, &c., and the relationship of the various clarification systems—e.g., defecation, sulphitation, and liming on the final product. Ultimately this investigation will have a direct bearing on the various boiling systems in use.

Apart from such work which is of highly scientific nature, the section is conducting a system of uniform control of the re-agents used in the determination of Hydrogen ion.

In addition, a system of mutual control of the boiling house operations has been prepared by the Station staff, and the Javan mills forward their working figures to the station every fifteen days. These figures are compiled on uniform principles and a typed comparative sheet of the work of all mills is then distributed to the associated mills.

This system of mutual control is also applied to the figures of milling work and to fuel control.

Engineering Problems.

The Engineering Department has the following problems in hand:—

1. The application of pressure evaporation to cane juices.
2. The use of air-pre-heating for boiler efficiency and fuel economy.
3. Extensive factory trials of variously designed bagasse furnaces.
4. The extended use of hot water maceration as influenced by the research work of the Chemical section.

In respect to reasearch work as previously set out, attention must be drawn to the policy of the Dutch scientists of submitting every new idea to rigid trials, both on a laboratory scale and on factory tests, before recommending the method or plant to the industry.

Two examples of this system of investigation are:—The rapid elimination of other varieties of cane, in favour of P.O.J. 2878; and the installation of feeding rolls to all mills to assist the feeding of bagasse into the mill.

This latter device is one well worthy of trial in Queensland where the present feeding device is a clumsy pusher.

The Javan Factories.

There are about 180 factories operating in Java at the present time. Most of these have been in operation for fifty years or more. Since 1926, three new factories have been erected by the H.V.A. However, there does not appear to be much likelihood of many more new estates being opened up owing to the conditions laid down by the Government, when application for a charter is made.

The factories in Java are run as an integral part of the whole estate, all cane crushed being supplied direct from the fields cultivated by the company, consequently there is no need for any cane-payment scheme. At the same time it must be remembered that the mill is run in order to obtain the maximum yield from the field. At times this means that the factory may be run at a much greater crushing rate than that which would give the best mill figures.

Since the introduction of P.O.J. 2878 with its higher tonnage yields per acre, the mills have greatly increased their crushing rates. One mill which was visited in 1924 was crushing at the rate of 25,000 piculs per day, and now has increased its crushing rate to 37,000 piculs with no further additions to the original plant installed in 1923.

In general, the standard size of the mills is 30 in. by 60 in. with a 30 in. by 60 in. crusher and a 12 roller plant. Preparatory knives are not used except in two factories, and the Krajewski type of crusher finds most favour. There are some mills which have neither crusher nor knives and these installations are usually equipped with a crusher top roll. The average tonnage of cane crushed is between 1,000 and 1,500 long tons per day, and the milling plant is in operation for three to four months of the year, between May and November.

The milling work, judged on sucrose extraction figures, is not as good as in Hawaii; the final bagasse is very coarse and the quantity of imbibition water is usually under 20 per cent. on the weight of cane.

The control of the milling and factory work is based on the weights of the various products of the manufacturing process. These weights are obtained either by direct weighing or by calculation from volume measurements. The Maxwell-Boulogne type of automatic juice and imbibition weigher is considered to be the best, and installations of this type of machine are gradually increasing.

The mills are usually driven independently by steam engines of the Corliss type, with an increasing tendency to some form of automatic speed regulation controlled from the governor by oil pressure on the top journal of the mill.

There are only three electrically driven mills in operation—one installed in 1923 is driven by A.C. motors; the other two, erected in 1927 and 1928, are driven by D.C. motors of 250 horse-power.

The clarification processes used in the mills vary with the type of sugar produced. Three distinct processes are in use:—

1. Defecation—lime only. This type of clarification produces a raw sugar of two grades according to colour variations—viz., Head Sugar of 16-18 Dutch Colour Standard having an average polarisation of 98.4; and Muscovado Sugar 14-16 Dutch Colour Standard, with an average polarisation of 97.5.
2. Sulphitation—usually the hot process in which the juice is heated to 75 C. before sulphitation. Sulphitation in the cold is practised by only two or three mills. This process produces the two grades of raws as above if required, but if the massecuite is submitted to double purging with steam drying in the second purge a plantation white sugar is produced of 25 Dutch Colour Standard and higher. The size of the grain of this sugar corresponds to that of Australian refined, but is coarser and more liable to variation than American Standard Granulated.

Note.—Both the above processes use settling for removal of the impurities; the settling being universally of the intermittent type as distinct from the Queensland system of continuous settling.

3. Carbonation for the manufacture of white sugar only and a very low-grade molasses sugar. The juices are limed very heavily, then carbonated and passed through filter presses. The carbonation is usually double, but a few mills use a single carbonation process—Procédé de Haan. Sweetland presses have been used at the two new H.V.A. mills for the filtration of the carbonated juice. Further trial of this type of filter is being made.

Evaporators.

These are usually of standard quadruple type with the heating surface of the first body double that of the other vessels. The extra heating surface gives a supply of steam which is used for the heaters or for one or two of the pans. Later types of evaporators tend towards a quintuple with the bodies of the semi-Kestner type—i.e., tubes of $3\frac{1}{2}$ meters in length. The new factory Goenongsari is equipped with a Kestner pre-heater and a quintuple of 5 semi-Kestner bodies and steam is bled from the first and from the second body of the quintuple. The set is fitted with automatic juice regulation.

Boiling Station.

The pans are usually of the coil type; these find favour instead of the quicker boiling calandria pans. Usually all pans and the effects are connected to a central condenser of barometric type with connection to a horizontal dry-air pump.

The pan station is well equipped with crystallisers and with centrifugals. The system of double purging for white sugar makes an increase in the number of centrifugals required. After purging, the sugar is passed through a drier, and after drying is often elevated and allowed to drop against a draft of cool air. Some factories pass the hot air from the drier into a closed room to recover the fine particles of sugar carried over by the current of air.

Boiler Station.

The boilers are usually of fire-tube type, but water-tube boilers generating steam at 12 and in the newer factories at 17 atmospheres are being installed. The boilers at the latter steam pressure are equipped with the Ruth Steam Accumulator.

Firing of the boilers is done by hand due to cheapness of labour, and the furnace construction is of the sloping grate type. The design of the furnaces has recently been altered to give a longer fire bar, and the step grate is closed to within 9 inches of the bottom to force the air through the grate.

All furnaces are used for one type of fuel only; no attempt is made to burn wood or cane trash in the same furnace as bagasse.

Many of the mills have a large surplus of bagasse, and this is baled during the crushing season and stored for subsequent use in the following year or for use in locomotives.

Cane Transport and Unloading.

A considerable amount of cane is hauled to the mill by means of ox wagons. Some of the larger plantations supplement the supply by small gauge tramlines and portable rail. The unloading at the mill where the cane is delivered by carts is usually done by hand and the cane carrier is hand fed. Where rail cars are used the cane is lifted out of the cars in slings and dumped on to an unloading table parallel to the cane carrier and dragged off the feed table by sliding rakes.

The above embodies the general practice in the Javan mills. Further reference should be made to the report of 1924 which was distributed by the Bureau to all Queensland mills.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

The following monthly hints to canegrowers have been received by the Bureau of Sugar Experiment Stations from the Entomological Laboratory at Meringa:—

Growers whose cane has suffered severely from grubs this year, and who are considering fumigating certain of their worst blocks during the early part of the coming year, are advised to place their orders for fumigants at an early date as only a limited amount is obtainable at short notice, any large quantities having to be obtained from overseas. Farmers requiring advice on the ordering of the fumigants, as to where and how obtained, and also of injectors for same, should communicate with the secretary of the Cairns Canegrowers' Association, Mr. F. C. P. Curlewis, or with the entomologist at Meringa, who will be pleased to supply details.

Attention is also drawn to the demonstration at South Johnstone of a horse or tractor drawn machine for the injection of liquid fumigants, which should prove highly satisfactory for use in cases where the growth of the grub-attacked cane will allow the passage of a horse. This demonstration is to take place at Field Day.

During this month most of the grubs will have gone deep down into the soil preparatory to pupating, and, as this state occurs at a depth of from 12 to 21 inches, they are now beyond the reach of most farm implements, and remain undisturbed by ploughing and cultivating operations.

In September and October further grub attacks will occur in patches, but this will be due to the ravages of the "frenchi" grub which does its worst damage during the months mentioned. Fumigation with carbon bisulphide is recommended for this pest as it is easier to kill than the "greyback" grub, and if the cane be fumigated, even after showing damage, it stands a good chance of recovering when the grubs have been suffocated.

During July and August also a great deal of cane appears with leaves barred in white patches. It must be noted that this state is occasioned by neither insects nor disease, but is solely due to cold weather conditions.

The Meringa Experiment Station now has tachinid flies for release on borer infested farms, and growers desiring these parasites are invited to communicate with the entomologist at Meringa regarding liberations.

CANE PESTS AND DISEASES.

Mr. A. N. Burns, Assistant Entomologist, stationed at Mackay, has submitted the following report (2nd July, 1929) to the Bureau of Sugar Experiment Stations, with reference to greyback grubs:—

Observations made during the past fortnight at Mia Mia and several other portions of the Mackay district where grubs have wrought serious injury to cane, clearly show that their feeding season is almost over, and that they are burrowing deeper to form their pupal cells. Much further damage from these pests this season will not occur. It was surprising to note upon visiting several places that were inspected only three or four weeks previously, and where damage was very severe and extensive, that little, if any, further injury had occurred. In one particular area it was noted that the cane looked slightly better than on the previous visit; certainly an indication that the grubs were leaving the cane roots, thereby allowing the cane to form new young roots without their being eaten off. Several examinations made (mostly at Sarina) showed that the grubs were then at depths varying from 8 to 10 inches.

The two recent cold snaps have no doubt been largely responsible for causing the grubs to cease feeding, and burrow downwards to form their pupal cells. Last year some grubs were found feeding right up until July, but the weather had been milder. The minimum grass temperature this year in the middle of June was 35 deg. Fahr.

After forming their pupal cells the grubs will remain perfectly quiescent for some weeks, perhaps three months, before the actual transformations into pupæ. This period of complete inactivity is called the "pre-pupal state," and, as it progresses, the grub's body becomes more limp, till finally the skin splits along the dorsal area and peels off—a fine almost semi-transparent tissue—leaving the soft brown pupa, which, however, soon becomes hardened.

Pupal cells are found at varying depths, according to the nature of the soil and other conditions, but the average depths vary from about 12 to 18 inches. In loose and friable soils they are reported (Bulletin No. 13, Bureau of Sugar Experiment Stations) "as having been found at a depth of 4 ft., and that grubs had frequently been found in their cells at depths varying from 3 feet to 3 feet 3 inches." In soils where the subsoil is clay or other similar hard substance, the grubs would certainly not go down to that depth. Occasionally in soils that retain moisture well, as on some river flats, pupæ are sometimes ploughed up.

The pupal cells are oval in shape, and the wells inside are smooth and hardened, being lined with soil specially treated by the grub during the process of formation. The actual period spent in the pupa itself is variable, but is usually comparatively brief; records obtained from examples bred in cages at the laboratory last year gave this period as varying from four to five weeks only. Upon emergence from the pupal shell, the beetle is very soft, and as yet unable to emerge from the soil. It therefore remains quiescent within its cell—sometimes for six or eight weeks, or even longer—being almost wholly influenced by weather conditions, upon which it is dependent to enable it to break through its cell walls and thus burrow upwards.

During a long spell of dry weather, when the soil becomes hard, many beetles are thus prevented from leaving their cells, and consequently perish therein. This happens when the first summer rains are retarded and do not come at the usual time. The first good soaking rains of early summer usually bring out an emergence of beetles, but sufficient rain is required to penetrate deep enough to reach the cells in which the beetles are resting.

MACKAY.

A cane disease survey of the Farleigh district was recently carried out by the Division of Pathology of this Bureau, with a view to assisting farmers to bring about an improvement in the disease situation. Gummy disease was found on about fifteen farms, while Mosaic disease was found to be generally distributed, and was especially prevalent in the Habana area. Farmers who have gummy on their properties should on no account plant their own seed (an exception being made in the case of Q. 813), and they have been advised to this effect privately. Individual reports have also been made to the owners of farms on which the percentage of Mosaic disease is too high to permit of seed selection.

Mosaic disease is undoubtedly causing more loss in the Farleigh district than all other diseases combined, and a determined effort should be made to bring this disease completely under control. It has repeatedly been proved that in practically every case Mosaic may be completely controlled by seed selection, clean farms, and the up-rooting of all diseased stools as soon as the disease is observed. Experiments have shown that in susceptible varieties a loss of up to 60 per cent. in weight may be expected.

The gummy disease situation is serious, especially in view of the fact that the two new canes of promise in the Mackay area—viz., P.O.J. 2714 and S.J. 4—both appear quite susceptible. In a gummy resistance trial carried out in Bundaberg last year, the following results were obtained from S.J. 4:—

- Stalks dead—95 per cent.
- Stalks oozing gum—5 per cent.
- Stalks apparently sound—nil.

It is quite apparent that gummy disease must be cleaned up before this variety, at least, can be grown successfully.

The following farms have been inspected twice, and on each occasion were found to be free from serious diseases, with the exception of a trace of Mosaic. In cutting plants, therefore, care should be taken to avoid the odd stools of Mosaic. Care should also be taken to avoid canes infected with red rot:—

- T. A. Andrews, Nindaroo; G. Annable, Hill End; Aprile and Co., Dumbleton; W. Blackburn, Habana road, Richmond; C. Blake, Habana road; E. J. Bourke, Eimeo road; Chick and Ormes, Nindaroo; T. W. Daniell, North Side; G. Davey, Mount Pleasant; E. F. Dolby, North Side; M. Donahoe, Mielere; A. Edmonds, Nindaroo; G. Farquhar, Eimeo road; Fordyce and Sons, Richmond; P. Galitte, Dumbleton, Farleigh road; Hamilton and Smith, Glenalbyn; P. W. Hand, Coningsby; A. Hansen, Richmond; H. J. C. Hansen, Pioneer; C. A. Hodge, Mount Pleasant; J. H. Jameson, Eimeo road; P. Kirwan, Dumbleton; F. Knobel, Coningsby; V. E. Kreil, Dumbleton; McGowan and Son, Dumbleton; McLeod and Sons, Farleigh; J. R. Malecolmsen, North Side; H. J. Matthews, Mielere; W. May, Shoal Point; W. T. Millard, Hill End; Mrs. S. J. Pitt, Eimeo road; T. A. Powell, Dumbleton; C. H. Rasmussen, Pioneer Estate; W. J. S. Ray, Dumbleton; E. Ryan, Dumbleton; J. Sherry, Farleigh; G. Shinn, Eimeo road; Mrs. G. Simpson, Hill End; W. Skeele, Coningsby; W. Waddington, Eimeo road; Mrs. M. A. Wilkinson, The Cedars; J. H. Woodward, The Cedars; Harry Wright, Dumbleton.

DISEASE SURVEY OF THE BAUPLE AREA.

A cane disease survey of the Bauple area was carried out during March and April. Altogether eighty-seven farms were inspected, and of these there were only five on which no major disease was found. Mosaic disease was found on eighty-two farms, gummy disease on ten farms, and Marasmius root rot on three farms.

A comparison with the survey made in 1927 shows that the Mosaic disease situation has improved, but there is still room for a great deal of improvement. It has been proved in Queensland, and in many other countries, that in practically

every case Mosaic can be controlled by (a) The selection of healthy seed cane; (b) the uprooting of diseased canes as soon as they appear; and (c) keeping the fields and headlands clean.

It should be a regular farm practice to inspect the young plant and ratoon cane at intervals and uproot any stool which has Mosaic disease. The fields should also be inspected before cutting any seed cane, and any diseased stools should be marked so that they will not be cut for seed.

With the object of assisting growers to obtain supplies of clean seed, the Bureau has compiled a list of farms on which there is not more than a trace of Mosaic, and no other major disease:—

J. Bates, T. Beattie, W. G. Cocking, Mrs. H. Dempster, W. A. Henderson, J. Herbener, A. Hurt, H. Jeppesen, L. Larsen, S. Lucas, R. A. Maiké, A. Mergard, J. Nicolai, E. J. O'Mara, W. H. Phillips, P. Roth, F. S. Stringer, Mrs. L. Stringer, E. Sleaford, C. W. Volmerhouse, C. J. Wood—all of Bauple.

W. W. Cunningham, J. Howie, B. Johnson, A. Smith, D. I. Strathford, P. B. and A. L. Scougall—all of Bauple road, Tiaro.

C. Kajewski and Mrs. M. Cavanagh, Gundiah.

As stated above, there is a trace of Mosaic on most of these farms, and, therefore, care should be taken to avoid the diseased stools at the time of cutting the cane for seed.

Although the amount of Mosaic has been reduced, the position with regard to gumming disease is alarming. This disease has now been found on ten farms, and, unless the required precautions are taken, it will assuredly continue to spread. Gumming disease is probably the most serious cane disease there is, and is certainly the worst disease in Southern Queensland, where it has caused a very great deal of loss, particularly in the Bundaberg district. There is no reason to believe that it will not cause as much, or greater loss, in Bauple.

The best known symptom of gumming disease is the oozing of gum from the cut ends of the stalk, but this is one of the last stages of the disease. The disease may be recognised in the field in its early stages by a particular kind of streak upon the leaves. These streaks may be up to a quarter of an inch wide, but are usually less, and vary in length from a couple of inches to almost the whole length of the leaf. Streaks may arise anywhere in the leaf, but generally commence at the margins, towards the tip of the leaf, and work downwards. The streaks follow the course of the large veins of the leaf and so run straight, and at an angle to the mid-rib. Their colour is yellowish-brown to yellow, usually dotted with a large number of small red blotches. Young streaks are best found after wet windy weather, but old dead streaks are common at this time of year; they are not found on the very youngest leaves.

Gumming is usually spread from plant to plant through scratches in the leaves during wet weather. It may be spread from field to field by flies and other insects, and on cane knives. Care should therefore be taken to sterilise cane knives in boiling water, or in 1 per cent. Phenyle, after having cut gummed cane; the bacteria which cause gumming disease have been found alive on cane knives six months after the knives were used. Farmers with gumming-free farms should not allow purchasers of seed cane to use their own knives when cutting cane in clean fields.

At certain times of the year it may be impossible to find any symptoms of gumming disease, although the field is known to be gummed. It is for this reason that once the symptoms have been found, all that field, and any cane within a quarter of a mile, are unsafe for seed unless of a highly resistant variety. Q. 813 is a resistant variety, and the ten farmers on whose properties this disease has been found are advised to plant this cane. If they desire to plant other varieties they should on no account plant their own seed, but should purchase it from one of the farmers in the above list.

Gumming was found mainly in the varieties D. 1135 and E.K. 28. E.K. 28 is one of the most susceptible varieties grown, and any farmer planting this variety should be doubly careful. If gumming is already on the farm this variety should be given up.

Every effort should be made to restrict the spread of this disease, and gradually eradicate it. There may be many varieties suitable to this district, but could not be introduced on account of their susceptibility to gumming disease.

SUGAR PRODUCTION—QUEENSLAND, 1928.

The Registrar-General (Mr. Geo. Porter, F.S.S.) has supplied the following statistics showing the result of the 1928 sugar crop:—

Thirty-five mills were again in operation during the 1928 crushing season, and the tabulation of details contained in returns received from each of these shows a total production of 520,620 tons of sugar net titre. This exceeds the estimate issued from this office on the 15th December last by 5,486 tons, and is 34,875 tons in excess of the production for the 1927 season, which was the previous record year.

As forecast in the estimate, production increased in the northern portion of the State, that is as far south as Mackay, including the sugar-growing areas in the Agricultural Divisions of Rockingham and Edgecumbe, but decreased in the southern portion, which includes the sugar-growing areas in the Wide Bay and Moreton Agricultural Divisions.

The following table shows the particulars of the crushing in the sugar-growing districts of the State during 1927 and 1928:—

Division.	TONS OF CANE.		TONS OF SUGAR AT 94 NET TITRE.	
	1928.	1927.	1928.	1927.
Rockingham ..	1,863,877	1,607,546	255,188	224,599
Edgecumbe.. ..	1,266,428	1,242,008	184,343	174,836
Wide Bay	566,494	644,325	75,850	78,757
Moreton	39,512	61,948	5,239	7,553
Total State ..	3,736,311	3,555,827	520,620	485,745

NOTE.—The above figures for tons of cane show the tonnage crushed at mills situated in the above districts, not the actual tonnage grown in each district. A table showing this information will be published later in the Agricultural Report. The total for State is, however, final.

It is estimated that 224,366 acres were cut for crushing in 1928 (mill estimate only, final figures not yet available), as against 203,748 acres in 1927.

There was an increase of 180,484 tons in cane crushed, and an increase in sugar made of 34,875 tons at 94 n.t., compared with the previous season.

It would appear that the increased production in 1928 was not due to heavier rainfall, as the undermentioned particulars would seem to indicate a lighter rainfall in 1928 than in 1927 throughout the sugar-growing districts.

Station.	District in which Situated.	Rainfall (Inches)	
		1927.	1928.
Innisfail	Rockingham	146.2	125.3
Mackay	Edgecumbe	89.3	84.9
Bundaberg	Wide Bay	66.0	41.0
Brisbane	Moreton	62.1	52.7

It is not claimed that the above stations are necessarily truly representative of the weather conditions prevailing in the sugar-growing areas in which each is situated, but they happen to be stations for which comparative figures are at the moment readily accessible. Furthermore, a true comparison of production and weather conditions would need to take into account the periods during which rain fell compared to time of planting, state of growth, and so forth.

The following table shows the tons of sugar made at 94 n.t. in each division of the State at five-year intervals since 1910. An examination of the figures will emphasise the expansion of the industry during that period.

Year.	Rockingham.	Edgumbe.	Wide Bay.	Moreton.	Total.
1910	57,135	77,062	68,861	7,698	210,756
1915	58,677	44,156	32,951	4,712	140,496
1920	100,865	52,970	11,196	2,370	167,401
1925	216,755	171,511	85,360	11,959	485,585
1928	255,188	184,343	75,850	5,239	520,620

A further table is appended showing the percentage of production in each district to the total production of the State in five-year periods:—

Period.	Rockingham.	Edgumbe.	Wide Bay.	Moreton.
1909-13	29.74	35.62	31.77	2.87
1914-18	39.70	33.78	24.13	2.39
1919-23	50.33	31.93	15.63	2.11
1924-28	48.55	33.58	15.88	1.99

This table shows the increased relative importance of production in the far North (Rockingham) to the total production for the State in the later periods, compared to 1909-13.

The yield per acre for 1928 season is estimated at 16.65 tons of cane, or 2.32 tons of sugar at 94 n.t., but as the mill estimates of acreage have been used in these calculations, the figures are liable to revision when final acreages are available.

The average tons of cane required to make 1 ton of sugar was 7.18, which is an improvement on previous years.

Comparative figures for five years are:—

Year.	TO EACH ACRE CRUSHED.		Tons of Cane to Make One Ton of Sugar.
	Tons Cane.	Tons Sugar.	
1924	18.92	2.44	7.75
1925	19.36	2.56	7.55
1926	15.45	2.06	7.52
1927	17.54	2.38	7.32
1928	*16.65	*2.32	7.18

* Estimates only.

In addition to sugar made, the output of molasses from the mills during the year amounted to 16,873,372 gallons, which was disposed of as follows:—

	Gallons.
Sold to distilleries	5,103,471
Sold, &c., otherwise	573,350
Burnt as fuel	5,131,726
Food for stock	2,524,136
Used for manure	7,200
Held in stock	488,600
Run to waste	3,044,889

PESTS OF CITRUS.*

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

The citrus orchards of Queensland frequently suffer from severe insect infestations which are responsible for more or less serious losses to the orchardists. Some of the pests in question are practically cosmopolitan introduced insects, whereas others are native species which have turned their attention from indigenous wild host plants to cultivated orchard trees.

Among the more important citrus insects that are worthy of consideration in these notes are the bronzy orange bug, the "Maori" mite, the orange-piercing moths, the red scale, the citrus root-bark channeller, the Queensland fruit fly, the pink wax scale, and plant lice. Quite a number of other insects and allied pests of citrus exist in this State, but for present purposes attention will be confined to those just mentioned.

The Bronzy Orange Bug.

The insect known as the bronzy orange bug was recorded as far back as 1889 as a pest on citrus in the Toowoomba district. It has since been found injuring citrus in many different orcharding centres in Queensland, and it has also been recorded from the neighbouring State of New South Wales. It has in recent years been particularly abundant on the Blackall Range in this State.

The bronzy orange bug belongs to the Pentatomidæ in the order Hemiptera, and is known to science as *Oncoscelis sulciventris* Stål.

FEEDING HABITS AND NATURE OF INJURY.

As is the case with all the members of the order to which this pest belongs, feeding takes place by means of piercing mouth-parts. The epidermis or skin of the host plant is pierced, and through the rupture thus made the bug extracts the plant sap.

Field observations suggest that the bugs confine their attention to young and tender growth. They are found feeding on stems and leaves of young twigs and on flower and fruit pedicels, and they may also attack the young fruit.

The effect produced by the feeding of the bugs is typical of the class to which they belong. The attacked twigs (Plate 44) wilt and shrivel up, and the buds and young attacked fruit drop off. When the bugs are present in the numbers that have been recorded in certain orchards in the Blackall Range district, it is not difficult to appreciate the serious situation that may be created by the activities of this pest.

Oranges, mandarins, and lemons are all attacked by this serious pest. It is believed to be a native of Australia, and the suggestion has been made that it feeds on native species of Rutacæ. Its association with native plants is, however, worthy of further consideration.

LIFE CYCLE STAGES AND LIFE HISTORY.

As this insect belongs to the Hemiptera it possesses what is known as an incomplete metamorphosis. In insects of this class the newly hatched wingless individual or nymph bears some slight degree of resemblance to the mature winged insect, into which it will gradually transform

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.



PLATE 44.—ORANGE TWIG ATTACKED BY THE BRONZY ORANGE BUG
(*Oncoscelis sulciventris* Stål).

during a period of growth that is accompanied by a series of moults. The life cycle of this species may thus be divided into three distinct stages; firstly there is the egg, followed by the wingless nymph, which after a series of moults produces the winged adult.

THE EGGS.

The green, shiny, spherical-shaped eggs (Plate 45, fig. A) are laid in rows in small masses, the number in each egg cluster being usually extraordinarily constant at fourteen. The eggs are laid on the foliage in summer anywhere on the tree, the under sides of the leaves being generally chosen for oviposition. The eggs pass through the usual incubation period, which is recorded by Tryon as being eight or nine days.

THE NYMPHS.

At the end of the incubation period the eggs hatch and the very small nymphs emerge. These are green in colour and are oval and somewhat convex in shape. They remain together without dispersing over the foliage, and it is believed that they either do not feed at all or, if they do, they partake but sparingly of food. A further noteworthy characteristic of these first-stage nymphs is the fact that they are very easily disturbed and will drop to the ground on the slightest provocation. The duration of this first stage is somewhat uncertain, but it is evidently brief and the nymphs then moult into the second stage.

The second-stage nymph resembles the first stage in its green colour, but it is very much flatter in shape and it clings extremely closely to the under surface of the leaf on which it is resting. It is by no means readily shaken from the host tree, and it further differs from the first stage in that it disperses over the foliage instead of the individuals of each egg cluster remaining close together. It is in this stage that the insect passes the winter in a state of inactivity. The nymph in this stage resembles the leaf so wonderfully in colour, and is so closely adherent thereto, that its presence even in very considerable numbers cannot be detected without careful examination. The second-stage nymphs, which have passed the winter in a state of inactivity, commence to crawl about in search of food late in August or early in September. By that time the citrus should be showing some tender young shoots, and it is on these shoots that the second-stage nymphs now commence feeding.

The third-stage nymph has its body decidedly flattened like the second-stage nymph. Observations by A. A. Girault in the Blackall Range district, in the spring of 1923, showed that by the end of September the great majority of the bugs that had hibernated as second-stage nymphs had moulted into the third stage.

The same records showed that by the end of October approximately half the bugs were in the fourth nymphal stage, while the remaining half were in the fifth. A few were still in the second and third stages, while one adult was found.

Nymphs in the fourth and fifth stages show distinct signs of the development of the wing-buds, and their colour scheme possesses certain features distinguishing these two stages from the three earlier ones.

The various nymphal stages are illustrated in Plates 45 and 46.

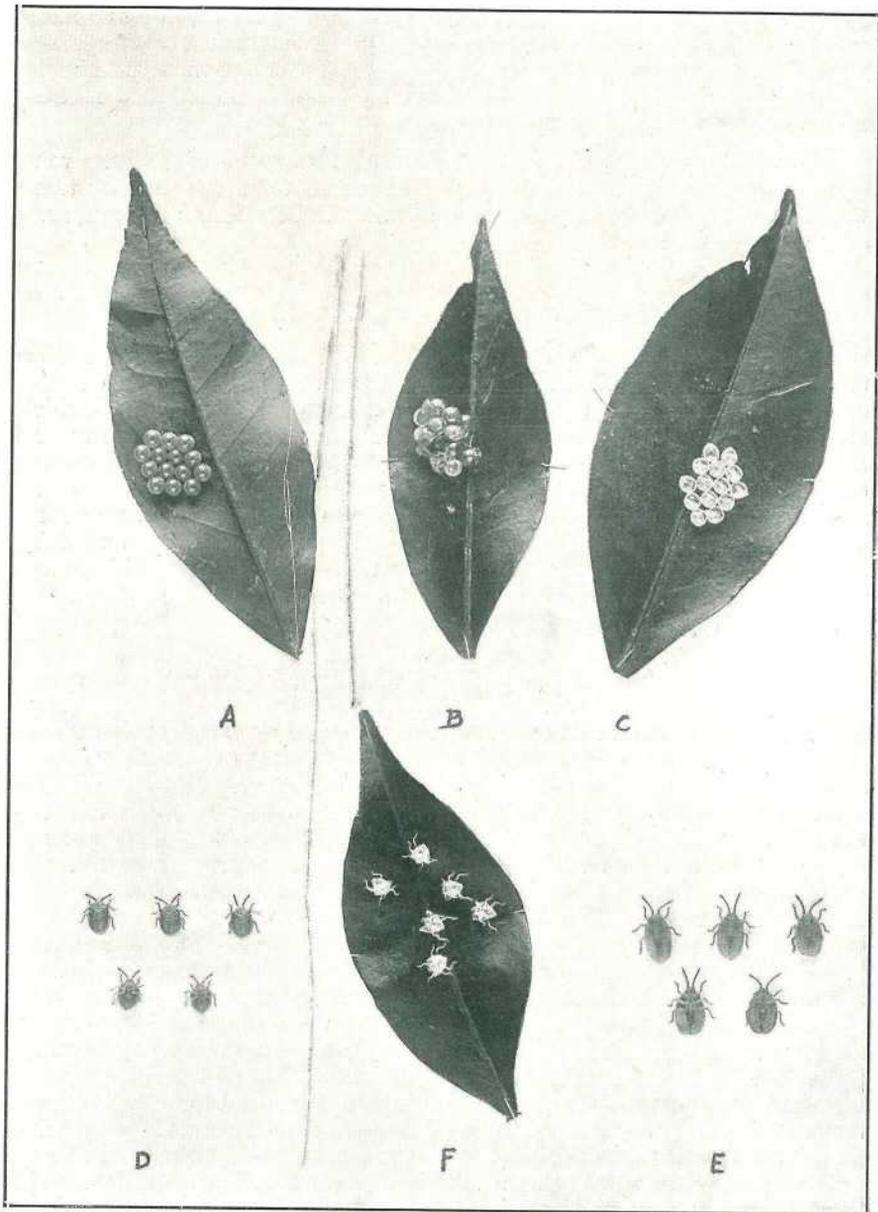


PLATE 45.—THE BRONZY ORANGE BUG (*Oncoscelis sulciventris* Stål).

Fig. A.—Egg cluster.

Fig. B.—Eggs hatching.

Fig. C.—Empty eggshells.

Fig. D.—Young nymphs.

Fig. E.—Somewhat older nymphs.

Fig. F.—Cast nymphal skins.

THE ADULT.

The adult bug (Plate 46) is just about an inch in length, and its colour scheme is somewhat appropriately described by its popular name of bronzy orange bug. There is little to distinguish the two sexes, although the male is generally considered to be smaller than the female. The under side of the abdomen in the female also possesses a median channel which does not occur in the male.

In the 1923 observations in the Blackall Range the first adults were found at the end of October, and from then on until midsummer there was a steadily increasing percentage of adults. The adults in both sexes are voracious feeders.

SUMMARY OF LIFE HISTORY AND HABITS.

The green spherical-shaped eggs are laid in clusters of fourteen on the under sides of leaves in summer. After an incubation period of some eight or nine days the eggs hatch, yielding small green nymphs which remain clustered together and apparently make little or no attempt at feeding. These then moult into the second-stage nymphs, which scatter over the host plant and pass the winter in a state of inactivity. In spring these second-stage nymphs commence to feed on the tender young shoots and then moult successively into the third, fourth, and fifth nymphal stages and finally transform to the winged adults, which mate and lay their eggs in summer, thus recommencing the life cycle. There is thus only one generation each year.

CONTROL MEASURES.

Much relief from this pest has been obtained by the adoption of the system of banging, accompanied by the cincturing or banding of the trees after banging. A padded mallet is used in order to sharply jar the various branches of infested trees, care being taken to ensure that the branches are not injured in the course of the operation. This work is best performed in spring-time, when third and fourth stage nymphs predominate. The nymphs in these stages will fall to the ground rather readily, and when that has been accomplished steps must be taken to prevent these wingless nymphs returning to the trees. This object may be achieved by building an earthen cone round the base of each tree, say 9 or 10 inches high, and then partially cutting the cone away so as to leave a steep face about 5 or 6 inches high up which the bugs cannot readily crawl. The return of the bugs may also be prevented by banding the tree with bands carrying sticky substances that will form a barrier which the bugs cannot cross. Tanglefoot has been used for that purpose. Some orchardists destroy the fallen nymphs by scorching them up with a blow-lamp, and this additional precaution ensures that there will be no possibility of return by some of the nymphs succeeding in crossing the bands or earthen cones. Bands are preferable to earthen cones.

The 1923 observations already referred to included spraying experiments, and these demonstrated the fact that, under the conditions then prevailing, spraying was not effective for the control of this insect.

Readers who desire further details with respect to this pest should consult the reports published by Tryon and Girault on the results of their investigations in 1923.

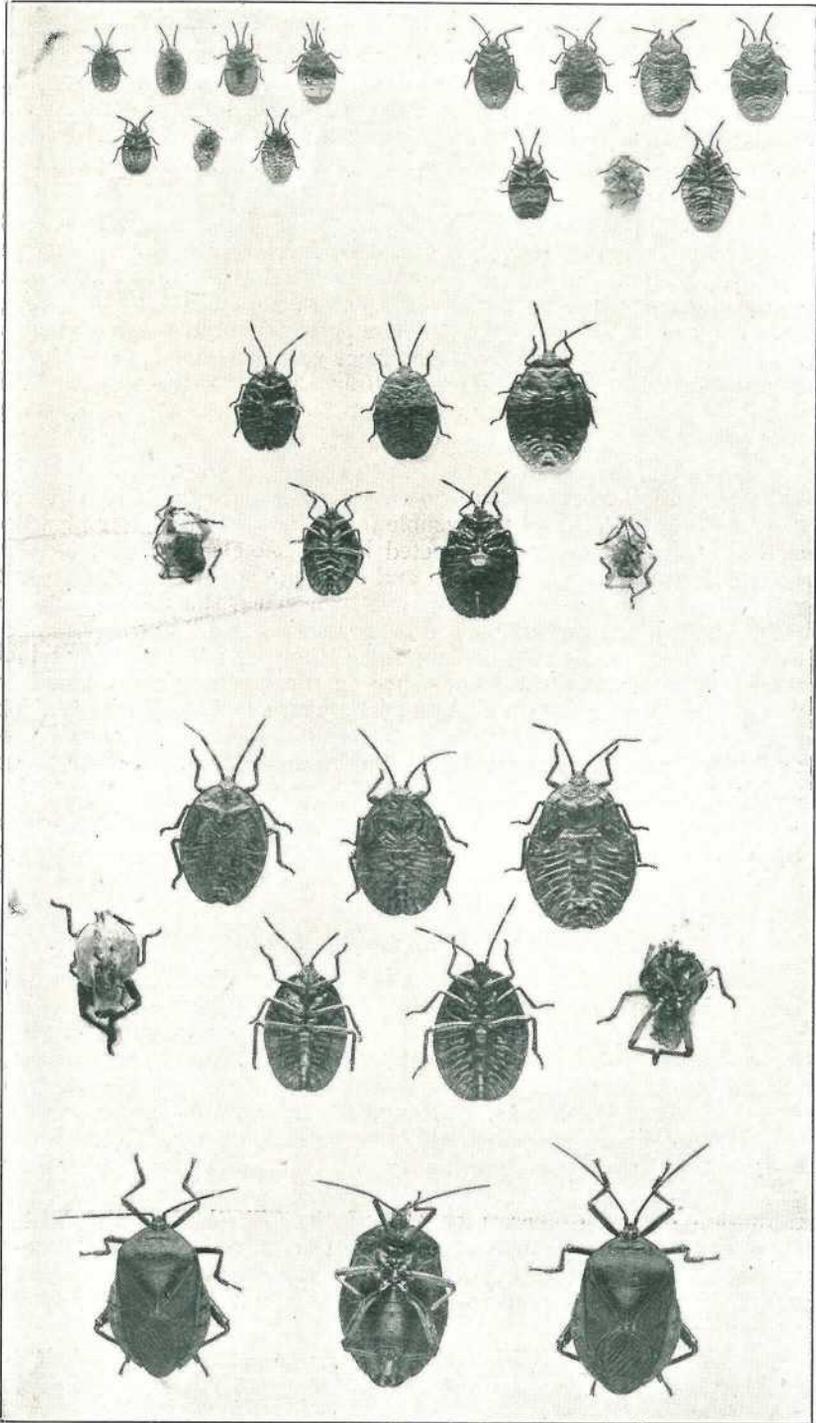


PLATE 46.—NYMPHAL STAGES AND ADULTS OF THE BRONZY ORANGE BUG (*Oncoscelus sulciventris* Stål).

The Citrus Rust Mite or "Maori" Mite.

Quite frequently oranges and lemons are found to be infested by a small mite known variously as the citrus rust mite, "Maori" mite, fruit mite, orange rust mite, or silver mite (*Phyllocoptes oleivorus* Ashm.). The oranges attacked by these mites acquire a characteristic dark-brownish tinge and are generally referred to in Queensland as "Maori" oranges.

No details are available with respect to the life history of this mite in Queensland, but in California some considerable information has been published thereon. Briefly it is to the effect that the extremely small circular and somewhat yellowish eggs are laid on the fruit or foliage either singly or in small clusters. These eggs hatch out after an incubation period of about a week in the warmer weather, and by a succession of moults the mites attain full size in some two or three weeks. Their breeding season lasts from spring till late in autumn, and thus a large number of broods are produced every year.

The individuals of this species are extremely small, light-yellowish, four-legged mites; they are indeed so small that they can be observed only by means of a lens, being invisible to the naked eye. Their presence, therefore, can most easily be detected by the effects produced by their feeding. Both the immature forms and the adults of the citrus rust mite pierce the oil-cells and feed on the oil. The bark, the foliage, and the rind of the fruit are all attacked in the search for food, and as the mites sometimes occur in enormous numbers they can cause appreciable damage. As a result of their presence on the fruit, this is stained the brown or dark brown that is characteristic of the "Maori" orange. The appearance of the fruit that has been discoloured by this infestation is undoubtedly by no means attractive, but the quality of the fruit is not necessarily impaired.

With regard to control, this may be effected by spraying with a weak solution of lime sulphur or by dusting with sulphur. Citrus rust mite, however, is generally quite a minor pest of citrus.

The Orange-piercing Moth.

The orange-piercing moth (*Othreis fullonica* Linn.) and two other allied moths of similar feeding habits—namely, *Mænas salamina* Fab. and *Argadesa materna* Linn. (Plate 49)—frequently appear in very large numbers in citrus districts during the autumn months. They are large handsome moths possessing the exceptional power of being able to pierce the rind of fruit and to extract the juices through the punctures thus made. The sucking or sipping of juices is, of course, quite the normal procedure in moths, the abnormality in this case being the power to pierce the rind of the fruit in order to obtain fruit-juice. An examination of the proboscis of one of these moths readily discloses the fact that it is highly specialised to permit of this habit, so unusual in moths. A discussion of the details of the modification of the proboscis, however, is quite unnecessary in these notes, although it is of great scientific interest.

The moths themselves are large, exceptionally handsome species that are well illustrated in the accompanying photographs (Plates 47 and 49). The larva of *Othreis fullonica* is quite in keeping with the moths so far as appearance is concerned, for it is a particularly handsome caterpillar (Plate 48).

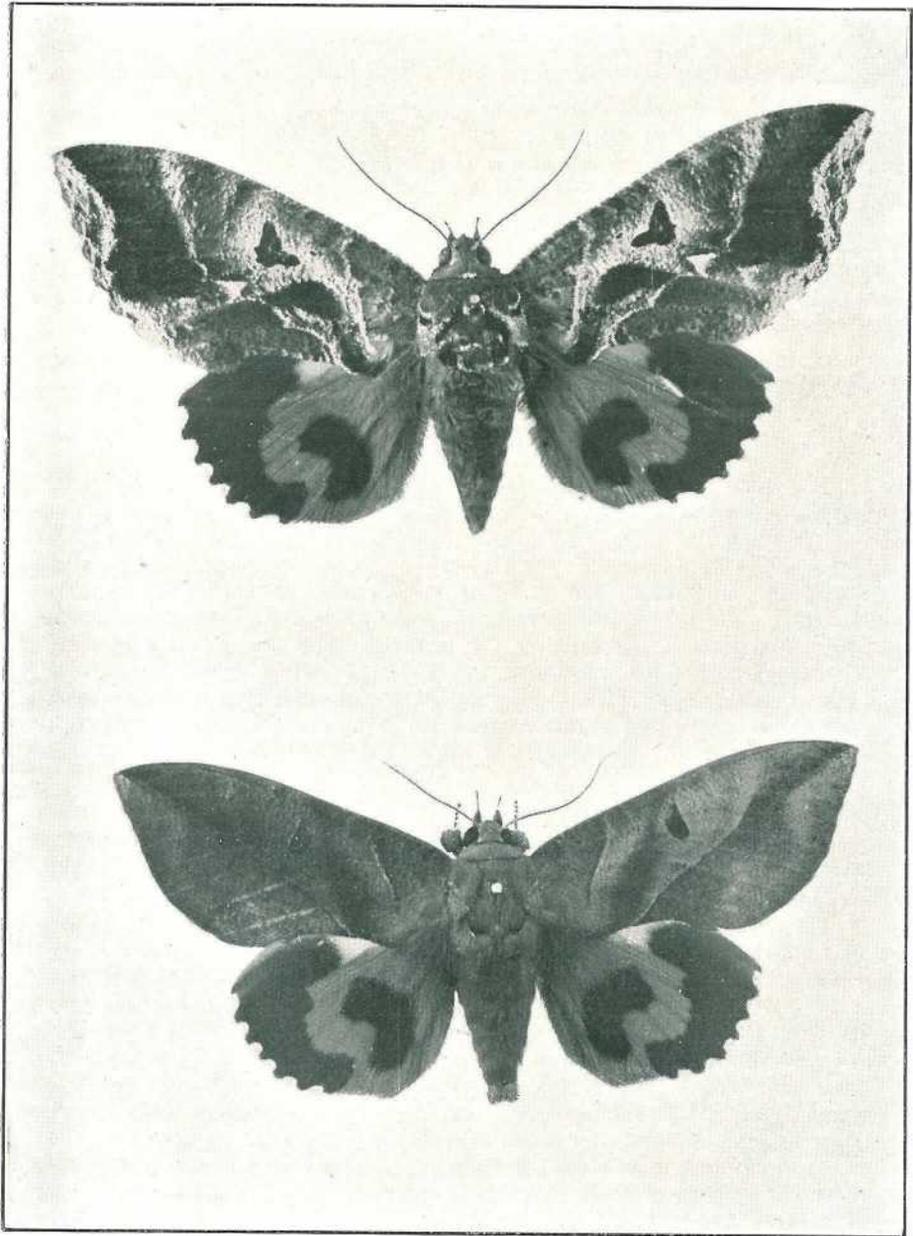


PLATE 47.—THE ORANGE-PIERCING MOTH (*Othreis fullonica* Linn.).
Male and Female Moths.

The larvæ feed on various native plants, and are themselves of no economic importance except by virtue of the fact that they develop into the moths that attack fruits of certain cultivated plants. The fruit-piercing moths have been recorded as attacking citrus, bananas, and mangoes. During the autumn of 1927 they were particularly destructive throughout coastal Queensland.

For the control of this pest, perhaps the best that can be done is to capture the moths at a lure. For this purpose over-ripe bananas, of which they are particularly fond, may be used, and these should be placed in suitable spots, visited daily after dark, and the moths feeding on them captured and destroyed. Small pieces of water-melon have also been strongly recommended as a lure; these have to be similarly visited and the moths destroyed. To obtain maximum results from this operation it should be commenced very early in the season.

If it is practicable to do so, the native plants on which the caterpillars of these moths are feeding should be destroyed.

The Red Scale.

The red scale (*Chrysomphalus aurantii* Maskell) is without doubt one of the most serious pests of citrus in Queensland, and indeed it may even be regarded as worthy of classification among the world's most destructive citrus insects. It is now practically world-wide in its distribution, at least so far as the tropical and semi-tropical regions are concerned. As is not unusual in the case of insects that have become widely distributed throughout the world, there is some considerable uncertainty with respect to its native home. It is not regarded, however, as being indigenous to Australia, and it would seem that evidence exists in favour of the belief that it originally came from China or elsewhere in the Far East.

This scale does not confine its attention to citrus, but it is as a pest of citrus that it has acquired its unenviable reputation. Other plants attacked include apple, pear, quince, plum, fig, olive, coconut, and rose. As already indicated, however, it is not a pest of importance except on citrus.

The effect of red scale, if allowed to multiply without the check administered by the application of control measures, is usually very serious. It attacks all parts of the tree, i.e., the foliage, the fruit, and the branches, and when a tree is severely infested many of the leaves will be shed and many branches killed. A tree that is so affected is naturally of little profit to an orchardist, and what fruit is produced is unattractive and frequently unsaleable. This scale insect does not excrete honeydew, and hence its presence is not accompanied by the occurrence of fumagine or sooty mould. Fumagine is the term applied to a fungus that grows on the honeydew or sweet substance excreted by certain species of scale insects. Fumagine does not attack the plant tissue, and apart from the unsightly appearance produced it is of relatively little consequence.

The red scale is viviparous—i.e., no eggs are laid and the young appear as very small larvæ. These are sulphur yellow in colour and possess three pairs of legs, thus enabling them to move about in search of a suitable spot at which to settle down. When that has been obtained they commence to form the scale covering which gives these insects their popular name. Under these scales the insects develop to maturity, the

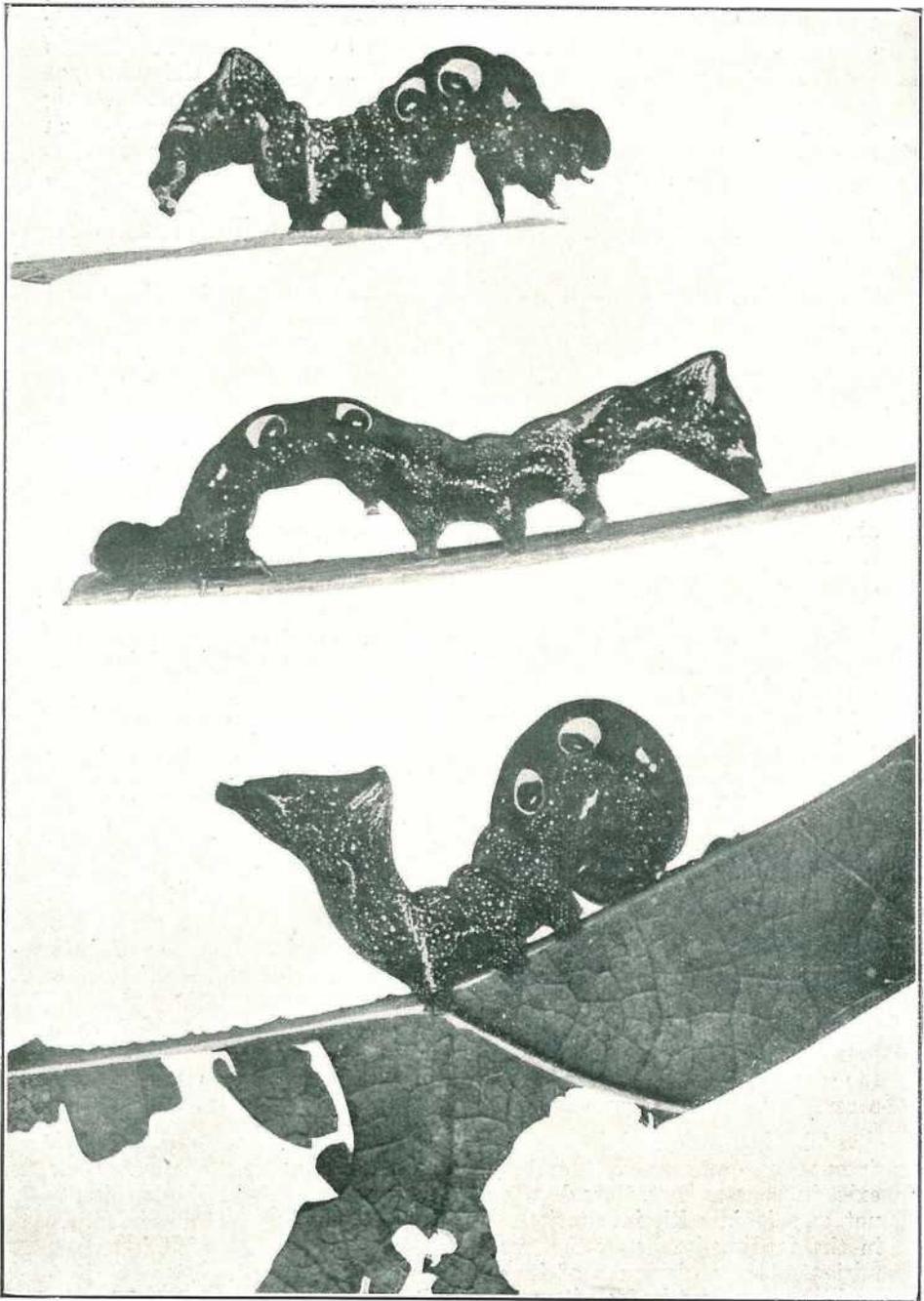


PLATE 48.—LARVÆ OF THE ORANGE-PIERCING MOTH (*Othreis fullonica* Linn.).

female adults becoming rather degenerate legless and wingless insects. The adult males are totally different in appearance, and possess a pair of wings and three pairs of legs by means of which they are able to travel from tree to tree in search of mates. Although the power of flight of the winged male is slight it is frequently transported long distances by wind. The scale of the full-grown female is about $\frac{1}{12}$ inch or slightly more in diameter and is distinctly circular in shape. It is transparent, and this fact allows the red colour of the female insect to be seen quite clearly, hence the popular name of the red scale. The scale covering the immature male insect is smaller than the scale of the female, and is elongate in shape rather than circular.

With respect to control, fumigation with hydrocyanic acid gas can be strongly recommended. Fumigation is discussed in some detail in the chapter dealing with insecticides. Spraying is also adopted for the control of this pest, resin wash and miscible oils being used for that purpose.

The Citrus Root-bark Channeller.

Like the notorious banana weevil borer, this citrus pest belongs to the Curculionidæ. It was technically described in 1920 as *Decilauis citriperda* H.T., but it is more commonly known among orchardists as the citrus root-bark channeller. It appears to have first become the subject of attention as far back as 1908, and since that date it has frequently figured in routine inquiries regarding the control of injurious insects. Reference to its attacks on citrus appears to come mainly from the Blackall Range, although recently a number of inquiries have been received from elsewhere on the North Coast.

NATURE OF INJURY.

The examination of an attacked tree readily provides evidence of the nature of the injury if the base of the stem and the roots in proximity thereto are inspected. It will then be seen that a number of channels have been excavated at the base of the stem and on the surface of the roots, and that on the latter the channels may extend outwards for several feet from the base of the stem. In the case of an old attack the channel is exposed by the decay of the thin layer of bark that originally covered it, but in a more recent infestation the outer layer of the bark is still present, and on that account the extent of injury may be somewhat masked. It may be further observed that in many of the older attacks the infested trees have attempted to heal the wounds, and these efforts have in some instances been attended with a certain measure of success.

The inspection of infested roots has so far shown that, although frequently quite a considerable number of individual channels may exist in the one root, they do not run into each other and ringbarking is not associated with infestation. This is a somewhat fortunate feature in the feeding habits of the citrus root-bark channeller, and it rather mitigates the seriousness of its presence in an orchard. Were a ringbarking effect typical of its presence it would be a more serious pest than it is. Nevertheless the infestation on a root may frequently be so very considerable as to practically completely destroy it, and obviously when a number of roots of one tree are so attacked the growth of the tree and the production of fruit must be very seriously retarded.

TREES ATTACKED.

The roots of both orange and mandarin trees are attacked, and it also seems probable that this pest feeds on the roots of some native species of plant or plants. This supposition has not yet been confirmed, but nevertheless the citrus root-bark channeller is believed to be a native species of weevil that has transferred its attention from a native host plant to cultivated citrus trees.

The information accumulated to date rather tends to support the belief that this weevil favours the older trees, and that young citrus, if attacked at all, is but slightly infested. It has also been thought that, in the older trees, lack of vigour may be a predisposing factor to severe infestation; this lack of vigour may be the result of growth under unfavourable circumstances such as unsuitable soil conditions, lack of attention, or unfavourable seasons. The whole question of the incidence of infestation appears, however, to warrant further attention.

LIFE CYCLE STAGES.

Beetles possess four distinct stages in their life cycles, each of these stages having very definite functions to perform; they are the egg, larva, pupa, and adult or beetle. The second stage, i.e. the larva or grub, is the one in which the damage is done to the roots of citrus by the particular species at present under discussion. It is creamy white in colour, legless, and otherwise rather featureless, and measures about $\frac{1}{3}$ inch in length. The pupa is characteristic of its class, and in it the legs, wings, and head of the future beetle can be clearly seen. The beetle itself is a typical black weevil measuring roughly about $\frac{1}{4}$ inch in length.

CONTROL MEASURES.

In attempting to control this pest the orchardist may adopt either or both of two courses. He may endeavour to stimulate the growth of the infested trees, thus enabling them to better resist and repel the infestation, or he may attempt to destroy or drive off the weevils responsible for the damage.

If this pest, as there is good reason to believe, is more commonly met with in the older trees that are in a state of decline as a result of adverse conditions other than root-bark channeller infestation, then the adoption of the first-mentioned alternative seems worthy of serious consideration. Anything that would tend to eliminate these unfavourable conditions would thus check the tree's decline in vigour, and would therefore help to alleviate the insect infestation. If the trees are suffering from unfavourable soil conditions, efforts should if practicable be made to counteract these adverse soil conditions; if cultural practices have been faulty these should be rectified; and if scale infestation is heavy that should be remedied by fumigation or by suitable spraying. Even if the old trees that are attacked are otherwise perfectly healthy, their growth should be stimulated to enable them to withstand the attack.

The alternative to these measures is to attempt to destroy the insects by the adoption of some form of soil fumigation. It must, however, be pointed out that so far no satisfactory system of soil fumigation has yet been demonstrated for the control of this pest, and all that can be done is to record lines along which possible experiments might be conducted. For this purpose paradichlorobenzene seems worthy of some

investigation, and indeed preliminary trials with this fumigant have already been carried out. These, however, will have to be followed up before any definite expression of opinion is possible. It will be necessary to determine, firstly, just how effective that fumigant really is for this particular purpose, secondly, what are the minimum doses that can produce the required results, and, thirdly, just how safe it is for application to citrus trees. It may be added that paradichlorobenzene has been demonstrated to be a very useful fumigant for a number of soil-infesting insects.

The Queensland Fruit Fly.

The Queensland fruit fly (*Chætodacus tryoni* Froggatt) is frequently the cause of very considerable losses in citrus fruits, the losses occurring mainly in the late and early crops. The eggs are laid in small punctures in the fruit, and the maggots hatching therefrom feed voraciously, thus obviously rendering the fruit valueless for marketing. This highly destructive insect has already been dealt with in very considerable detail in Chapter VII. Its life history and control are discussed therein, and further reference to this pest is unnecessary in these notes as the full details can be obtained in the chapter mentioned.

The Pink Wax Scale.

This very conspicuous scale insect (*Ceroplastes rubens* Maskell) is a common pest throughout coastal Queensland on mandarins, oranges, and lemons, and it is also one of the pests most frequently associated with the mango. The fully developed scale is slightly more than $\frac{1}{8}$ inch in length and is pink in colour. What is seen by the orchardist is not really the scale insect, but is the very heavy hemispherical coating of wax with which it has covered itself. Beneath that protective layer is the actual insect; the young insects belonging to this species do not of course possess this heavy protective covering, but they gradually acquire it during the process of growth. This species was originally described from specimens obtained in Australia, but, in spite of that fact, some authorities do not consider it to be a native of this country.

The feeding of this insect on the foliage of the trees which it infests is always associated with the presence of what is known as fumagine or sooty mould. The pink wax scale secretes a sweet sugary substance, and on this secretion there grows a black fungus which gives to the attacked tree an unsightly, dirty appearance. (This fungus is further discussed at the end of this chapter.)

Although the pink wax scale is not nearly so injurious to citrus as the red scale, it is nevertheless decidedly harmful, partly because of the actual weakening of the attacked tree and partly because of the production of the unsightly fumagine referred to. Steps should therefore be taken to control this pest, and for that purpose spraying with soda-wash or resin-wash can be recommended.

The spraying should be done at a time when large numbers of young insects are hatching out, because, as already indicated, the young scales have little or no protective covering, and they are then much more vulnerable than they will be at a later stage in their development.

The preparation of resin-wash has already been dealt with in Chapter 3. The soda-wash may be prepared in accordance with the following formula:— $1\frac{1}{2}$ lb. of washing soda to 4 gallons of water. Only clean, fresh washing soda should be employed when mixing this spray, otherwise if old washing soda is used considerable damage may be done to the foliage of the treated trees.

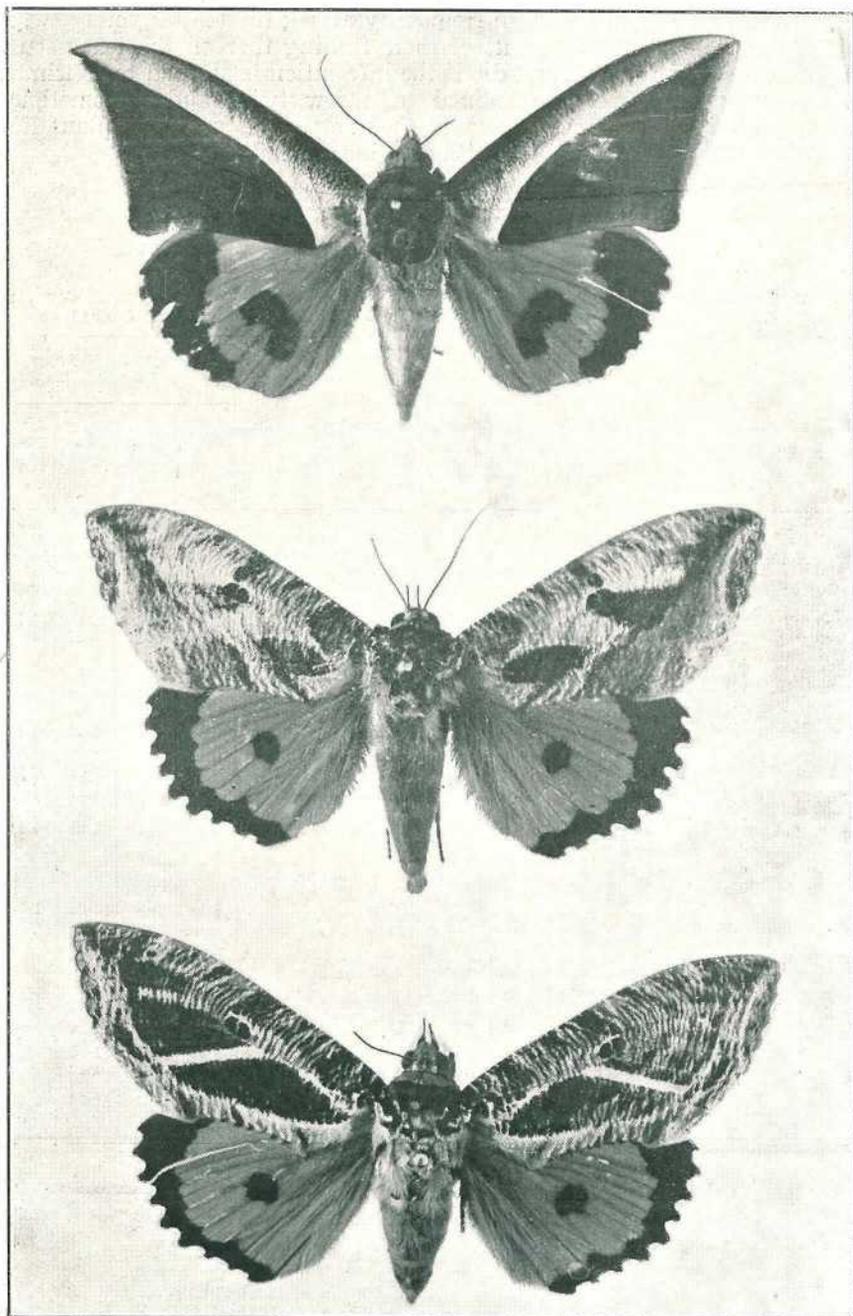


PLATE 49.—*Mœnas salaminia* Fabr.
Argadesa materna Linn. (Male and Female.)

Aphis.

Plant lice or aphids not infrequently attack the tender young twigs of citrus trees, and as a result of their feeding thereon the leaves curl up and the twigs shrivel and die if the infestation is allowed to continue. Frequently the attack is confined to a few twigs and it sometimes disappears quite suddenly. Should that not be the case, the plant lice may be controlled by spraying with nicotine sulphate.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JUNE, 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	June.	No. of Years' Records.	June, 1929.	June, 1928.		June.	No. of Years' Records.	June, 1929.	June, 1928.
<i>North Coast.</i>					<i>South Coast—</i>				
Atherton	1.62	28	1.29	0.28	Nambour	3.64	33	3.08	2.88
Cairns	2.79	47	2.60	0.58	Nanango	2.08	47	1.38	2.63
Cardwell	2.05	57	1.46	0.94	Rockhampton ..	2.19	42	10.39	1.27
Cooktown	2.00	53	2.02	0.35	Woodford	2.86	42	3.52	2.46
Herberton	1.04	42	0.87	0.24	<i>Darling Downs.</i>				
Ingham	2.36	37	1.60	2.14	Dalby	1.71	59	1.15	1.69
Innisfail	7.11	48	4.09	1.73	Emu Vale	1.49	33	2.73	1.60
Mossman	2.65	16	1.76	0.77	Jimbour	1.74	41	1.41	1.89
Townsville	1.30	58	2.03	0.48	Miles	1.86	44	0.75	1.45
<i>Central Coast.</i>					Stanthorpe	1.92	56	1.65	2.60
Ayr	1.41	42	3.24	0.75	Toowoomba	2.44	57	1.38	1.88
Bowen	1.61	58	1.81	0.06	Warwick	1.78	64	1.91	1.59
Charters Towers	1.29	47	1.76	0.22	<i>Maranoa.</i>				
Mackay	2.68	58	2.41	1.43	Roma	1.66	55	0.61	1.70
Proserpine	3.41	26	2.49	1.17	<i>State Farms, &c.</i>				
St. Lawrence ..	2.42	58	0.87	0.96	Bungeworgorai ..	1.55	15	0.43	1.84
<i>South Coast.</i>					Gatton College ..	1.88	30	1.47	1.95
Biggenden	2.18	30	1.97	4.73	Gindie	1.48	30	2.91	1.19
Bundaberg	2.83	46	3.36	5.25	Hermitage	1.90	23	1.78	1.46
Brisbane	2.78	78	4.40	2.22	Kairi	1.47	15	1.42	0.19
Caboolture	2.64	42	3.45	2.56	Mackay Sugar Experiment Station ..	2.37	32	2.54	1.11
Childers	2.51	34	1.38	4.65	Warren	2.29	14	0	0
Crohamhurst ..	4.43	36	4.66	2.77					
Esk	2.21	42	3.05	2.79					
Gayndah	1.87	58	1.07	2.87					
Gympie	2.67	59	2.63	3.88					
Kilkivan	2.17	50	0.97	2.85					
Maryborough ..	3.01	57	2.55	5.74					

GEORGE G. BOND,

Divisional Meteorologist.

QUEENSLAND SHOW DATES, 1929.

Nundah: 3rd August.
 Redcliffe: 9th and 10th August.
 Royal National: 12th to 17th August.
 Crow's Nest: 21st and 22nd August.
 Wynnum: 30th and 31st August.
 Goombungee: 30th August.
 Imbil: 4th and 5th September.
 Zillmere: 7th September.

Stephens: 14th September.
 Malanda: 18th and 19th September.
 Pomona: 18th and 19th September.
 Beenleigh: 20th and 21st September.
 Rocklea: 28th September.
 Kenilworth: 28th September.
 Enoggera: 5th October.
 Pine Rivers: 15th and 16th November.

DISEASES OF CITRUS.*

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

The diseases dealt with in this chapter are black spot, melanose, blue mould, scab, exanthema, die back, collar rot, and sooty mould.

Black Spot.

Black spot is a fruit disease to which most commercial varieties of citrus are subject. Old trees of the common seedling orange are probably the most seriously affected, and with these black spot is often responsible for considerable fruit disfigurement.

SYMPTOMS.

An indication of the presence of black spot often overlooked is a somewhat scanty brown spotting of the leaves which may be present at various times throughout the year. The characteristic spotting of the fruit takes place when the latter is approaching maturity, and appears first as scattered, minute, pink or reddish-brown spots on the surface of the rind, usually with a definite and somewhat darker margin. These enlarge to a more or less circular area $\frac{1}{16}$ to $\frac{1}{8}$ inch in diameter. The central portion becomes shallowly depressed, and as the spot matures this region assumes a greyish colour, leaving only a narrow rim of the original brown.

If conditions are suitable, the fruiting bodies of the fungus causing the disease may be developed even in the early stages of spot formation. These make their appearance on the depressed areas in the form of minute, translucent, dome-shaped blisters which gradually darken until they become sooty black in colour. The small, grey depressed spot with a narrow brown rim, and studded on its surface with black points just visible to the naked eye, is quite characteristic of this disease. (Plate 50.)

Under conditions favouring the growth of the fungus, a diffuse browning may spread out from the margin of the spots, and, if the latter are numerous, coalescence and spreading may take place until a large proportion of the skin shows a brown and somewhat shrunken area over which are speckled the black points of the fruiting bodies. This latter effect is seen more especially on ripe fruit after storage, or on fruit which has fallen to the ground.

CAUSE.

Black spot is caused by a fungus (*Phoma citricarpa*) first described by McAlpine, the Victorian Plant Pathologist, in 1899. The fruiting bodies arise just beneath the surface of the depressed spots, and take the form of small flask-shaped receptacles known as pycnidia. It is the black walls of these pycnidia which show up as the characteristic black points mentioned above. From the inner lining of these structures are produced numerous minute, clear, oval spores which are extruded through an opening at the apex and thus serve to spread the disease.

The spotting resulting from an attack of this fungus does not usually appear until the fruit is commencing to colour, and becomes increasingly prevalent as the weather becomes warmer. For this reason greatest loss is sustained in fruit held for a late market.

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.

EFFECTS.

Although black spot does not usually penetrate beyond the outer region of the rind leaving the edible qualities unaffected, it nevertheless produces disfigurement sufficient to cause considerable reduction in price. After storage the spotting may spread, to give rise to a larger brown area of a more serious nature.

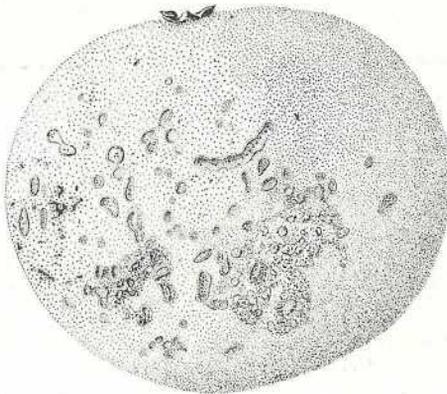


FIG 1

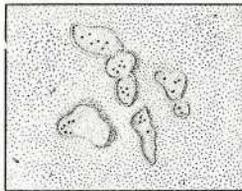


FIG 2 .

*W. Helmsing
1928.*

PLATE 50.

Fig. 1, Black Spot on Orange. Fig. 2. Individual spots enlarged to show the black points of the pycnidia.

Spotted fruit becomes more easily attacked by blue mould and other rot-producing fungi, with the result that the keeping qualities are further impaired.

In the orchard it will be found that fruit affected with black spot will not hang on the tree when ripe. The loss from fruit falling off on this account is often considerable.

CONTROL.

1. It is very noticeable that black spot is often present to a greater extent in an old orchard or one showing signs of neglect. For this reason steps should be taken by satisfactory manuring and cultivation to get the trees in a state of healthy vigorous growth. All dead and sickly wood should be pruned out.

2. As has been pointed out above, the fruiting bodies of the fungus may develop on fallen fruit, and these should therefore be carefully picked up and destroyed by fire or burying.

3. It is possible to control the disease by spraying with Bordeaux mixture. Experiments are now being conducted to determine for Queensland conditions the most effective times at which to make applications. In the meantime the following schedule is suggested:—

Bordeaux of 4-4-40 strength, or Bordeaux 4-4-40 + 1% of oil emulsion—

- (1) As soon as the fruit have set;
- (2) About one month to six weeks later;
- (3) If black spot has been serious previously, another application just prior to the February rains.

Fruit on the sunny side of the tree is more subject to attack, and special attention should therefore be paid to this region.

Melanose.

Melanose is a trouble which is of rather frequent occurrence in some older orchards, where it may be of more serious consequence than black spot. The orange, mandarin, and lemon may all be affected.

SYMPTOMS.

The disease appears on leaves, twigs, and fruit, though it is on the latter that it becomes most conspicuous. The characteristic lesions on the fruit consist of small brown, more or less circular dots scattered over the surface. The individual spots vary in size from minute specks up to about $\frac{1}{10}$ inch in diameter. They appear at first merely as a surface stain, but later become slightly elevated and somewhat fissured diagonally or round the margin so that a melanose-affected fruit is decidedly rough to the touch. The spots may be sparsely scattered or abundant, and are often seen to be arrayed in rings or lines (Plate 51).

When numerous a coalescence may take place so that a more or less continuous superficially fissured area is formed. In this latter condition melanose resembles to a certain extent both "Maori" and exanthema. A typical "Maori" orange, however, is usually of more uniform colouration, and is smooth to the touch, while a fruit affected with Exanthema, although rough usually, has the rind of the affected region more definitely hardened often with resultant splitting.

The spotting on the leaves resembles in general appearance that on the fruit except that it is black rather than brown in colour. Leaves badly affected may be puckered and otherwise deformed by the presence of the disease. Young twigs and water-shoots may be attacked in a similar manner, and if infection is severe leaf-fall may result.

Examined microscopically, the lesions are seen to consist of two or three layers of brown dead cells, which in the later stages become elevated by the development of a layer of corky tissue beneath. The unequal tensions resulting from the hardening of the surface layers, and growth of the tissue surrounding, results in the fissuring mentioned above.

CAUSE.

The symptoms displayed by this disease are the same as those of the melanose of Florida, which has been shown to be caused by the fungus *Phomopsis citri*. A fungus closely resembling this has been isolated from a stem-end rot of lemons and from dead twigs in Queensland, and it is probable that the two diseases are identical.

Some growers have been in the habit of designating the disease as "false" melanose. This name was applied by McAlpine many years ago to a similar disease then occurring in New South Wales, whose presence he attributed to an entirely different fungus. The term "false" should be avoided when speaking of the disease which occurs in Queensland, since it often leads to confusion.

The fungus *Phomopsis citri* is not a very active parasite, and the melanose lesions formed by it are usually greatly restricted in extent, the fungus itself quickly losing its activity. It does, however, maintain a more active existence on dead twigs and branches, and it is here that the fruiting bodies are produced. These take the form of small depressed flask-like receptacles or pycnidia developed just below the surface of the bark, where they form minute pimple-like pustules the apex of which becomes split to liberate the spores developed within (Plate 51).

The spores are small, clear, oval cells which are extruded in a mass during damp weather. They are then washed by rain and dew from the dead twigs on to young and tender shoots or fruit, where they germinate if conditions are suitable, and infect the living tissue sufficiently to cause the spotting described above. The ring-like arrangement of the spots so characteristic of melanose is due to the lodgment of a number of spores in a water-drop, when they tend to spread out to the margin and there come to rest.

Examination of a tree badly affected with melanose will almost invariably reveal the presence of dead wood. A vigorously growing tree free from dieback is seldom affected. For this reason it is usually the older or neglected orchards that suffer most. It is only young shoots and fruit which are susceptible to infection. Growth which has hardened off is immune. Rain is necessary for the spread of the disease and the germination of the spores. This is always liable to occur in sufficient quantity during the spring and early summer months.

CONTROL.

To control melanose the object is to reduce as far as possible the source of infection and to keep the young growth covered with a fungicide during its susceptible period.

1. Prune out all dead twigs and branches, and practise a system of fertilising and good cultivation with a view to inducing strong vigorous growth.

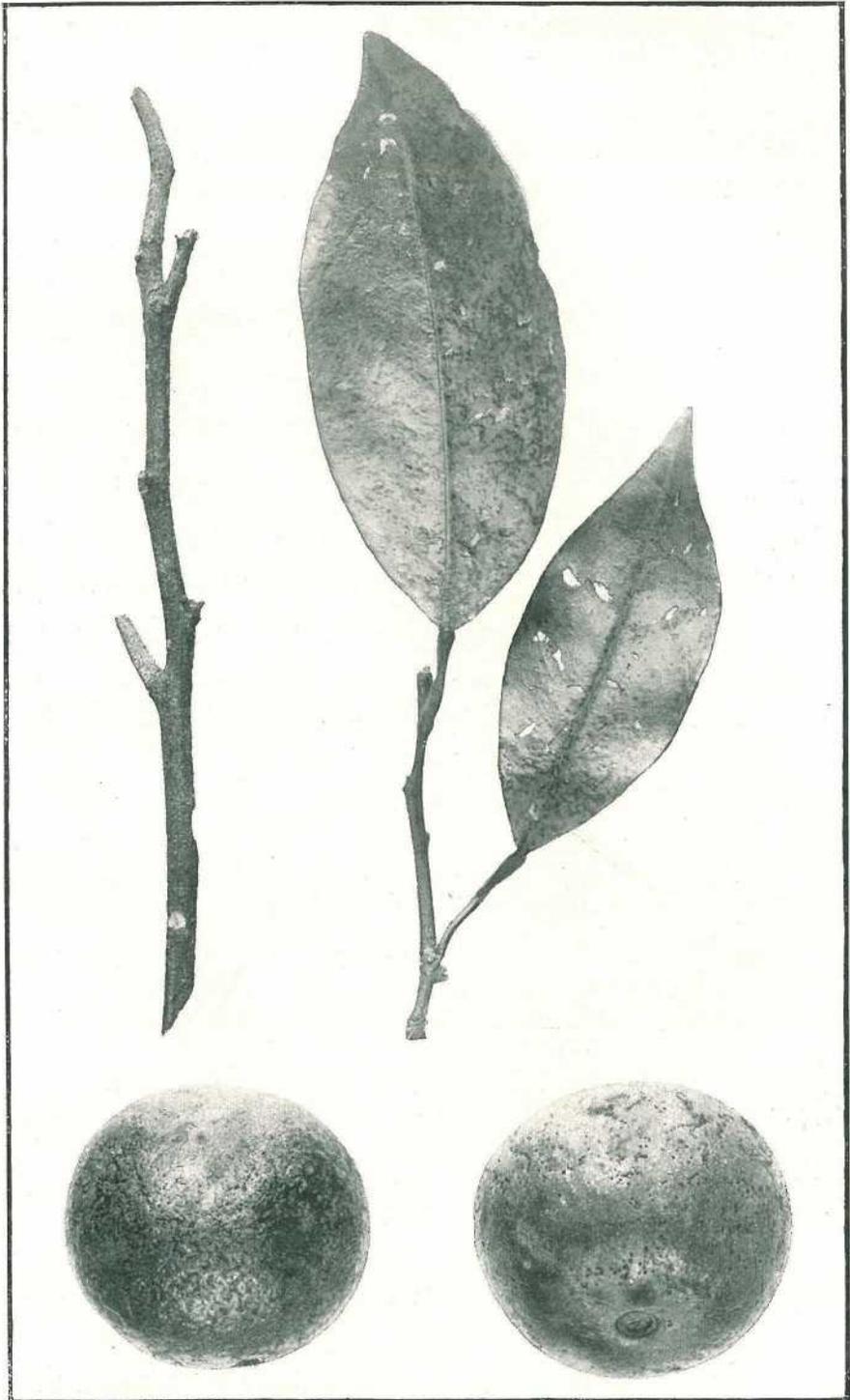


PLATE 51.—Typical Melanose symptoms on leaf and fruit of the Orange. Also dead twig bearing pycnidia of *Phomopsis citri*.

2. Spray with Bordeaux mixture of 4-4-40 strength, or Bordeaux 4-4-40 + 1% oil emulsion—

- (a) Immediately the fruit has set;
- (b) One month to six weeks later, or oftener if the weather conditions are exceptionally wet.

Scab.

Scab is a disease to which lemons are more particularly subject, their leaves, young twigs, and fruit being affected. During wet seasons most varieties of mandarin may also be attacked, though in this case the foliage may suffer to a greater extent than the fruit. The sweet orange is apparently immune.

SYMPTOMS.

Only young growth is liable to infection. When the leaves commence to harden off and the fruit to mature they become resistant. The disease appears first on the young soft foliage as small, scattered, light yellowish green spots with a somewhat diffuse margin. The affected area becomes depressed from above downwards or *vice versa* so that a small conical projection is formed on the lower or upper surface of the leaf. At the apex of this elevation a small mass of brown corky tissue is developed which gives the characteristic scabby appearance to the leaf. The corky excrescences are also commonly formed on the leaf surface without previous leaf indentation. They vary in size from minute brown specks to rough wart-like scabs $\frac{1}{16}$ to $\frac{1}{8}$ inch in diameter. Large scabby areas may be produced from these by coalescence. Distortion and stunting often result owing to the inability of the leaf affected with scab to develop evenly (Plate 52). The lesions on the twigs and on mandarin fruit resemble in the main those on the leaf. On the lemon fruit the actual scabs are of much the same appearance except that they are as a rule somewhat larger. The effect is, however, often accentuated by the growth of the rind tissue surrounding a scab lesion into a prominent conical projection bearing the scab at its apex. Considerable malformation is produced by this means.

Scab is due to the presence of a fungus (*Sporotrichum citri*) whose fruiting stage appears as a delicate greyish mould covering the surface of young scabs.

CONTROL.

As pointed out above, the scab fungus infects only young immature tissue. Certain conditions of temperature and moisture are also necessary for its development. These conditions are always liable to occur in the Queensland spring weather, and if scab is present in the orchard steps should be taken to control it by means of spraying. The following applications may be made for this purpose:—

- (1) Spray with Bordeaux mixture of 6-4-40 strength, or Bordeaux (6-4-40) + 1% oil emulsion, immediately before the new growth commences. This will help to clean up the fungus present on old scabs.
- (2) Bordeaux of 4-4-40 strength, or Bordeaux (4-4-40) + 1% oil emulsion, at about the middle of the flowering period. This and the subsequent application are for the protection of young foliage and fruit.

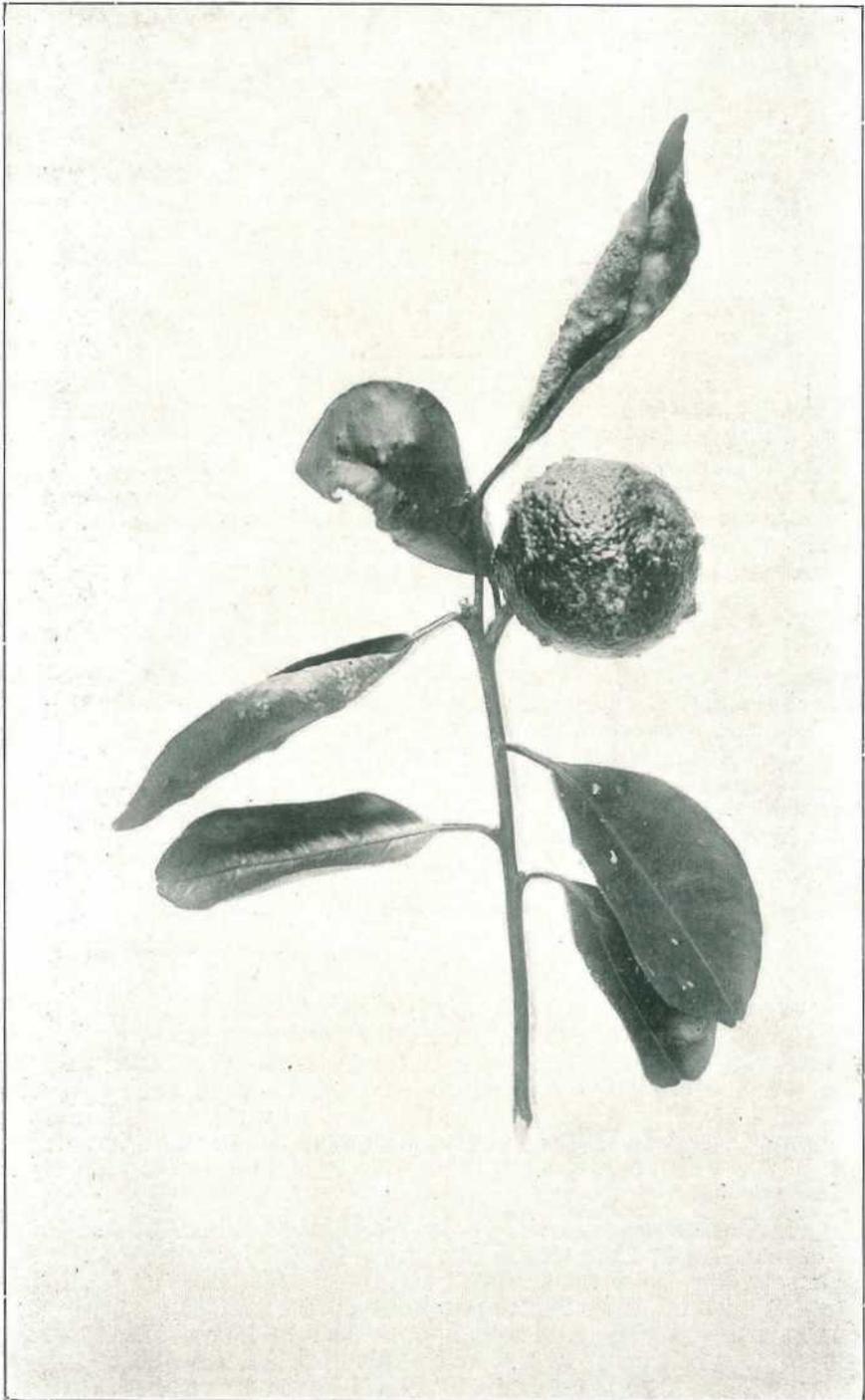


PLATE 52.—MANDARIN AFFECTED WITH SCAB.

- (3) Bordeaux again as soon as the fruit have set.
- (4) If the season is exceptionally wet it is advisable to give one or two further applications in order to keep the young fruit and foliage well covered.

It must be remembered that Bordeaux mixture may check the development of entomogenous fungi which materially aid in keeping down scale. It will therefore be necessary to pay particular attention to the control of these pests after Bordeaux has been used. If scab infestation is not serious or if the season is dry, lime sulphur, which does not possess these disadvantages to the same extent, may be substituted.

Blue Mould.

Blue mould rot of citrus fruits is caused by two allied fungi—*Penicillium digitatum* which forms an olive-green powdery spore coat over rotting fruit, and *Penicillium italicum* in which the spore mass is distinctly blue. The former is by far the chief source of rot in Queensland, and has been known to cause loss of 30 per cent. and over in long-distance consignments. This mould is sometimes referred to as the green mould to distinguish it from the blue form, but since remarks concerning the one are in general applicable to the other they will for convenience be treated together.

SYMPTOMS.

The rot commences as a small, soft, water-soaked spot on the rind. The area enlarges, and when it has reached about an inch in diameter a white mould develops on the surface and extends out in pace with the softening of the rind by the fungus within the tissue. From the white surface mould are produced closely aggregated short upright hyphae, which branch two or three times near the end. From each of the final branchlets are cut off chains of minute oval spores. It is the colour of these spores in mass which gives the characteristic appearance of the rotted fruit to which the disease owes its name. Finally the fruit may become broken down to a soft watery mass.

CONTRIBUTING CAUSES.

The loss of citrus fruit in transport on account of blue mould rot has exercised the minds of orchardists throughout the world ever since the growing of these fruits began to assume a large commercial scale. The fungi causing the damage and the factors contributing to the development of the rot have been investigated in various countries, and these investigations in almost every case have led to three important conclusions which clearly point the way to the solution of the problem. These are—

- (1) The species of *Penicillium* causing blue mould rot are relatively weak parasites and are unable as a general rule to penetrate the skin of a perfectly sound fruit. The blue mould fungus differs from the green in that the fungal threads making up the surface mould of the former may sometimes pass from a rotted to a healthy uninjured fruit with which it is in direct contact in the case. The first infection by means of spores must take place through wounds in the case of both species. It is a common sight to see perfectly sound fruit lying in a pack alongside one covered with green mould, clearly showing the immunity from infection of the uninjured fruit.

(2) The wounds occasioned during picking, carting, and packing serve as centres for infection by the blue mould spores which are present in the air of the orchard and packing house. Examination of twenty-one cases of oranges and mandarins arriving on the Brisbane markets showed that out of the 286 mouldy fruit present there were only 74 (or 25 per cent.) which did not show an obvious injury to account for the mould invasion, and very many of these consisted of fruit too mouldy for a primary cause to be ascertainable. The more common forms of injury were as follows:—Case bruises and cracks arising from poor packing, especially noticeable in connection with mandarins, 27 per cent.; punctures by long stalks, 18 per cent.; scratches and punctures of which the causal agency could not be determined with certainty, 16 per cent. The rest included miscellaneous injuries due to rubbing and pulling the button out, &c.

(3) The trouble can be to a great extent controlled by cleanliness and careful handling of the fruit to avoid bruising or otherwise injuring it.

CONTROL.

Keeping the above facts in view, the following recommendations can be made for the control of blue mould.

(1) All waste fruit in the orchard and packing house should be collected at frequent intervals and destroyed by burning or burying, as it will otherwise serve for the production of countless millions of mould spores to contaminate the air in which marketable fruit has to lie.

(2) Picking fruit during wet weather should be avoided, as fruit gathered under moist conditions usually shows a much higher incidence of blue mould. Great care should be exercised during picking operations in order to ensure that no injury is given by the clippers, finger nails, &c. The fruit should be cut, not pulled, and long stalks must be avoided as these are a frequent source of injury to other fruit. It may be found advisable in many cases to make a double cut, removing the stalk close back by a second cut when the fruit is held in the hand.

The method of handling during the transference to the packing shed and subsequently should be such as to avoid bruises or mechanical wounds. The collecting boxes should be smooth and the fruit must be placed in them carefully.

(4) Citrus fruit are best allowed to cure for three to seven days before packing, and all those in which rot commences should be removed by frequent inspection. The grader, if used, should be of a style which does not bruise the fruit. Close attention must be paid to the picking over, and all blemished fruit should be discarded. Packing cases should be made of smooth wood, and care must be taken that the fruit are not rubbed against the sides or the pack made too tight, as bruising and cracking often arise from these causes, especially in the case of mandarins.

Wrapping the fruit serves to lessen blue mould loss by reducing the number of case bruises, and by enclosing any mouldy fruit so that the spores are not distributed throughout the case.

(5) Careful carriage of the consignment between packing shed and market is also advisable but not always within the control of the grower.

By giving attention to cleanliness and careful handling the loss due to blue mould may be reduced to an insignificant minimum.

Exanthema.

This disease is one apparently not dependent on the presence of parasitic organisms for its development, but is rather due to physiological disorders brought about by improper nutrition. Most varieties of citrus are subject to the malady.

SYMPTOMS.

In the typical cases on young trees, symptoms commence with a flush of young succulent growth the branches of which are sometimes curved at the ends and usually bear abnormally large dark-green leaves. After a time the new growth assumes a slightly yellowish tinge, and there are developed along the branches dark-brown patches of a resinous appearance due to the deposition of a resin-like substance in the cells of the outer layers of bark. Definite longitudinal cracks may be formed from which is extruded the brown resin mass to form a rounded or fissured excrescence. (Plate 53.) Gum pockets having the appearance of a rounded blister may be formed on the succulent growth by the accumulation of the brown gummy secretion in certain spots between the wood and bark, the latter being forced out in the process. Multiple buds and very angular stems are often characters associated with branches exhibiting this disease. The leaves of the affected terminals usually drop, leaving the bare brown branches showing up conspicuously. Later these die back and are invaded by various saprophytic fungi. A dark-brown superficial marking somewhat similar to that occurring on the shoots may be present on the rind of the fruit borne by a diseased tree. These patches often have the appearance of being formed from aggregated spots. The latter are slightly raised and cracked, which makes the affected area rough to the touch. The presence of this fruit discolouration is usually accompanied by a hardening of the skin, with a consequent restriction in growth, which often leads to cracking.

CONTRIBUTING CONDITIONS.

Exanthema usually makes its appearance on very light sandy soils lacking in humus, such as are to be found in some of the coastal citrus areas. The use of this type of soil would appear to be one of the main causes of the occurrence of this disease so far as Queensland is concerned. Heavy rainfall followed by a dry spell; poor drainage; and the excessive use of organic nitrogenous manures are factors also stated to favour the development of exanthema.

CONTROL.

All dead and dying wood should be removed by thorough pruning.

The soil conditions should be improved as far as possible by judicious manuring (avoiding excessive use of organic nitrogen), and by the ploughing in of green crops to better the physical condition and increase the humus content. Artificial drainage should be practised when necessary.

Some growers have obtained benefit from spraying with Bordeaux mixture, the copper sulphate in this case appearing to act largely as a tonic. The bluestone may also be applied by spreading it on the ground round the tree. In this case $\frac{1}{4}$ to 1 lb. per tree is used, depending on the size of the tree.



PLATE 53.—EXANTHEMA ON ORANGE.

From a water-colour drawing by I. W. Helmsing.

Dieback.

Dieback is a condition which may sometimes be confused with exanthema. It is characterised by the death of twigs and small branches on the outside and more especially on the top of the tree. This trouble differs from Exanthema in the absence of resinous exudation, gum pockets, and multiple buds, and in the fact that the affected branches are usually of stunted rather than of vigorous growth.

Pink pustules of a fungus (*Glæosporium sp.*) are usually scattered over the dying twigs. This fungus commonly attacks only those branches which are in a weak or dying condition owing to the tree having insufficient vigour to support them.

The trouble appears in neglected orchards and on poor land, more especially if a hard impervious subsoil is causing bad drainage.

The treatment should follow the lines of improving the growing conditions of the tree by good cultivation, manuring, and if necessary drainage, when the trouble will be found to disappear.

Collar Rot.

Collar rot or foot rot is the commonest and the most destructive of the several forms of gumming disease to which citrus trees are subject. Lemon trees or the lemon stock on which other varieties are worked are most susceptible. The mandarin and sweet orange are also sometimes affected.

SYMPTOMS.

The disease usually occurs at the base of the main trunk, where it appears as a darker, somewhat water-soaked area not very definitely marked off from the surrounding healthy bark. There is usually a puncture or slit towards the centre from which gum-drops have exuded. The bark over the diseased region may be easily lifted, and between this and the wood is found a slimy, clear, gum-like substance. The wood below the diseased bark exhibits a brown discolouration, which, however, does not usually penetrate for more than $\frac{1}{2}$ inch. The margin between this and the healthy tissue is especially distinct and shows as a narrow band of slightly darker brown.

A collar rot of any size will make its presence evident by a yellowing of the foliage and dieback. This will often take place only on the one or more branches which arise from the same side of the trunk as is affected by the rot. Eventually the branch may die out completely. Should the lesion extend round the trunk the whole tree may be ringbarked and die.

CAUSE.

The organism recorded as causing foot rot in Queensland is a fungus known as *Fusarium limonis*. It is, however, probable that other fungi are at times responsible for the trouble.

CONTROL.

The organisms concerned in collar rot will not penetrate healthy living bark, so that a wound of some form must be present before infection can take place. It is therefore important to avoid any injury during cultivation.

Badly drained soil and water accumulation round the crown are conducive to gumming and should therefore be avoided.

A close watch should be kept for the appearance of collar rot lesions. When caught before they have advanced too far the disease can be cured by surgical methods. The soil should be opened up away from the crown and main roots so as to expose these to the sun and air. The diseased bark and wood must then be carefully removed by cutting or scraping with a sharp instrument well back into sound tissue. The excised pieces should be carefully collected and burnt. If any of the roots are badly affected they are best removed entirely. When the trunk has been thoroughly cleaned of all diseased tissue the wound should be painted with Bordeaux paste.

Armillaria Root Rot.

The tree affected by this disease exhibits symptoms similar to those associated with collar rot. There is usually a yellowing of the foliage of the whole tree or on one or more branches, together with more or less dieback. As the fungus responsible for this rot attacks also a number of other fruit-trees, the full description of the disease, together with recommendations for treatment, have been left to Chapter XIII.

Fumagine or Sooty Mould.

Sooty mould cannot be considered as a definite disease to the same extent as may the citrus troubles previously described, but since it is of conspicuous appearance and to a certain extent detrimental to the tree affected a short description is here given.

SYMPTOMS.

The tree affected with fumagine is conspicuous on account of the black sooty deposit covering the foliage and often the fruit. It is common to see whole trees or even entire orchards exhibiting the dirty black appearance due to the presence of this mould. The fruit may be rendered so unsightly that scrubbing becomes necessary.

CAUSE.

An examination of the leaves will show the sooty appearance to be due to a thin, black, superficial film, which may be easily scraped off in flakes. This film is formed by the close interlacing of the dark mycelial filaments of a fungus known as *Capnodium citricolum*. This fungus is not a plant parasite, but lives on the sugary substances which become scattered over the leaves after secretion by certain scale insects. Of these latter the chief ones concerned are the pink and white wax scales and to a certain extent the Lecanium or soft scales.

The fungus is entirely superficial in its growth and therefore does not directly injure the tree. The presence of the covering of mould will, however, eventually tend to weaken the tree, as assimilation will be checked by the exclusion of light and by the blocking up of the breathing pores of the leaf.

CONTROL.

To get rid of sooty mould it is necessary to destroy the scale insects on whose secretion the fungus is dependent for its existence. This should be done by suitable spraying or cyaniding, when the fumagine will be found to gradually disappear. If it is desired to remove the mould quickly after the destruction of the scale, the trees may be sprayed with a thin paste made by boiling flour in water. This will form a skin over the leaf which when it dries will flake off and carry away the mould in the process.

NOTES ON SOME POT EXPERIMENTS CARRIED OUT ON THE ABNORMAL SOIL PATCHES—ATHERTON TABLELAND.

By W. R. WINKS, B.Sc., A.A.C.I.

IT has been recorded for some time that the maize grown on certain scrub soils of the Atherton Tableland, particularly around Kairi, exhibits a patchiness of growth, some being quite normal and producing average crops, while in other cases small areas appear which are stunted and fail to produce any cob at all.

The writer's visit to the Tableland was during the planting season, and already this abnormality could be seen in the maize plants 9 inches to 1 foot high, the abnormal plants being yellow and red in colour and much smaller than other plants of the same age.

There appeared to be no regular distribution of these patches, which, over a given area, may amount to 25 per cent. of the total area.

Information obtained from farmers shows that these patches increase every year, not by the appearance of new patches, but by the ones already in existence growing on themselves.

It was, however, not possible for the writer to confirm this method of increase himself, due to the short time at his disposal, but the existence of the abnormality was, at the time of his visit, sufficiently serious to warrant further investigation with a view to its eradication.

The appearance of these patches in the field affords few clues as to why they appear. A white ashy material generally present on these patches seems to point to a destruction of the organic material of the soil, due to burning off of the scrub-timbers, but further investigation fails to confirm this view.

This ashy material is not assimilated by the soil even after years of ploughing, but it is probable that the toxic material existing in it may be accumulated just above the hardpan, which is present at a depth of from 5 to 6 inches below both the good and bad soils.

On other parts of the Tableland large areas of newly burnt land growing quite normal maize could be observed, much of the maize growing in beds of ashes and appearing to suffer no ill effects from the ashes. It is also generally stated that this abnormality does not appear on new land until at least the third planting.

As field investigation did not denote very much to account for the poor condition of the maize, a large amount of the abnormal soil was procured to a depth of 4 inches, from the farm of Mr. J. Hooper, of Kairi, and some normal soil from within a few feet of this abnormal soil was also procured for pot experiments.

Analyses of the two soils (supplied herewith) showed little variation, except in the case of lime, the bad soil containing nearly three times as much lime as the good soil, much of this being in the form of carbonate, while the good soil contained no carbonate.

It would appear, therefore, that the abnormality was due, in some part, to excessive lime, and pot experiments were arranged to seek a remedy. Maize is a comparatively cheap crop, and any treatment recommended must, of necessity, be one that is comparatively cheap.

The Pot Trials.

For the experiment, pots 5 inches in depth and containing 2 lb. of soil were used. The condition of the optimum moisture was determined by the addition of varying amounts of water to the soil, till it came to a state which appeared to be the best moisture condition for plant growth—in this case 25 per cent.—and the soils were kept in this condition during the greater part of their growth, being weighed every day, and the amount of water used by the plant and lost by evaporation added.

Two seeds were planted in each pot, the pots being numbered, and the treatment for each pot being drawn from a hat. After planting the pots were mixed up haphazardly so that the personal factor did not enter into the observations.

In the early part of the experiment mice destroyed many of the seeds, but after a cover had been made by Mr. Cree this trouble was overcome, but it was found necessary to cover the plants at night so that outside moisture could not get into the pots, and this prevented them getting much of the early morning sun, and in the week-ends they were covered for more than a day and a-half.

The amount of fertiliser added was worked out on a drill basis, that is on the basis that the fertiliser would be planted in a drill 6 inches wide, each drill 3 ft. 6 inches apart, and that it would operate to a depth of 4 inches. On this basis one-eighth part of the field would be covered with fertiliser.

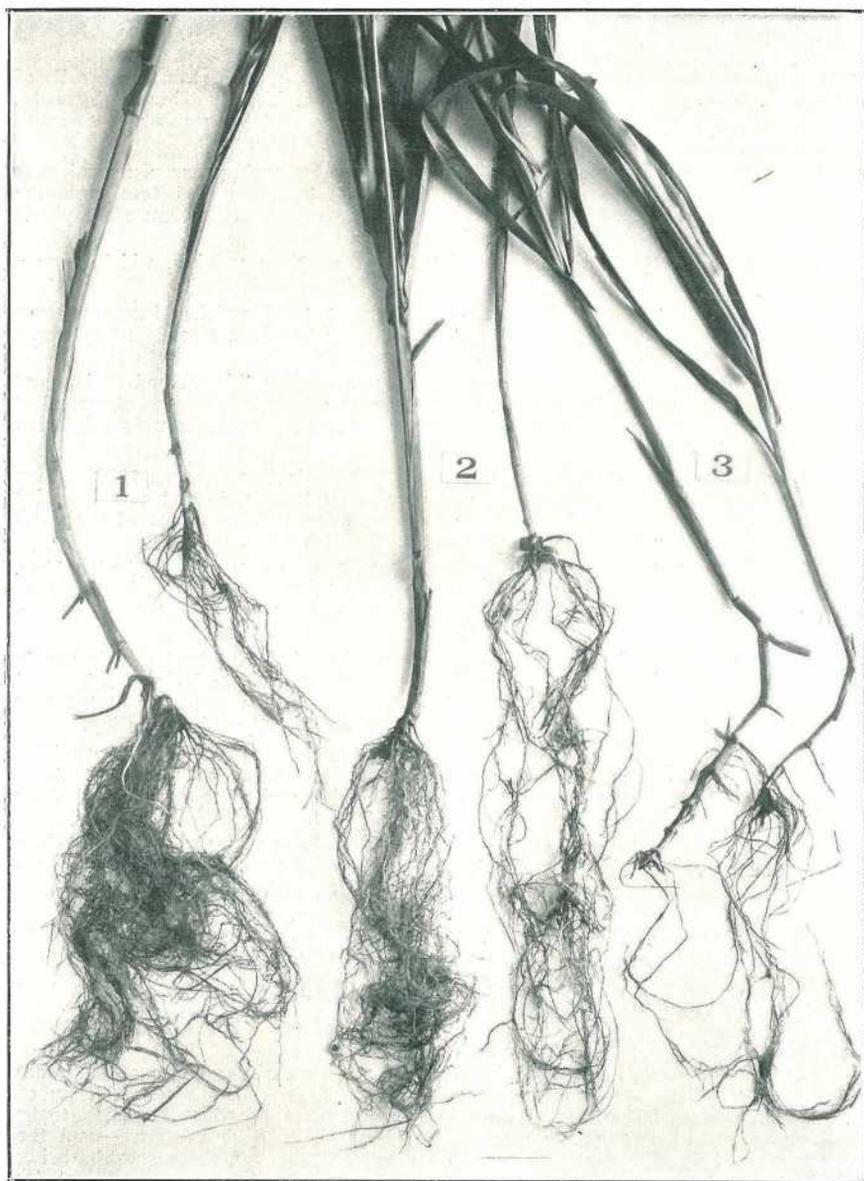


PLATE 54.

No. 1.—Bad soil fertilised with a complete fertiliser, consisting of 1 cwt. nitrate of soda, 1 cwt. sulphate of potash, 180 lb. superphosphate, and 5 cwt. of gypsum per acre. The second plant in this series was checked by ammonia fumes.

No. 2.—Normal soil unfertilised.

No. 3.—Bad soil unfertilised. Note the secondary roots sent out to support the plant due to its primary root system being insufficient for this purpose.

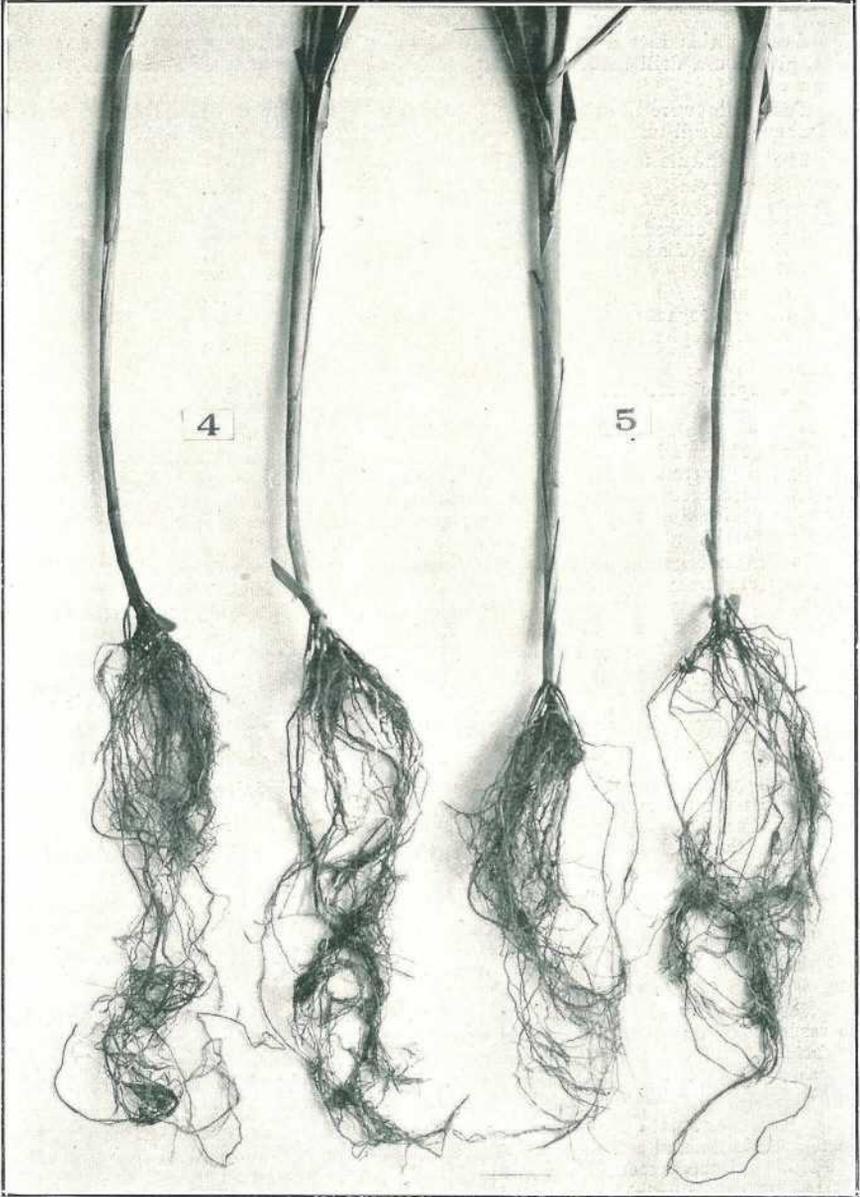


PLATE 55.

No. 4.—Bad soil fertilised with 1 cwt. sulphate of ammonia per acre.
No. 5.—Bad soil fertilised with 1 cwt. nitrate of soda per acre.

While there is much to be said against this reasoning as to the application of fertilisers, the amounts added on a broadcast basis to a 2-lb pot at the rate of 1 cwt. to the acre would be so small as to be almost impossible of mixing with the soil.

Even at this rate a soil of specific gravity 1.27, at the rate of 1 cwt. to the acre, gives on a drill basis only .702 grammes to a 2-lb. pot, or about one-fortieth of an ounce.

Four pots were allotted to each treatment, and four controls each of normal and abnormal soil unfertilised were used as a check on the experiment.

The treatments used were as follows:—

Sulphur	1 cwt. per acre.
Sulphate of potash	1 cwt. per acre.
Nitrate of soda	1 cwt. per acre.
Sulphate of ammonia	1 cwt. per acre.
Gypsum	5 cwt. per acre.
Gypsum	10 cwt. per acre.
Superphosphate	180 lb. per acre.
Superphosphate	3 cwt. per acre.
Complete fertiliser	{ 1 cwt. nitrate of soda, 1 cwt. potash, 180 lb. superphosphate, 5 cwt. gypsum (on broadcast basis).

One pot each in the above experiments was watered with distilled water, but during the progress of the experiments these pots (which were kept together for the convenience of watering) had ammonia fumes blown over them, burning their leaves and checking their growth to a great extent. Two of the pots containing complete fertiliser were also subjected to a similar calamity.

In the experiments a mistake was made in adding the gypsum on a drill basis, as it was originally intended to be used on a broadcast basis, but this was a rather fortunate error as will be demonstrated later. In the complete fertiliser the gypsum was added on a broadcast basis.

The experiments were commenced on 7th January, 1929, and on 12th January the plants were sufficiently advanced to allow of one being removed from each pot, leaving one plant to the pot in each case. The plants were dug up and their roots examined on 22nd March, 1929, and photographed, 23rd March, 1929.

Results.

The results of this experiment served to show quite definitely that the abnormal soils were unfit for maize growth. In every case the plants were thin and spindly with very little root system, which in most cases had been too weak to support them, and hence they were blown over and had sent out secondary stem roots. This is well exemplified in fig. 3 in Plate (54).

The maize in the normal soil was strong and healthy and had good root growth, and, in fact, was little different from the best of the treated pots (Plate (54), fig. 2).

The best growth of all was made by one plant of the completely fertilised pot, but this result is not conclusive as the other three plants were spoilt by ammonia fumes (Plate (54), fig. 1).

The pots treated with 5 cwt. of gypsum and 1 cwt. of sulphur showed little or no response to this treatment, being only slightly above the average of the bad soil controls unfertilised, as will be shown in Plate (56). Little response was shown to potash, which is to be expected from the fact that analysis shows the soils to contain an abundance of available potash (Plate (57)).

A treatment with 10 cwt. of gypsum gave a decided response, but as this was on a drill basis and not a broadcast basis, such treatment would be too expensive to adopt on a cheap crop (Plate (56)).

As the soil is deficient in available phosphoric acid, this was used in the form of superphosphate, at the rate of 180 lb. per acre and 3 cwt. per acre, the lesser amount showing better results than the greater, which is in accordance with experimental results on the Tableland (Plate (57)).

Very noticeable results were shown by the ammonium sulphate and nitrate of soda treatments. In both cases the maize grew larger and better than in any of the check pots, the better growth being given by ammonium sulphate (Plate (55)).

This would almost be expected as sulphate of ammonia is an acid fertiliser and would tend to bring the soil to a slightly acid or neutral condition, thus overcoming the excess alkalinity.

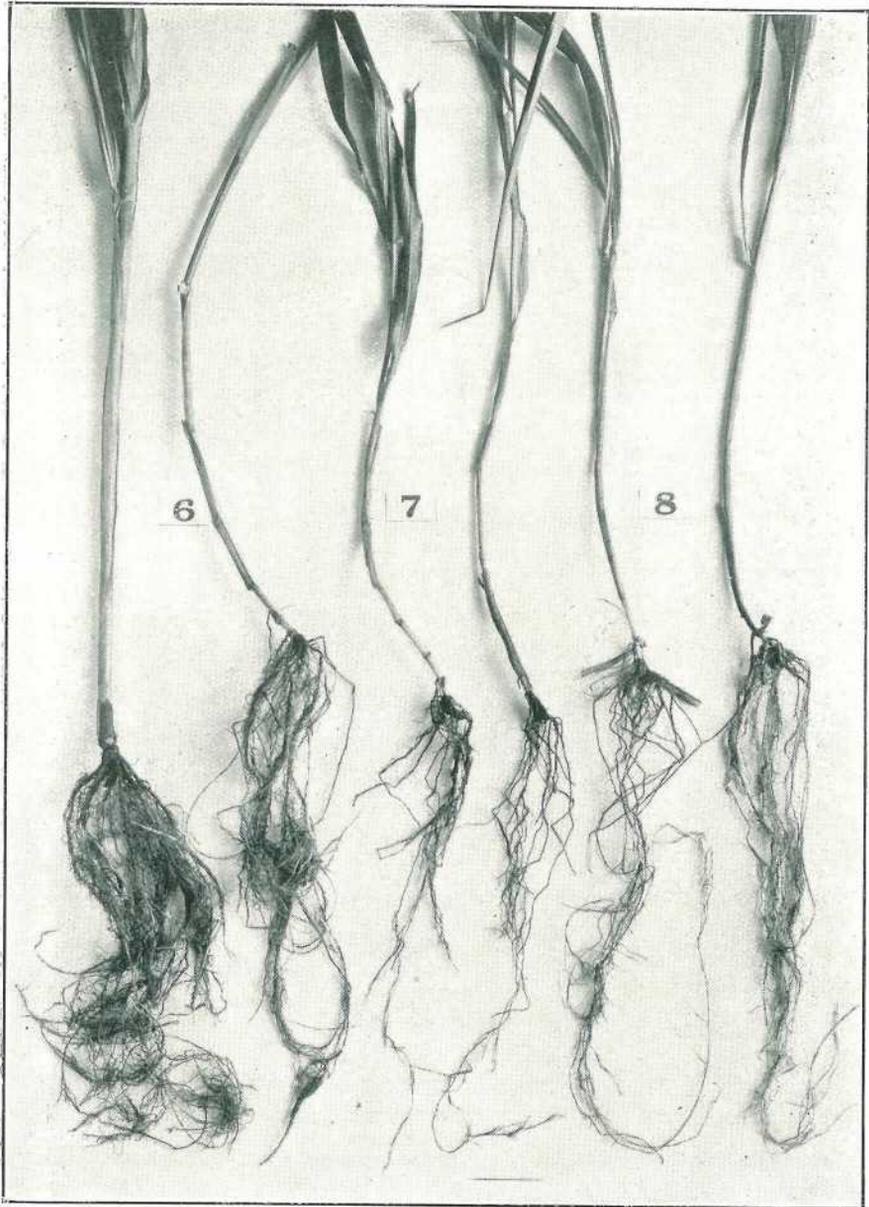


PLATE 56.

- No. 6.—Bad soil fertilised with 10 cwt. of gypsum per acre, in drills.
- No. 7.—Bad soil fertilised with 5 cwt. of gypsum per acre, in drills.
- No. 8.—Bad soil fertilised with 1 cwt. per acre of sulphur.

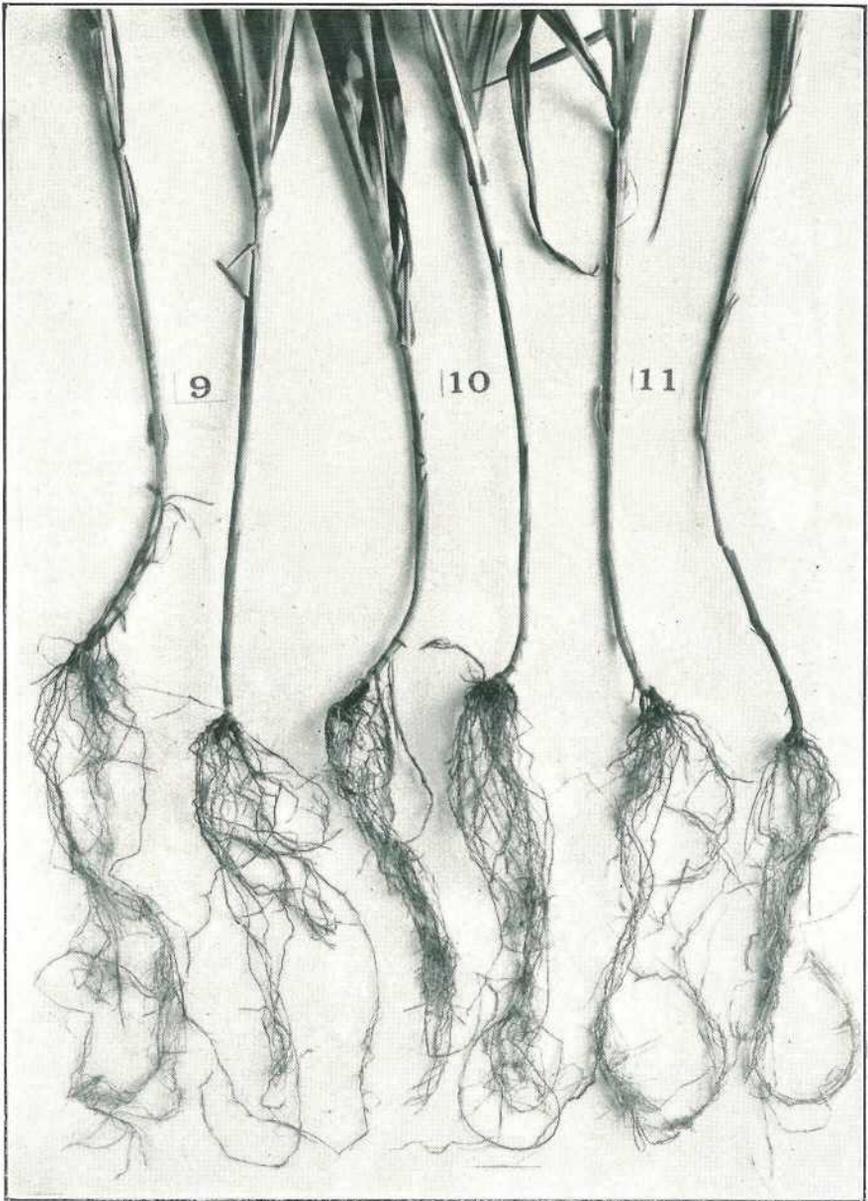


PLATE 57.

No. 9.—Bad soil fertilised with 3 cwt. superphosphate per acre.

No 10.—Bad soil fertilised with 180 lb. superphosphate per acre.

No. 11.—Bad soil fertilised with 1 cwt. sulphate of potash per acre.

Summary.

The experiments, while not being conclusive in showing the best fertiliser for use in the district, show that decidedly abnormal conditions exist in the Atherton scrub soils.

These conditions can probably be overcome and the soil brought back to normal by treatment with fertilisers, the best and most suitable of which appears from these experiments, to be sulphate of ammonia.

The good soils were not subjected to any fertiliser treatment, but treatment of the bad soils did not improve them beyond the normal soils, but merely brought them to the normal condition.

A suggested field treatment would be for a field officer to carefully map out certain of these bad patches and to treat them with (1) nitrate of soda, 1 cwt. per acre; (2) ammonium sulphate, 1 cwt. per acre; (3) superphosphate, 180 lb. per acre; and a complete fertiliser consisting of (4) ammonium sulphate, 1 cwt. per acre; superphosphate, 180 lb. per acre; sulphate of potash, 1 cwt. per acre; allowing, say, four drills for each treatment.

This could be carried out with comparatively little expense, and would serve as a check on the laboratory experimental work, though, in the opinion of the writer, much could be done by putting the land under grass or lucerne for two or three years and allowing it to rest from the continuous cropping without rotation to which it has been subjected in past years.

Subsoiling of these patches would also be advisable, but it should be carried out in such a way that the subsoil is broken but not brought to the surface.

ANALYSIS OF ATHERTON SOILS USED IN POT EXPERIMENTS.

---	Ashy Material.		Bad Soil.		Good Soil.	
Laboratory No. . . . .	.. ..		3021		3022	
Classification	Br. Loam		Choc. Loam		Choc. Loam	
Reaction (Truog Acidity) ..	Nil.		Nil.		Very slight	
Apparent Sp. Grav.	1.23		1.27		1.20	
Weight of soil in tons per acre 12 in. deep	1493		1542		1457	
Water Capacity	54%		50%		58%	
Weight absorbed tons per acre	806		771		845	
Capillarity after 3, 6, 24, and 48 hours	7, 10, 16, 21		14½, 18½, 23½, 25½		10½, 13½, 17½, 21	
Moisture	3.36 lb. per ac.		8.70 lb. per ac.		5.30 lb. per ac.	
Humus	1.81 4 in. deep		1.86 4 in. deep		1.95 4 in. deep	
Other organic material and combined moisture	15.53		12.88		13.19	
Chlorine .. .. .	.004		.007		.010	
Nitrogen .. .. .	.238 2565		.227 2383		.254 2621	
Soluble in Hydrochloric acid of specific gravity—						
Phosphoric acid P ₂ O ₅ ..	.38 4126		.41 4260		.38 3916	
Iron, alumina, &c. Fe ₂ O ₃ , Al ₂ O ₃ .	35.02		39.52		39.92	
Lime CaO	6.71 72233		2.08 21870		.88 9028	
Magnesia MgO .. .. .	.86		1.16		.49	
Potash K ₂ O .. .. .	.09 1003		.11 1151		.13 1305	
Insoluble Residue	39.37		41.68		43.26	
Soluble in 1 per cent. Citric Acid Solution—						
Phosphoric acid P ₂ O ₅ ..	.0003 3		.0008 8		.0008 8	
Lime CaO .. .. .	.7933 8560		.8865 9315		.3690 3798	
Magnesia MgO .. .. .	.0999		.2519		.2356	
Potash K ₂ O .. .. .	.0205 221		.0141 148		.0284 293	
	A		B		C	

A—Agricultural analysis of ashy material mixed with soil.

B—Agricultural analysis of abnormal soil.

C—Agricultural analysis of normal soil.

ANALYSIS OF ASHY MATERIAL IN SOIL.

Lab. 2280.

	Per cent.
Moisture	2.56
Loss on ignition	16.32
Silica	34.03
Potash .. .. .	.26
Lime	14.14
Magnesia	1.60
Phosphoric acid .. .. .	.47
Iron and alumina	31.40

ANALYSIS OF ASH OF MAIZE PLANTS.

Moisture.	On air-dried material.	Calculated to dry weight.
	Per cent.	Per cent.
Ash	10.80	11.30
Phosphoric acid	5.16	5.32
Iron	4.60	4.81
Alumina	9.44	9.90
Lime	5.32	5.57

INDEX TO PLATES.

PLATE (54).

Fig. 1.—Bad soil fertilised with a complete fertiliser consisting of 1 cwt. nitrate of soda, 1 cwt. sulphate of potash, 180 lb. superphosphate, and 5 cwt. of gypsum per acre. The gypsum was added on a broadcast basis calculated as 5 cwt. per acre, 4 inches deep. The second plant in this series was checked by ammonia fumes.

Fig. 2.—Normal soil unfertilised.

Fig. 3.—Abnormal soil unfertilised. Note the secondary roots sent out from the cornstalk to support the plant, due to its primary root system being insufficient for this purpose.

PLATE (55).

Fig. 4.—Bad soil fertilised with 1 cwt. sulphate of ammonia per acre.

Fig. 5.—Bad soil fertilised with 1 cwt. nitrate of soda per acre.

PLATE (56).

Fig. 6.—Bad soil fertilised with 10 cwt. of gypsum per acre in drills.

Fig. 7.—Bad soil fertilised with 5 cwt. of gypsum per acre in drills.

Fig. 8.—Bad soil fertilised with 1 cwt. of sulphur per acre.

PLATE (57).

Fig. 9.—Bad soil fertilised with 3 cwt. superphosphate per acre.

Fig. 10.—Bad soil fertilised with 180 lb. superphosphate per acre.

Fig. 11.—Bad soil fertilised with 1 cwt. sulphate of potash per acre.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

AGRICULTURE IN QUEENSLAND.**QUARTERLY CROP REPORT.**

The Minister for Agriculture, Hon. Harry F. Walker, has received the following reports from Messrs. A. E. Gibson, G. B. Brooks, and N. A. R. Pollock, Senior Instructors in Agriculture for the Southern, Central, and Northern Districts respectively.

SOUTHERN QUEENSLAND.

Although the rainfall experienced during the month of April was ample for agricultural and dairying requirements, the subsequent dry stretch extending from the beginning of May until well on towards the end of June had a counteracting effect and delayed wheat-planting, and also affected the dairying industry. Pastures have in all cases been reported upon as being ample for requirements, the dry, cold weather, accompanied in most instances by frost, has been responsible for a rapid drying off of all grass and herbage. Water supplies are in all instances adequate and sufficient for immediate requirements. Live stock in every instance are in good condition and markets are generally firm.

Although a considerable area of wheat had been sown with late maturing varieties early in April, as previously mentioned the lack of sufficient moisture delayed sowing, but with the advent of good rains in the latter part of June a considerable area has since been planted and sowing is now practically completed. A few areas which missed a sufficiency of rainfall will probably now lie fallow until the maize-planting season. It is expected that the area under wheat this year will approximately equal that of 1928.

Maize harvesting is approaching completion, and, whilst on the whole the crop may be regarded as satisfactory, certain areas report a medium harvest only. The area under crop is comparable with that of 1928.

Although the recent dry and cold weather experienced throughout the Downs has affected the growth of lucerne, good cuttings were being obtained before the frost. No general increase in the area under this crop is reported, although certain districts claim a slight improvement.

Fodder crops, including oats, barley, and in some instances late sorghums, are generally reported as good and show an increase in some districts in the acreages under oats for green fodder, particularly so in the coastal areas. Malting barley, owing to existing conditions, is below the average area sown on the Downs.

Pumpkins have given satisfactory yields in many districts, while in others crops have been light. Potatoes both English and sweet are expected to give satisfactory yields, and in some districts the area under these crops has increased. Harvesting of the crop is already completed in some districts, heavy yields being obtained. Root crops apart from potatoes, while giving in many instances satisfactory returns, do not appear to be favoured outside the immediate coastal areas, and even in these a decrease in area is reported.

Arrowroot crops are reported to be satisfactory, but a decline in the area under this crop is noted.

Heavy rain in the early part of the quarter under review was the cause of a fair amount of damage to lucerne crops harvested for hay, particularly so in the coastal areas; later cuttings have, however, been satisfactory.

Inland and above the Range the quality of the hay conserved has generally been high. On the black soil areas cultivation has, to a certain extent, been delayed by lack of soil moisture. On the lighter classes of soil field operations for summer crops are well advanced.

CENTRAL QUEENSLAND.

The rainfall received in the Central area during April ranged from 8.98 in. at Rockhampton to 2.86 in. at Jambin in the Callide Valley. May was remarkable for its dryness, no rainfall being registered during that month. The falls recorded in June compensated for the previous month's dryness, ranging from 10.39 at Rockhampton to 2.21 at Jambin.

Light frosts were experienced along the coast including Mackay, and heavy frosts recorded in the Dawson and Callide areas. Low temperatures were experienced earlier than usual, four frosts being recorded in the Callide during April. May was responsible for eight frosts, and nine were recorded in June. Early frosts were responsible for some damage to cotton and other crops.

Grass and water are plentiful in the various localities embracing Mackay and Bundaberg on the coast, and Durango, Dawson and Callide Valleys, and Theodore to the west.

Although a few isolated cases of pleuro and blackleg have been reported, stock generally are healthy and in good condition. All classes of stock have been realising satisfactory prices and a keen demand exists for stores. Draught horses are fetching remarkably good prices in the Mackay district.

The area under wheat is estimated to be double that of last season. Incidentally, increased area of peanuts, sorghums, pumpkins, lucerne, and rape have been noted, whilst more attention is being given to the growing of winter cereals for dairy fodder purposes. The area harvested for potatoes, both English and sweet, shows a decrease compared with last season, for which floods in the early part of the year were mainly responsible.

Hay crops are mostly confined to panicums, millets, and sudan grass; these were generally secured in good condition. Many farmers in the Central district rely on stand-over crops of sorghum to carry their stock through the winter months.

It is estimated that approximately 800 tons of silage have been conserved during the last three months.

An excellent germination was secured from the first planting of wheat, and the recent rains will ensure later sowings germinating satisfactorily. Land upon which cotton and maize were grown is in the course of preparation for spring crops. Conditions generally are excellent for the preparation of good seed-beds.

Reviewing climatic conditions of the period under review, it may be considered that although on the whole they could be classed as good, they were at the same time erratic. Heavy falls of rain occurred during April and June, whilst over the whole area no rain fell in May. June registrations constituted a record for Rockhampton and surrounding districts. While there is an abundance of grass, no succulence is present in the dairy pastures, but recent rains are having the effect of promoting growths of herbage, and, owing to the fact that many farmers have sown areas of wheat, barley, or oats for winter feed, these are making excellent growth. The outlook for the ensuing three months is most promising.

NORTHERN QUEENSLAND.

Although the rainfall experienced during April in the northern portion of the State was above the average, May was almost rainless, while the precipitations recorded in June were also above the average. Pastures were stated to be excellent, though in lightly stocked localities much of the grass produced a rank growth.

Stock generally are in good condition, although it is admitted that most of the fats arriving at the meatworks could show an improvement in condition. The small flocks of sheep at Hervey's Range and on the Tableland are particularly mentioned as being in very good order.

Due to drought losses in previous seasons supplies of fat cattle are not heavy. Meatworks killings will probably be in the vicinity of 80,000 head, and it is anticipated that the average dressed weights of these will range between 650 to 700 lb. Present price, delivered at the works, is 25s. per 100 lb. for first quality, whilst retail butchers are paying a little more. A strong demand exists for store cattle, but very few are changing hands. The outlook for the cattle market generally is very bright.

The supply of pigs to the Tableland's bacon factory at Mareeba is steadily increasing.

While it is expected that the area under maize and peanuts is likely to decrease, increased areas are to be noted in broom millet, arrowroot, potatoes, tobacco, and all classes of fodder crops. The maize crop is now being harvested and is nearing completion, only a medium crop being anticipated. Late reports of harvesting operations on the Atherton Tableland point to a possible shortage of 7,000 tons compared with last season's figures.

Tableland hay has been harvested under adverse conditions and quality in consequence suffered, and can only be classed as useful for home consumption. In other localities, where conditions were more favourable, the quality is reported as very fair. No stack silage has been conserved, but the quantity conserved in pits and silos equals that of last season.

No appreciable area of land is as yet being prepared for cropping, except where crops are to be grown by the aid of irrigation. Ploughing usually commences in the months of September and October, when all the crops have been harvested. Generally speaking, the season has been favourable and prices realised for agricultural produce satisfactory.

The fine falls of rain experienced during June are expected to ensure satisfactory yields from truck crops as well as green fodders for dairy cattle. The area under the latter shows a gratifying increase, it being estimated that fully 600 acres on the Tableland are under barley, oats, and wheat for this purpose.

Cream supplies to the factories at Malanda, Ravenshoe, and Julatten are very satisfactory, and that dairying prospects for the next months are excellent, due to the fine rainfall that the Tableland has experienced, which is responsible for heavy growth of winter fodders that later on will mean increased supplies of cream to the factories.

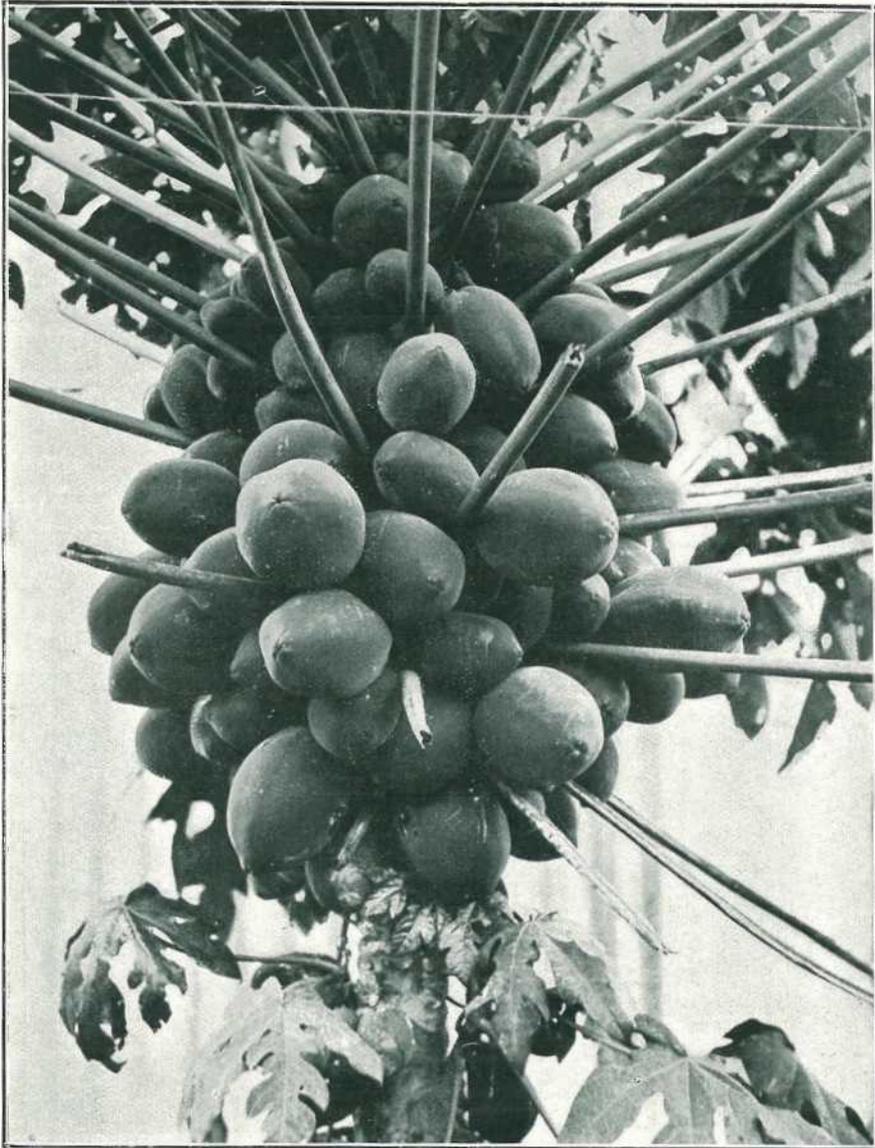


PLATE 58.—A PROLIFIC PAPAW TREE.

Grown by Mr. T. M. Evans within a coo-ee of the Brisbane Town Hall. There are over 200 fruits on this two-year old tree and still more are forming.

QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Scrub Bloodwood (*Baloghia lucida*) is one of the smaller rain-forest trees, as it does not exceed about 1 ft. in stem diameter and about 90 ft. in height. The bark is very frequently marked by dark patches or spots of hardened gum. When cut the bark exudes a bright red sap which accounts for the common name of Scrub Bloodwood. The species extends from Illawarra, New South Wales (Bentham) to Rockingham Bay, North Queensland. It is found also on Lord Howe and Norfolk Islands and in New Caledonia.



Photo.: W. D. Francis.

PLATE 59.

SCRUB BLOODWOOD (*Baloghia lucida*), A TREE IN THE IMBIL RAIN FOREST.

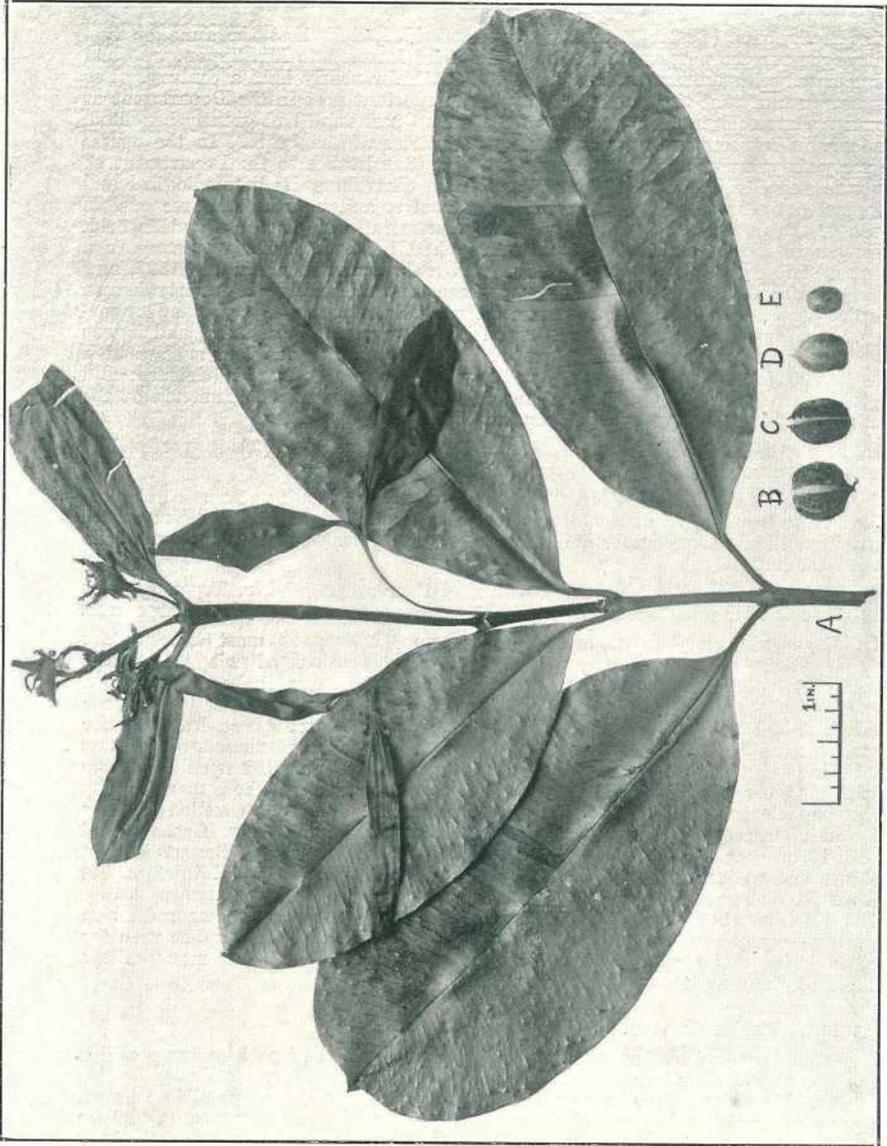


Photo.: Dept. of Agriculture and Stock.]

PLATE 60.—SCRUB BLOODWOOD (*Baloghia lucida*).

A. Flower-bearing twig; B. Dry fruit; c. Part of dry fruit; D. Same as C, but with outer covering removed; E. Seed.

RETIREMENT OF MR. HENRY TRYON.

VALEDICTORY GATHERING.

The retirement of Mr. Henry Tryon, formerly Government Entomologist and Vegetable Pathologist, from the Public Service of Queensland on 29th June was marked by a large valedictory gathering at the Department of Agriculture and Stock on the following Monday afternoon.

Mr. E. Graham (Under Secretary), who presided, said that the function had been arranged for the purpose of bidding an official farewell to Mr. Tryon, who had been associated with the Public Service of the State for nearly half a century. For the greater part of that time he had held a very important post in the Department as Government Entomologist. As a result of his work Queensland had greatly benefited, particularly in respect to the great primary industries of the State. In the course of his forty-six years of service he had been of great assistance to the Department of Agriculture and Stock, helping it, advising it, and controlling its entomological and pathological activities. His work had been extensive, and he had been responsible for much of the important pioneering work of Australia in his chosen scientific field. His services to the sugar industry particularly had been of immense value. As a result of a visit paid by him to New Guinea on a Government mission in 1896, new varieties of cane had been introduced into Queensland, including the variety known as Badila, which had proved of vast economic advantage to Queensland sugar-growers. Mr. Tryon's record was a splendid one of service to the State, and it was the hope and wish of his fellow officers of the Department, who had such a high appreciation of his work and worth, that he would enjoy a well-earned leisure; and they would all retain pleasant recollections of their association with him and of the yeoman service he had rendered to Queensland.

Mr. F. F. Coleman and Mr. C. T. White (Government Botanist) supported Mr. Graham's remarks.

Mr. Graham then presented Mr. Tryon with a wallet of bank notes as a token of the high esteem in which he was held by the officers of the Department. He remarked that Mr. Tryon had served under every Minister for Agriculture since that portfolio had been inaugurated.

Mr. White, on behalf of Mr. Hubert Jarvis, then presented Mr. Tryon with an additional serviceable token from the officers of the Department in the Stanthorpe area.

Mr. Tryon, in responding, thanked his former colleagues most heartily for meeting together to wish him god-speed on the occasion of his retirement. He appreciated also the material tokens which he was asked to accept as denotive of their appreciation of associations now severed. Gratitude evaporated, it had been said, on being expressed, and so he would not draw further upon even the ample fountain of it he possessed. However, he continued, a man was known by his friends. What of all that was good must be reflected upon him from them with all the friendliness of those whose personal characters whose mental gifts and whose efficiency went to constitute a departmental staff not excelled by any official administrative staffs in the Australian Commonwealth. Mr. Graham had reminded them that he had served under every Minister of the Department of Agriculture and under every Under Secretary. He had not troubled Ministers, but he was afraid that he could not plead that he had not troubled the permanent heads, however. He remembered one—always most kind to him—the first he was under and most worthy—saying: "Tryon, you have too much devil in you." He spoke with the strong conviction and terseness of a Scotsman, and being a religious man perhaps knew more of the devil than he did. (Laughter.)

The Ideals of Public Service.

They would expect him as a very old public servant to give them some of his views as to the ideals that should actuate the discharge of one's duties to his Department. To every officer he would say—Study as fully as was possible to work in combination, manifesting combined effort. That was especially needful where science and scientific enterprise were involved. Recently it was his pleasure to hear the Public Service Commissioner, Mr. J. D. Story, urge this consideration in addressing members of the University staff as a matter of supreme importance. Again he would present to them another ideal—perhaps it should have been given priority—aim at some other end than emolument of office and the briefest extent of daily or weekly service; aim to make yourself, he concluded, ever more mentally strengthened, equipped, and efficient for the discharge of your duties—that is what you owe to the public whose servants you are. (Applause.)

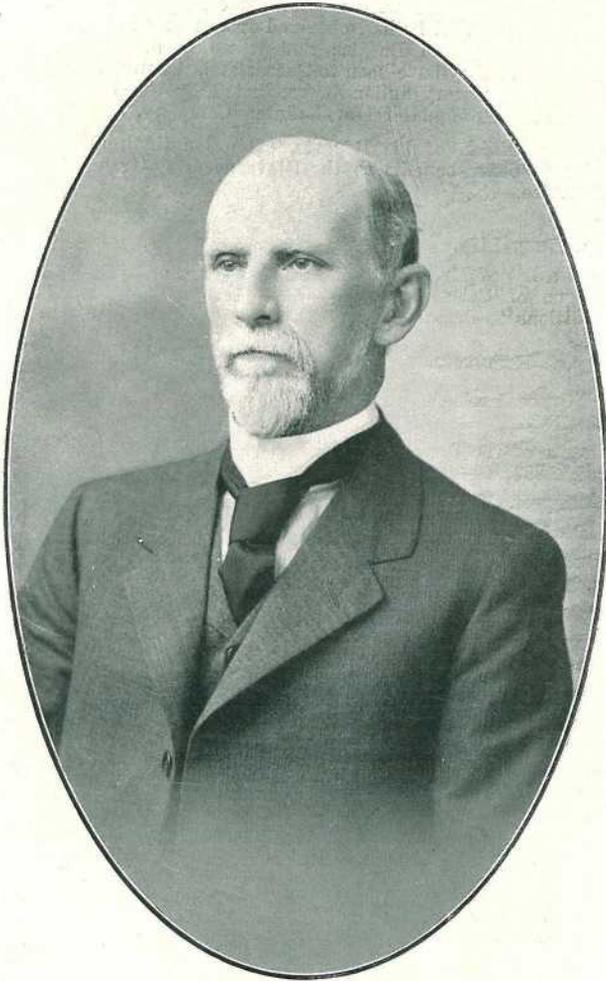


PLATE 61.—MR. HENRY TRYON .

Formerly Chief Government Entomologist and Vegetable Pathologist,
who has retired after nearly half a century of service.

MR. TRYON'S SCIENTIFIC SERVICES.

Perhaps Mr. Tryon's most material service to Australia was one not directly associated with entomology. In 1895, when the Department, in co-operation with that of New South Wales, decided upon sending a party to New Guinea to secure new varieties of sugar-cane, it entrusted the command of the expedition to Mr. Tryon.

Accordingly, on the 14th September of that year, he left Thursday Island in the 18-ton cutter "P.C.E." for New Guinea, and after exploratory travels in many districts returned to Cooktown in January in the following year with his boat laden with sugar-canes that, together with a previous consignment from him, comprised sixty-five named varieties that he had obtained from many native gardens. Amongst these were the Goru (3) and Badila; and it would be difficult to estimate the immense monetary value they have been to Queensland. Then followed their methodical testing in the field, laboratory and mill, conducted by the Department of Agriculture and Stock and the Colonial Sugar Refining Company.

The mere enumeration of his Reports, often lengthy and detailed, will, it is considered, point to other benefits to the State accruing from his labours and his long years of service.

A Record of a Busy Life.

Following is a list of Mr. Tryon's scientific writings as contained in the "International Catalogue of Scientific Literature" (Queensland Vol.—J. Shirley B.Sc., 1899), with additions to date:—

ECONOMIC ZOOLOGY, INCLUDING ENTOMOLOGY.

1. Notes on Queensland Ants. Proc. Roy. Soc. Queens., 2, 1885, 146-162. Reprint. 34.
2. The Occurrence of the Genus *Apus* in Australia. Trans. Nat. Hist. Soc. Queensland, 1, 1893, 64-65.
3. The Bean Maggot. Trans. Nat. Hist. Soc. Queens., 1, 1892, 4-7.
4. Bean and Pea Weevils. Trans. Nat. Hist. Soc. Queensland, 1, 1894, 86-90.
5. List of Butterflies collected in British New Guinea Expeditions undertaken during year 1889-1890. Ann. Rep. Brit. N. Guinea, 1889-1890, 112-115.
6. Scale Insects—Coccidæ. Queens. Agr. Jour., 1, 1897, 118-129. Three plates.
7. List of Coleoptera collected in the St. Joseph River district of B. New Guinea, by Mr. A. C. English. Ann. Rep. Brit. N. Guinea, 1889-1890, 109-112.
8. *Cryptolaemus Montrouzieri*, or the Scale Insects' Enemy. Trans. Nat. Hist. Soc. Queens., 1, 1892, 23-26.
9. Hemiptera of New Guinea. Annals of the Queens. Mus., Part 2, 13-24. 1892.
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Photo.: Dept. of Public Instruction.]

PLATE 62.—A LECTURE ON TEETH.

The Travelling Dental Clinic provides a well appreciated service in rural Queensland. Public health is regarded as of the utmost importance, and by this means country school children are taught the elements of dental hygiene, besides receiving qualified dental attention,

THE CULTIVATION OF THE PEANUT.

By N. A. R. POLLOCK, Northern Instructor in Agriculture.*

Description.

THE Peanut, "*Arachis hypogaea*," also known frequently as the earth or ground nut, is a plant of annual habit, belonging to the natural order Leguminosae or pod-bearers, and in common with most other members of the pea family has the power of obtaining its nitrogen supply from the atmosphere and storing it up in nodules on the roots.

Unlike other legumes, excepting the Bombarra ground nut, "*Voandzicia Subterranea*," this plant, while blooming above ground, matures its pod or fruit under the surface of the soil. The yellow flowers are borne at the joints where the leaves are attached to the stem, in the bunch or upright varieties at the base of the plant, and in creeper or procumbent varieties right along the stems. Upon pollination taking place the flower fades, and falling off leaves the stalk with a thickened pointed end called the "peg" or "point," which grows down into the soil, where it matures into the pod or so-called nut. It is apparent from this that the soil on which the crop is grown should be of a soft or friable nature or such that a loose surface can be easily maintained.

Range.

The peanut can be grown over the whole of Queensland, and while in the cooler parts it only succeeds in summer, in the tropical portions it may be grown at any period of the year where a sufficiency of rain falls.

The period of growth ranges according to variety and climate from fifteen to twenty weeks, the longest period being taken up by the creeper or procumbent varieties.

A moderate rainfall, plenty of sunshine, and a comparatively high temperature best suit the crop, and departures from these may result in a more lengthened period of growth. The crop can also be grown under irrigation.

Soils.

The nature of the soil on which the crop is grown, besides its fertility, is the main factor in a prolific crop. A loose texture is desirable to allow the pegs to easily penetrate and expand to form the pods and mature evenly, as well as to permit of easy harvesting in freeing the nuts from the soil. Good drainage is also essential, more especially when a heavy rainfall is liable to occur during the growing period.

Light sandy loams are best adapted for the production of peanuts for market as edible nuts, since the shells are clean and bright. Soils inclined to be clayey are apt to stain the shells, and though the berries or peas may be of equal quality, the clean, bright shell, being more inviting, will naturally command a better price. Ill-drained or sour soils are not desirable. Peanuts may be grown on most soils except a heavy or puggy clay, but except in the loose, friable soils they should only be grown for feeding off.

Rotation.

Peanuts should always be grown in a rotation, as though owing to the roots being harvested the same quantity of nitrogen is not left in the soil as with other legumes, where the whole root system is available, a sufficient quantity of the nodule-bearing rootlets are left to exert an influence on the following crop. At Tolga, in a comparison with potatoes grown on land on which the previous crops were maize and peanuts, the yield on the portion previously cropped with peanuts was estimated by an official of the Department to be 9 tons of tubers as against 6 tons on that previously cropped with maize. In the rotation, however, the peanut, when harvested, should not take the place of the legume or other crop that is ploughed under to restore the organic matter in the soil, and should only be looked upon as adding a quantity of nitrogen. Where the whole growing plant is ploughed under it answers the same purpose as cowpeas, Mauritius, and velvet beans, &c.

In orchards, either as a crop to be ploughed under or to be harvested, the peanut is commended.

* These notes first appeared in the Journal for June, 1922, and again in the issue for August, 1927, and are now reprinted in response to numerous requests from our readers.—Ed.

Fertilisers and Lime.

In common with other legumes, the peanut thrives best in a soil in which there is a sufficiency of lime. Not all soils require the addition of lime, but most soils in districts subject to heavy rainfall, and which give an acid reaction, will benefit by an application of from 5 to 10 cwt. of stone lime or 10 to 20 cwt. of earthy lime or pulverised limestone to the acre, broadcasted (not ploughed in), preferably a week or more before applying commercial fertiliser and sowing the seed. The cultivation of the crop will sufficiently work this lime into the soil. Where any doubt exists as to the necessity of applying lime to the soil, a portion should be limed and the resultant crop compared with a similar area unlimed.

In applying manures for the crop, care should be taken to only apply organic manure in a well rotted condition, and then only in small quantities and thoroughly mixed with the soil. Larger quantities or fresh manures will result in many of the pods being poorly filled. These poorly-filled pods are known as "pops" or "duds."

Organic manures should be applied to a previous crop to get the best results.

As the peanut is a legume and draws nitrogen from the air, this element is not called for in quantity in the fertiliser, but its presence in small quantity, say, 2 per cent. or 3 per cent., will be beneficial. Phosphoric acid and potash will be the chief elements in the fertiliser, and the quantities will be dependent on the soil content. In general, a fertiliser containing from 10 to 12 per cent. phosphoric acid, 2 to 3 per cent. nitrogen, and 6 to 8 per cent. potash will be a good mixture, and may be applied in quantities of from 1 cwt. to 5 cwt. per acre. Such a mixture can be obtained with 1 part sulphate ammonia, 7 parts superphosphate, and 1½ parts sulphate of potash.

The most suitable application will be discovered by applying varying quantities over a small area and noting results, but usually 2 cwt. is sufficient.

Commercial fertilisers are usually applied immediately prior to planting a crop, and as the roots of the peanut do not spread to any distance, the application in the drill with a fertiliser distributor having one or two times at the back will greatly aid in mixing the fertiliser with the soil.

Ashes from the forest hardwoods, which contain lime and potash, are useful, and may be applied to the soil broadcast in a similar manner to lime at the rate of about 10 cwt. to the acre. These ashes, however, should not previously have been exposed to rain, as then a great deal of their value will have been lost. The ashes of soft woods growing in the scrubs are not considered so good.

Selection of Seed.

As with other crops, in order to secure the best results it is essential that the seed of the peanut should be of the highest grade. Poor seed cannot be expected to yield a good return. In the first planting, seed should be secured from a heavy producing crop and subsequently carefully selected in the field from the heaviest producing plant of the required type. A good plan is to select the nuts from the best producing plants and sow these in a special seed patch, each year selecting the best of this area for next year's seed patch. Nuts harvested for seed should be fully matured, handled carefully, and not picked from the plants for several weeks after curing; they should then be picked by hand and the selected ones thoroughly dried and stored in a dry place free from mice or insect attack. Storage in tanks in a similar manner to maize is most satisfactory.

Methods of Planting.

The seed can either be planted whole or shelled. Whole nuts may be soaked in cold water twelve to twenty-four hours, drained, dried for an hour or two to assist handling, and then planted. This accelerates germination. Shelled seed should not be soaked.

Where shelled seed is used the shelling should be done by hand, though hand shellers carefully handled are sometimes used. All shelled seed in which the thin skin covering the seed is broken should not be sown, as this injury is liable to affect germination.

Breaking the pods in two answers the same purpose as shelling. Where the seed after planting may be subject to attack by vermin, the seed may be treated by sprinkling with a solution of equal parts of stockholm tar and kerosene. In this case, however, to protect the maturing crop it is advisable to destroy, by poisoning, the vermin beforehand.

Whether planted whole or shelled the operation may be effected by hand or with planters especially designed for the purpose.

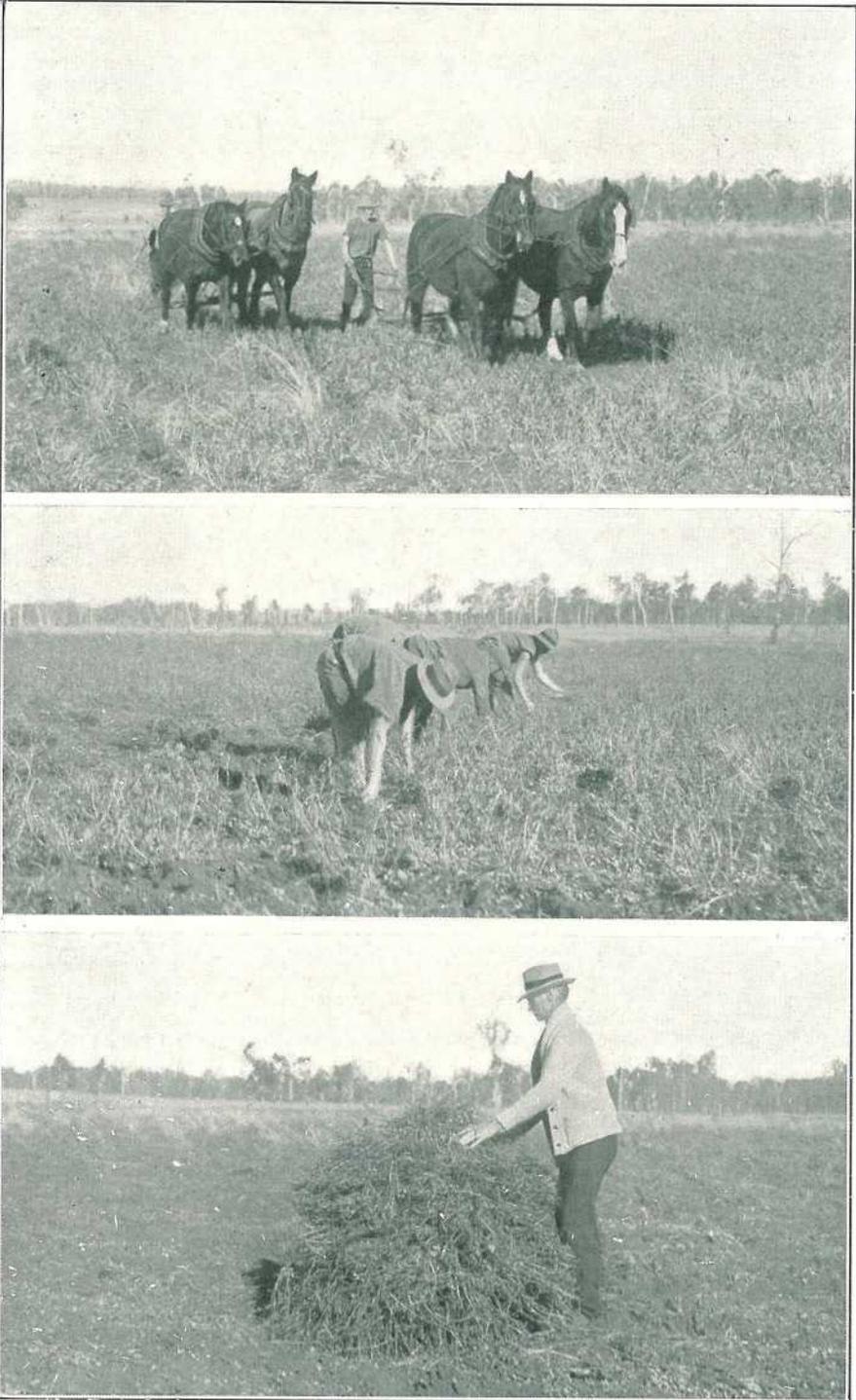


PLATE 63.—PEANUT GROWING IN THE SOUTH BURNETT.

Top—Ploughing out prior to stacking. Centre—Lifting peanut roots for stacking. Bottom—Stacked.

Amount of Seed.

The amount of seed required to plant an acre is about 40 lb. of the whole nuts and from 25 to 30 lb. of whole nuts shelled, varying slightly according to the weight of the nut and the distance apart they are planted. Some growers use as much as 60 lb. per acre of the large podded varieties. It is interesting to note that the whole nut, when planted, provides but one plant, but if shelled and the kernels planted apart, two plants will result.

Time of Sowing.

According to the climates of the various districts, so will the time for planting vary.

In the cooler districts, sowings may be made when all danger of frosts is over and the soil can be expected to be reasonably warm, September, October, November, and December being suitable months. In the tropics the crop can be grown practically throughout the year, but consideration must be given to climate and rainfall—i.e., sufficient rainfall should be obtained to grow the crop and fine weather be expected at harvest time.

In the tropical portions of the State, where the monsoonal rain or wet season commences in December, the main crop is sown in January, February, and March, according to the likelihood of reasonably fine weather in the months of April, May, and June or July, when harvesting should occur.

In planting large areas it is recommended to spread the sowings over such a time as will allow of harvesting one lot before the next is over-ripe. Peanuts left too long in the ground are easily detached from the plant and consequently more difficult to harvest, while some varieties are liable to sprout.

Length of Crop.

The large nuts or creeper varieties require a longer time for growth to maturity than do the bunch or upright varieties, the time varying from fifteen to seventeen weeks for the bunch varieties and from seventeen to twenty weeks frequently for the creeper variety.

Preparation of Land.

In preparing the land for peanuts the first ploughing may be deep, but the second should not be deeper than 6 in., preferably 5 in. This top 5 in. should be brought to a fine tilth and be free from weeds and trash.

Where lime or ashes have been applied the land is harrowed and drills drawn out, in which the fertiliser, if any, is mixed and the peanuts sown either by hand or with the planter. The drawing of drills may be done with the fertiliser distributor, or the whole operation can be done with a seed drill and fertiliser distributor combined.

Where no seed drill or fertiliser distributor is obtainable, the drills could be drawn out with a cultivator having a wide shovel attachment in the rear, the fertiliser dusted along this by hand, the cultivator then run along the drill with tines set close in front to mix the fertiliser with the soil, and the shovel attachment set at the back to reopen the drill for the reception of the seed to be dropped by hand; this drill should not be deeper than 4 in. from the levelled surface of the soil, and the seed should be covered to a depth of 2 to 3 in., according to the texture of the soil and its moisture content. In light soils where evaporation is great the deeper planting is preferable, but in stiffer soils the shallower covering should be adopted.

A light firming of the soil over the seed is desirable, and this is obtained in the seed drill by a wheel at the rear. When planted by hand the area may be covered with the harrow, or preferably by the cultivator, with tines straddling the drill and set so as to throw the soil inwards.

Time of Germination.

Germination usually occurs with shelled nuts in five days, but is subject to the amount of moisture and heat in the soil. The whole nuts take longer unless first soaked in water, as the moisture has to penetrate the shell to affect the berry or pea which contains the germ.

Spacing.

The intervals between drills and the spacings between seeds in the drills vary somewhat, according to the richness of the soil and the variety planted.

The bunch or upright varieties take up much less room than the creeper or procumbent kinds, and the growth of both is correspondingly greater on the richer soil.

In general, the drills are drawn out from 30 in. to 42 in. apart, the distance being influenced by the space required by the cultivating implement.

The spacing of the seed in the bunch varieties may be from 6 to 12 in. apart, and of the creeper varieties from 12 to 24 in. apart in the drill. An instance of success with close planting is noted from an experiment in width, in a light sandy loam, the bunch varieties were planted 3 in. apart in drills 30 in. wide. It is thought, however, in richer soils this crowding of the plants would be detrimental.

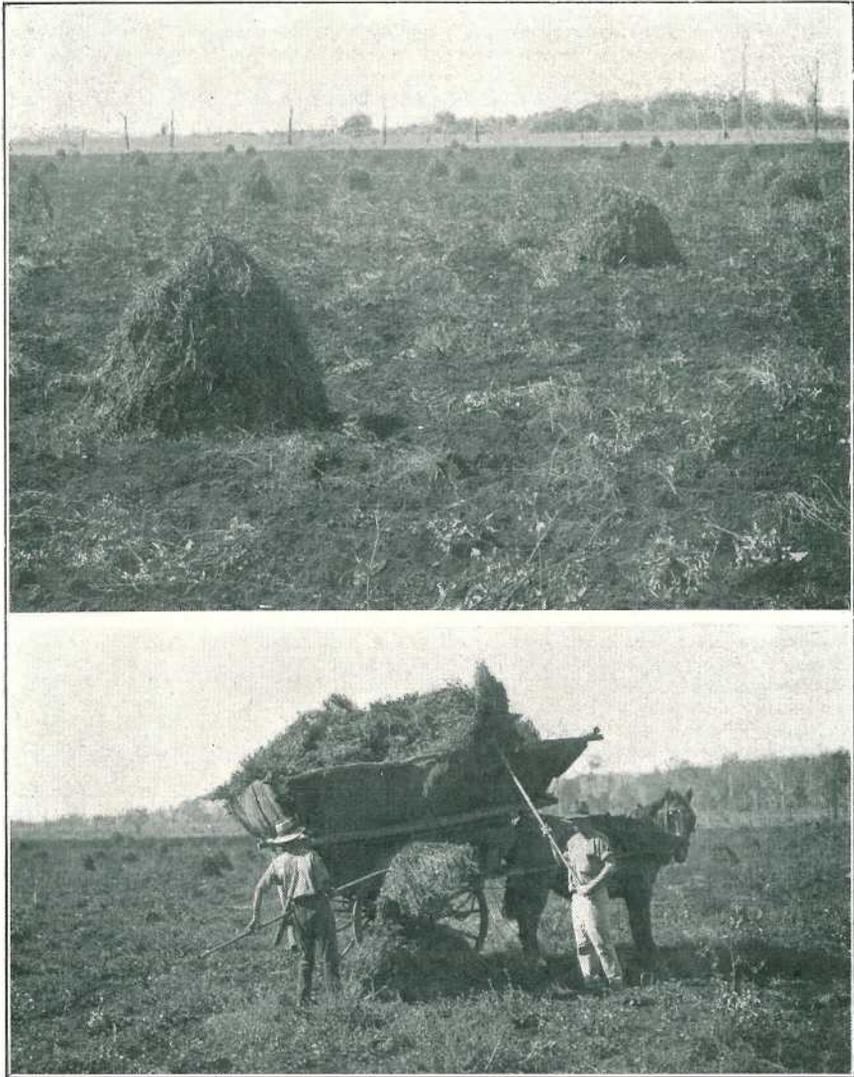


PLATE 64.

Top—On a Memerambi Farm—Stacks of “nuts” awaiting transport to the thresher.

Bottom—Topping up the Load—A peanut harvest scene on a Wooroolin farm,

Cultivation.

Where close planting has been adopted the land may be harrowed with a light harrow shortly after the plants appear through the surface. Otherwise it will be better to use the cultivator between the rows and the hand hoe, where necessary, between the plants. The first one or two cultivations should be done with fine points, as in the strawberry cultivator or the 1½-in. or narrowest shovel points supplied with the usual 5-tooth cultivator; after this the broader points can be used and later the hilling attachments. In early cultivations the cultivator can work close to the roots, but not deeper than 2 in.; but later, after flowering, when the pegs enter the soil care should be taken that the plant is not disturbed.

In most soils it is desirable to draw a little of the soil in towards the plant to provide a bed of fine earth in which later the pods may form, and this can be done at each cultivation, finally leaving a flat bed in which the plants are growing with a water furrow between each drill. The height to which hilling may be practised depends largely on the soil. Usually, the heavier the soil the more necessity for hilling.

Soil should not be thrown on the centre of the plant, the object of hilling being to provide fine soil for the pegs to enter and mature evenly and for ease in harvesting. As a rule, in the creeping varieties the pegs easily reach the soil, but in certain cases a light roller run over the crop will facilitate this operation. In the bunch or erect growing varieties no rolling should be attempted, but a final higher hilling made if it is noticed the points have some distance to go to reach the soil.

Harvesting.

The time for harvesting is noted in the appearance of the foliage, which starts to yellow or lose colour, and by examination of the nuts. If the majority of the berries or peas are full grown and the inside of the shell has begun to colour and show darkened veins, the crop is mature and harvesting should not be delayed.

If the crop is harvested too early the proportion of "duds" is very great, while if deferred too long some of the nuts may germinate and others become detached from the plant when lifting, while the tops, having lost most of the leaves, will be of much less value for fodder. In some soils, notably the friable chocolate volcanic loams, the plants may be lifted by hand, when most of the nodule-bearing rootlets are left behind and only the root stock with the nuts are lifted. In other cases it is necessary to loosen the soil before lifting out. In small areas this is sometimes done with the digging fork inserted under the plant, which is lifted while the fork is worked underneath. In large areas a potato digger with an endless belt elevator from the shovel point is found very effective where the soil is dry enough to fall through the slats of the elevator and the crop is free from weeds.

A very satisfactory digger could, however, be made on the farm or by a local blacksmith by attaching to an ordinary wooden plough beam a knife edge to go under the plant and cut the roots just below the nuts; finger bars at the rear of this knife edge would lift the plants and loosen the earth, thus facilitating the lifting by hand. The width of the knife edge should be sufficient between the attaching portions to the beam to allow of the whole plant passing through, and the depth should be regulated by the wheel or wheels in front. Perhaps a better idea might be given by taking the back off an ordinary earth scoop, together with all the bottom excepting 6 in. in front, and substituting finger bars slightly elevated to carry the plants and attaching the whole to a plough beam with handles. In a digger of this description, where one horse is used, the digging attachment would be to one side of the beam, while with two horses it would be in the centre, the operator straddling the row and the depth regulating wheels being preferably two, one on each side of the line of plants.

Where an ordinary plough is used the share should cut 10 or 12 in. wide, and the mould board removed and some rods substituted to prevent the tops being mixed with the soil.

It should always be remembered that the cutting of the roots as close to the pods as possible results in the greater quantity of nitrogen being returned to the soil.

Harvesting should not begin until the dew is off and the tops are dry, and the operation should be regarded as a hay-making of the tops, and not more than can be handled should be lifted in any one day.

Curing.

After the plants are lifted and the soil shaken from the nuts they are allowed to lie either spread on the ground or in small bunches until the leaves are wilted, but not curled or brittle. They are then bound in small sheaves or taken separately and

stacked until cured. The time in which the plants are allowed to wilt varies according to the weather, and in some cases stacking may be necessary within an hour of lifting.

The usual method of curing peanuts where the quantity is large is to place them in small stacks around a pole. From twenty to thirty poles will be required for an acre.

These poles should be reasonably stout, from 2 to 3 in. of hardwood in diameter at the bottom end, which should be sharpened. When erecting, holes are made in the

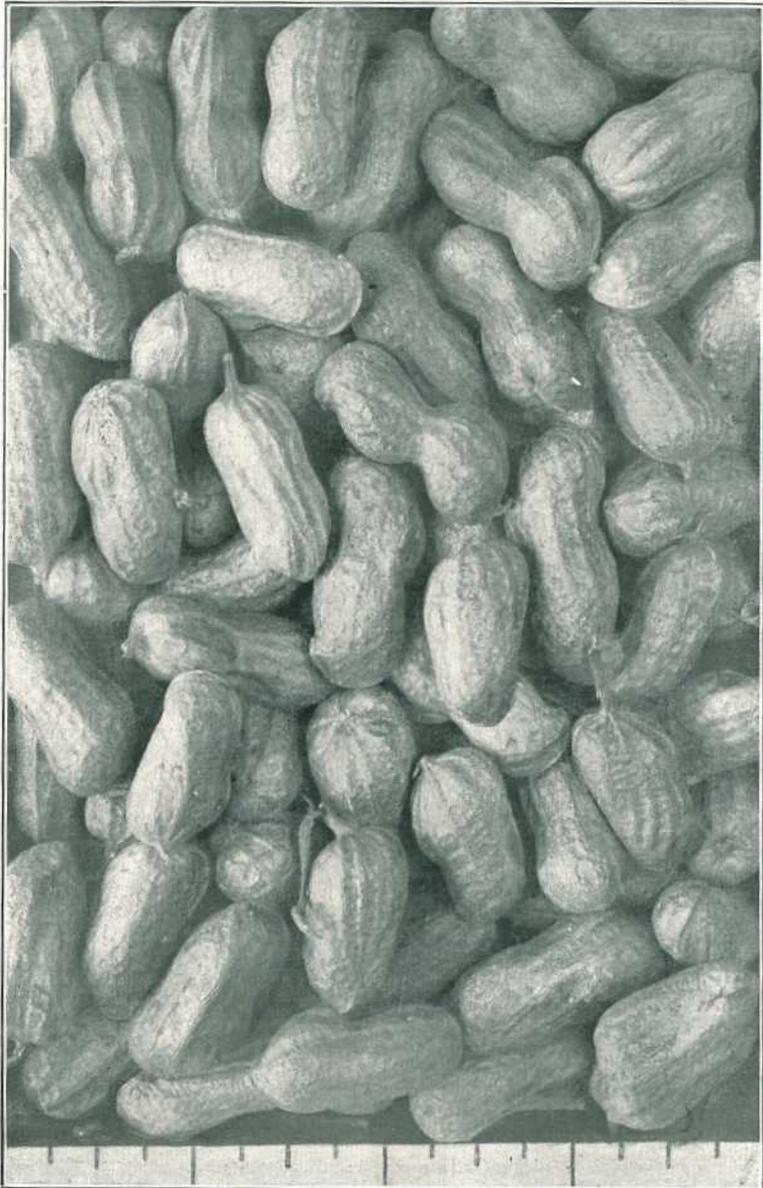


PLATE 65.

Peanuts in the shell, Graded for sale.

soil with a crowbar, post-hole digger, or earth auger, and the pole inserted or driven down with a mall to a depth that will ensure their not being blown over with the weight of the stack upon them. Crosspieces about 3 ft. in length are now nailed across the post at right angles, one immediately above the other, 9 to 10 in. above the level of the ground; 3 by 1-in. hardwood battens answer the purpose admirably. According to the crop, six or seven rows are taken on each side of the poles, and the plants, when wilted, forked into one row on either side of the pole. When stacking, a few vines are placed across the crosspieces, which keep them off the ground, to form the foundation. The vines are then stacked by hand with the nuts next to the pole and tops outward, pressing down each layer and building evenly around the pole. From time to time a bunch should be divided and hung around the pole to bind the mass and to assist in keeping the centre high.

This latter is important, in that it allows any rain falling to run off. When the stack is approaching 3 ft. high the vines should be drawn closer round the top and finished off with a cap of grass as a thatch to run rain off. It is important that free circulation of air should obtain through the stack in order to facilitate curing. The building of thick or high stacks or pressing them too tight will tend to cause heating, with consequent damage to both fodder and nuts.

After about two weeks in the stack the peanuts may be stored in the barn, but the nuts should not be picked from the vines until preferably six weeks from the date of harvesting, as if picked too soon they are liable to shrivel, and there is danger of fermenting or moulding after picking.

Picking.

The usual practice in this State has been to pick the nuts from the cured plants by hand—a tedious process, the cost of which, if the ruling rate of wages were paid, would be prohibitive, since 60 lb. is considered a fair day's work. This practice of hand picking has been followed for ages, and is still the usual method adopted in countries such as India, China, Japan, &c., where labour is plentiful and cheap. In certain cases, too, the nuts are washed by agitation in frequently changed water and dried in the sun to obtain a clean inviting article for edible purposes. This is necessarily a costly undertaking, and would need a much higher price for washed nuts to compensate.

Other methods adopted in North Queensland with a lessening of expense have been, in the case of the bunch nuts, to hold the stems in the hand and thresh the nuts off by beating across tightly-drawn wires or the edge of a board placed midway across a box or other receptacle to hold the nuts, and with both bunch and creeper to rub the whole plant over a wire netting drawn tight until the nuts fall through. Subsequent winnowings remove trash and light pods, and it is stated thoroughly drying the resultant nuts in the sun will cause the stems or tails to break off in the bags, resulting in a clean sample when it reaches the market.

In other lands, however, labour and time saving machinery has been evolved which does very satisfactory work in picking, stemming, cleaning, grading, and bagging for market, without breaking or damaging any appreciable quantity of the pods.

Two types of pickers are on the market in the United States of America—one working on the principle of a cylinder grain-thresher and the other one in which the plants are drawn between spring points over a wire mesh in such a manner that the nuts are pulled off and fall through on to a conveyor, which carries them through a winnowing process to a stemming apparatus, after which they go through a further winnowing and a cleaning and grading process. Two machines of the latter type are in use in the Cooktown and Tableland districts respectively.

The cost of machines of this description is too great for the individual in most cases, and it would be advantageous, where any considerable area was under crop, for farmers to co-operate in the purchase, when the machine, which is on wheels, could be transported from farm to farm.

Contract picking is a feature in the United States just as contract chaffcutting is in Australia. The picking crew, working day after day, naturally become expert; so that a greater average quantity is handled daily with less damage than when novices or hands out of practice are engaged.

When a power-driven picker is in use it is advantageous to place it in a central position in the field where the poles with the stacked peanuts can be transported bodily to the machine, resulting in less handling. With suitable uprights with a cross bar attached to the dray a lever with a grip attached to the top of the pole and passed over the cross bar would use it as a fulcrum, when the long end of the lever

being lowered to the shaft would lift the pole entirely clear of the ground, allowing of its quick and easy transport to the picker.

The stems or vines of the plant, after the nuts are detached by the picker, can be stacked, baled, or chaffed and used for forage purposes, while the "dud" nuts (small or immature) can be fed to stock.

Marketing.

The nuts are usually bagged whole and shipped to the buyer, but where freights are high it is sometimes more remunerative to market the kernels only.

Special machinery is available to shell peanuts with a minimum of damage to the kernels. Bruising of the kernel at shelling or during transport is injurious, as decomposition is liable to set in and rancidity occur.

Shelled kernels should also be absolutely dry before packing for the same reason. Each variety should be kept distinct, whether shelled or unshelled, as oil millers are understood to give lower prices when the kernels are of different colours.

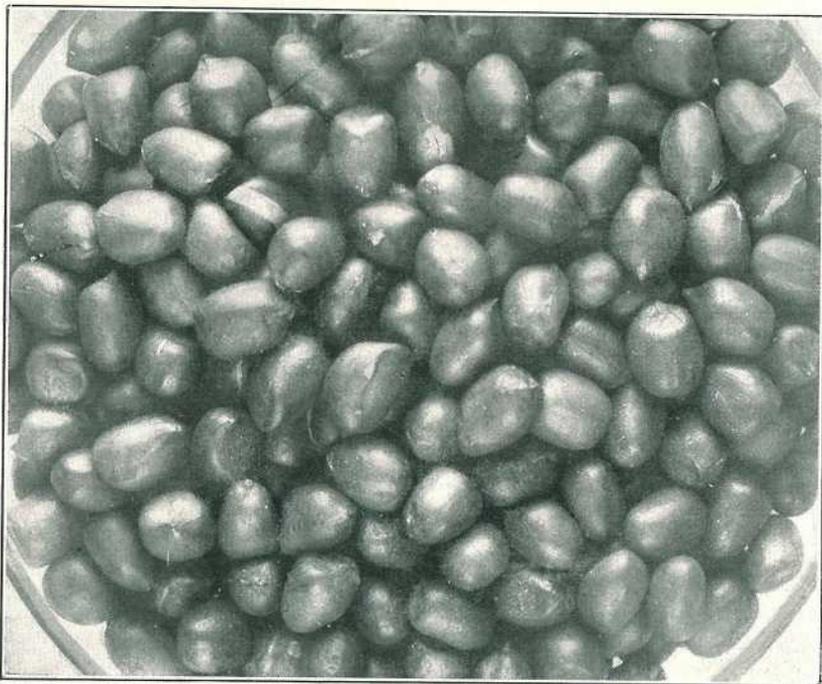


PLATE 66.

Peanuts—Graded kernels ready for market.

Diseases.

The peanut is seldom subject to disease when grown under proper conditions of soil and drainage. The most common disease noticed in Queensland is a form of leaf spot (*Cercospora* sp.) which appears as brownish spots on the leaves and is most frequent on sour or poorly drained land. When this appears late it will be possible with the upright growers to mow the tops and make hay before they are too far gone. Another disease that has been noticed on occasion is a kind of fungus attacking the stem where it enters the ground and is characterised by a cobwebby appearance, due to the mycelial threads of the fungus on the stem just below the surface, together with the appearance of minute round white or brown bodies the size of mustard seeds, which are the spore cases of the fungus. A proper system of drainage, together with liming and a rotation of crops, will minimise disease in the peanut as with other crops.

Pests.

Insect pests are of infrequent occurrence, so far the only attack noticed in the State being odd instances of mealy bugs on occasional roots.

Vermin are very partial to the nuts, as are many birds outside those domesticated.

The duty recently imposed by the Commonwealth on peanuts and peanut oil is as follows:—On peanuts from the United Kingdom, 2d. per lb.; other British countries, 3d.; foreign countries, 4d. On edible oils, which include peanut oil:—From United Kingdom, 2s. per gallon; other British countries, 2s. 6d.; foreign countries, 3s.

The protection afforded by this tariff should compensate for the additional costs in growing under white labour conditions in Australia, and peanuts should become a staple crop in North Queensland.

Yield.

The yield of the peanut crop will, of course, depend on the fertility of the soil, amount of rainfall, and attention bestowed.

While it will bear a satisfactory crop under a small rainfall, showing to an extent that it is drought-resisting, it is not injured by excessive rains provided the soil is well drained. An instance of this was observed at Banyan in 1921, where a perfect sample of the Red Cross variety was seen which had experienced a fall of 120 in. of rain in the growing period.

Crops on a small scale have been estimated to produce 3 tons to the acre, and in the North field crops averaging 1 ton and over are not uncommon; but as a general rule, in satisfactory soils and under ordinary conditions with proper cultivation, 15 cwt. per acre might be expected as a fair average yield.

Where the crop grows to perfection, as at Cooktown and the Tableland, there is a fine opportunity for the institution of a co-operative oil mill and the purchase co-operatively of labour-saving machinery in picking, &c. In the growing of peanuts for marketing as whole nuts, it frequently happens that the product is not readily saleable owing to stained shells, glutted market, or other causes, when the presence of an oil mill will be advantageous.

The districts mentioned are in a particularly good position for the establishment of an oil mill, since freight on the whole nuts to the Southern parts is high and a ready market for the cake is to be obtained from the dairymen and pig raisers near at hand.

QUEENSLAND WEEDS.

By C. T. WHITE, Government Botanist.

TWIN LEAF (*Zygophyllum apiculatum*).

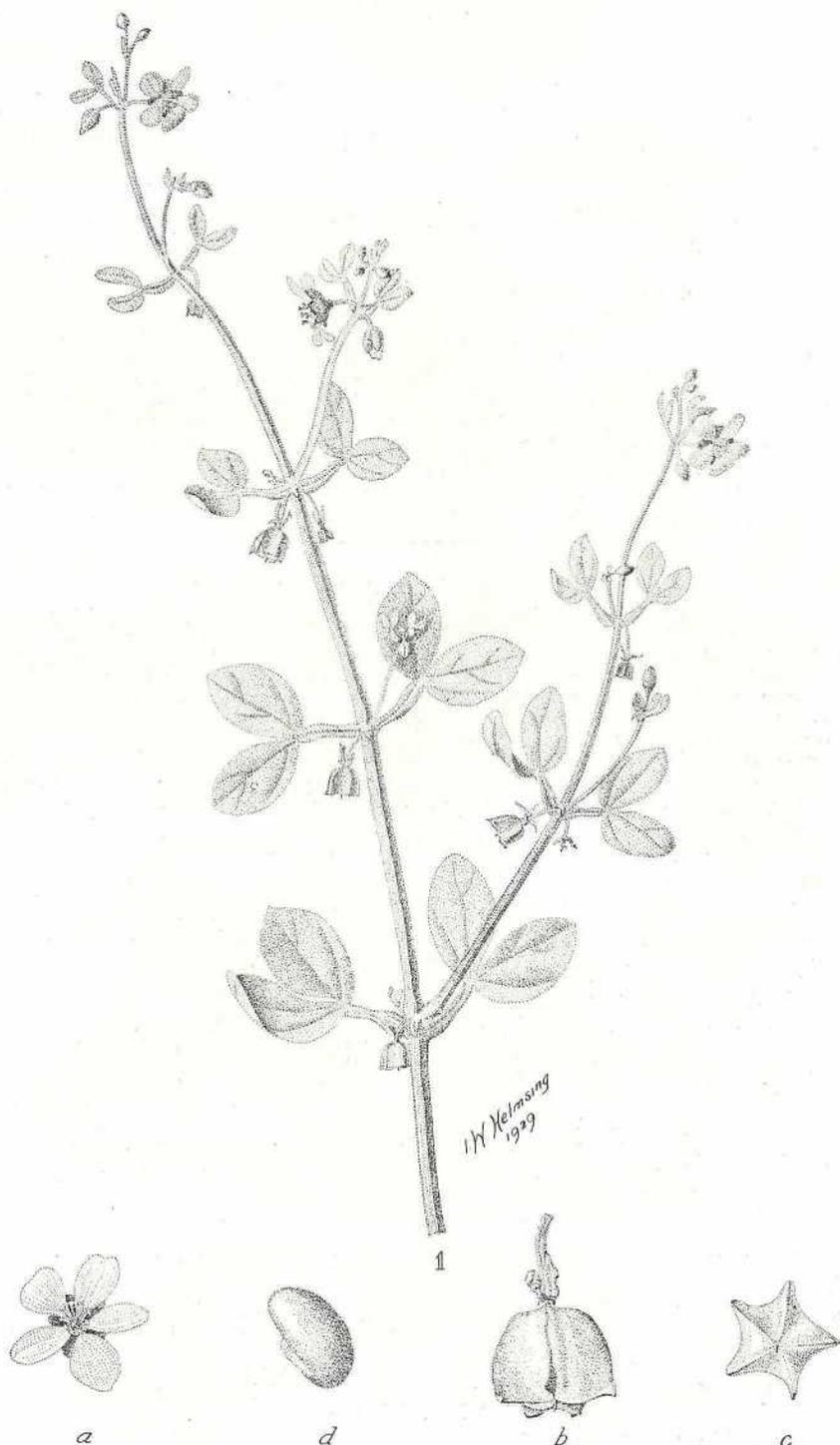
Description.—A bright green, succulent herb (dying a yellowish green), growing in large clumps about 2 ft. high; stems angular, flat on one side and convex or rounded on the other. Leaves composed of a single pair of leaflets; common petiole or leaf stalk, winged, about $\frac{1}{2}$ in. long; leaflets mostly about 1 in. long and $\frac{1}{2}$ in. broad, elliptic in outline, very oblique (i.e., unequal sided, the midrib not dividing the leaf into two equal parts). Flowers, yellow, about $\frac{1}{2}$ in. across on slender pedicels in the upper leaf axils. Fruit (seed-vessel) about $\frac{1}{3}$ in. in diameter, five-celled and prominently five-angled; each cell containing a single dark brown, flat seed, 2 to 3 lines long and 1 line broad.

Distribution.—A native (but not found outside Australia). It is found in all the States.

Common Name.—Though very abundant, I have not heard a local name given to it. The Plant Names Committee, the Field Naturalists' Club of Victoria, have suggested the name Twin-leaf for members of the genus, distinguishing the present species as "Pointed Twin-leaf," which is really a translation of the botanical name.

Botanical Name.—*Zygophyllum*, from the Greek *zygos*, a yoke, and *phylon*, a leaf, in reference to the paired leaflets; *apiculatum* from the Latin *apiculum*, a little point; probably referring to a little point or appendage at the top of the leaf-stalk between the leaflets.

Properties.—About half a dozen species of the genus *Zygophyllum* occur in Australia and all probably possess similar properties. They have been accused, both here and in the other States, of being poisonous to stock, but not on very



W. Helmsing
1929

PLATE 67.—TWIN LEAF *Zygophyllum apiculatum*.

Fig. 1.—Portion of Plant (half natural size).
 Fig. 1a.—Flower (natural size).
 Fig. 1b.—Seed Capsule $\times 1\frac{1}{2}$.

Fig. 1c.—Seed Capsule seen from top,
 $\times 1\frac{1}{2}$.
 Fig. 1d.—Seed $\times 4$.

definite grounds. Though the present species is extraordinarily abundant in parts of Queensland, and during times of drought may be the only green feed seen, I do not remember having seen stock eat it to any extent. The late Mr. J. H. Maiden, however, writing in the "Agricultural Gazette" of New South Wales (Vol. XI., p. 24) quoted Mr. Max Koch, a well-known botanical collector, as stating about *Zygophyllum* that—"They form, in a good season like the present one, a most valuable adjunct to the winter pasture, providing succulent, if not very nutritious, fodder for both cattle and sheep. My horse is always ready to make the best use of a short halt by feeding on the plants indiscriminately and with a relish, and the cropped appearance of a neighbouring paddock which is stocked with sheep is ample proof of the usefulness of these plants. The foliage being of a watery nature, enables the sheep to do without a drink during the winter months as long as the herbs last, and to feed in the more remote portions of the paddocks. This is a matter of great advantage to the sheep-farmer, for the pasture near the wells (Mr. Koch is speaking of the dry country of the interior.—J. H. M.), which is more or less heavily punished during the ever-recurring spells of dry weather, has an opportunity to recover. They mature seed in abundance, and perpetuate their kind regularly, provided seasonable rains fall at the end of February or the beginning of March." This would seem to indicate that the plants are not poisonous, but have a definite fodder value.

Botanical Reference.—*Zygophyllum apiculatum* F. von Mueller, in *Linnea* XXV., 373, and *Pl. Viet.* I., 101.

SOLANUM AURICULATUM—A "WILD TOBACCO."

Description.—Large spreading shrub, leaves and branchlets covered with a soft velvety pubescence composed of stellate hairs. Leaves green above, paler (almost white) beneath, due to the dense velvety covering of hairs, petiolate or stalked, with a couple of prominent auriculate (somewhat ear-shaped) stipules at the base of the leaf-stalk, broadly lanceolate or elliptic-lanceolate in outline, large but very variable as to size according to age and growth of the plant. Flowers bluish-purple, on dense heads (cymes) 2-3 inches across at the ends of the branchlets, the heads (cymes) stalked, the peduncle (common stalk), branches, and calyx lobes densely stellate-pubescent. Individual flowers nearly $\frac{1}{2}$ inch across. Berries borne in dense clusters 4-5 inches across; the individual berries yellow when ripe and about $\frac{1}{2}$ inch in diameter, full of a watery pulp and very small straw-coloured seeds.

Distribution.—A native of Brazil, no doubt originally introduced as an ornamental shrub, now one of the most persistent and troublesome weeds on farms in the "scrub" (rain-forest) belts in coastal Queensland. The seeds are carried by birds, and the plants come up in great abundance after a burn. A similar species that smothers farms in the same way is the native *Solanum verbascifolium*. This is easily told by having white, not purple, flowers and no auriculate stipules at the base of the leaf-stalk. Both go by the name of "Wild Tobacco," a name also applied to other Solanaceous plants in Queensland.

Botanical Name.—*Solanum*; origin doubtful. J. C. London, in his "Encyclopædia of Plants," says, "By some ingenious commentators this word has been derived from *solari* to comfort; the derivation may be possible but the application is not evident"; auriculatum from the Latin *auricula*, the ear-lap, referring to the small ear-like stipules at the base of the leaf-stalks.

Properties.—The berries are eaten by birds (including domestic fowls) freely without ill-effects following. No cases of poisoning by children eating the berries has come under my notice, but, as a general rule, I think they are avoided by them; no doubt in their green state, like most species of *Solanum*, the berries would be dangerous.

Eradication.—One of the most difficult plants to eradicate; hoe chipping in the young state is probably the most satisfactory; brushing the adult plants and burning off generally results in a fresh crop of seedlings. For satisfactory results the plants must be attacked before reaching the seeding stage, as the amount of seed produced on a single plant is enormous. Arsenical sprays might be tried on the young plants, but we have no definite knowledge of the effect of these on this weed. The following general spray for weed eradication has been recommended by the Agricultural Chemist (Mr. J. C. Brünlich):—

"Half a pound of arsenic dissolved by means of one quarter of a pound of caustic soda in three gallons of water, and the solution then diluted to ten gallons with water."

Botanical Reference.—*Solanum auriculatum*, Aiton Hort. Kew. I., p. 246.



PLATE 68.—*SOLANUM AURICULATUM*.



PLATE 69.—QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE—TEAMS MUSTERING AT STABLES.

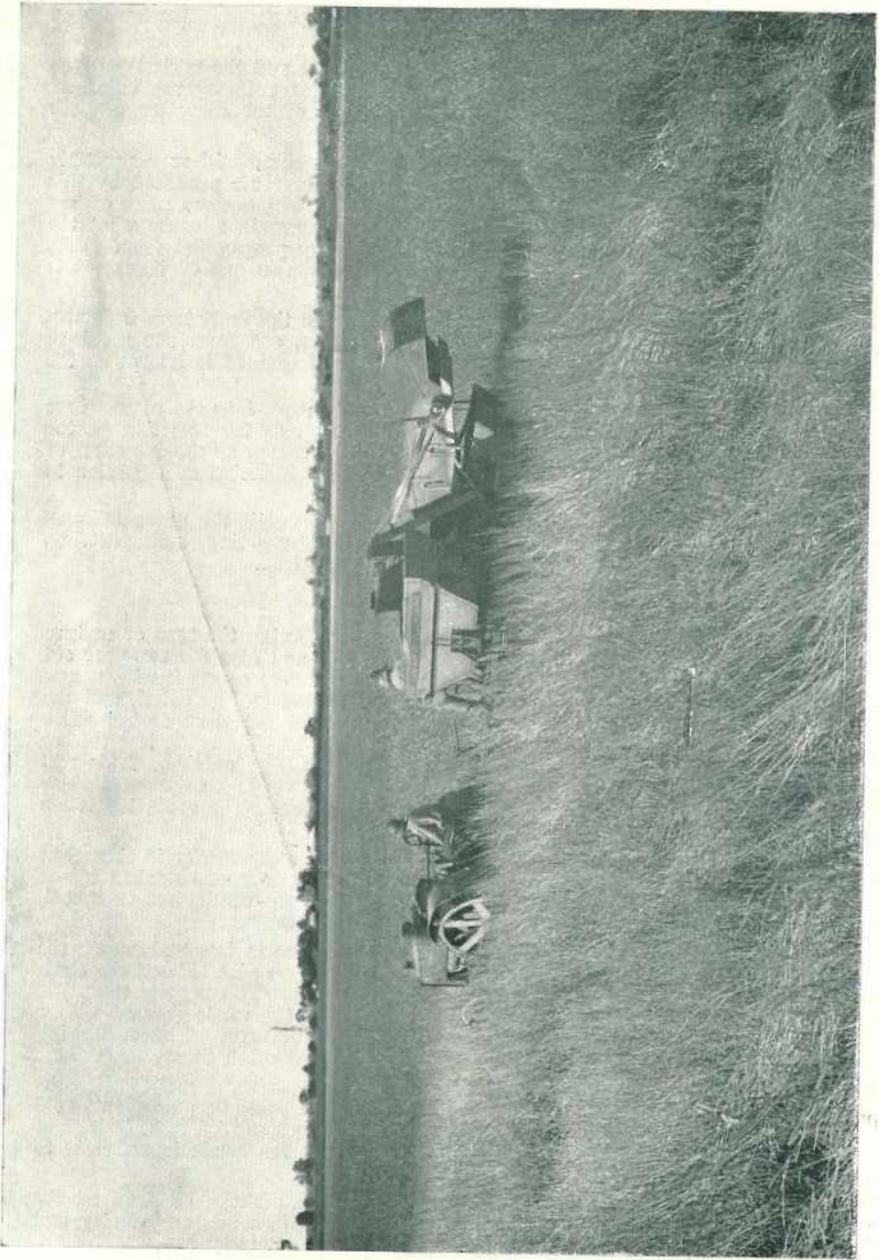


PLATE 70.—QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE—TRACTOR AND REAPER THRESHER AT WORK.

BUDDING AND GRAFTING.

By JAMES H. MITCHELL, Fruit Inspector.

INCREASING the number of plants of any species is known as propagation. Plants propagate naturally in two distinct ways—namely, by seeds and by plant division, and from these natural methods certain artificial methods of propagation have been developed, and are now practised in fruit culture.

All varieties of fruit plants originally produced seeds, and the majority do so at the present time, but as the seed in most cases is produced by the union of elements from two plants, the new plant will have some of the character of both parents, and may resemble neither of them very closely.

For example, a Rome Beauty apple growing in an orchard will very probably receive pollen from some other tree; if the seeds from the fruit produced by this flower are planted they will in turn produce trees that will possess some of the characters of both parents, and it will be impossible to know in advance what the fruit will be like. For this reason plants are not usually propagated from seeds, except for raising seedling stocks. Propagation by division in one of its forms is generally employed for propagating fruit trees.

A method of propagation commonly used for many of the fruit trees is known as grafting. It is the causing of a twig, called a scion, cut from one plant to become part of another. The plant to which the scion is joined is known as the stock.

The different kinds of grafting may be classified in respect to the place where the scion is attached to the stock—namely, root grafting, or the insertion of the scion in the stock at the surface of the ground; stem grafting, or the insertion of the scion on the stem or trunk; and top grafting, or the insertion of the scion in the top or branches.

Grafting is also classified, in respect to the way in which the union between the scion and stock is made—namely, cleft grafting, kerf grafting, bark grafting, whip grafting, splice grafting, veneer and herbaceous grafting.

Cleft Grafting.

Cleft grafting was the method commonly used for renewing the tops of mature deciduous trees (but now superseded by strap grafting), and also for two-year old stocks of vigorous habits. The method is to sever the branch or stock with a saw or secateurs; the exposed part is then split with a grafting tool or chisel, and the cleft is spread with a wedge or similar tool ready for the reception of the scion. The scion is cut to a wedge shape at the butt, one edge of wedge being left thicker than the other, and is set into the stock with the thick edge outside. This will hold the scion firmly in position, and the greatest pressure will be on the outer edges where growth takes place. In order to ensure growth there must be contact between the growing tissues of the stock and scion.

The grafting is done in the spring when the sap in the stocks is then just starting to rise. The scions require to be dormant, and care must be taken to see that they are removed from the parent before the rise in sap, and stored in a cool, moist place. It is usual to leave three or four buds on each scion.

The growing part of a stock is the outer part of the wood just underneath the bark. In making a cleft graft it is usual to insert a scion on each side of the cleft, and if both scions grow the least desirable one is cut away. To complete the graft the union is tied, tightly round with string or raffia, and the whole covered with a grafting wax to exclude the air. A grafting wax may be made of the following ingredients:—Resin, 4 lb.; beeswax, 2 lb.; tallow or linseed oil, 1 lb.

The resin and beeswax should be broken into small pieces and melted with the tallow or linseed oil—when thoroughly melted the mixture should be poured into cold water, and when cool enough to handle should be pulled and worked until it is light coloured and grained. In applying the wax the heat of the hands is sufficient to soften it.

Another method for making grafting material, and perhaps as good as the above, especially for grafts at the surface of the ground, is a mixture of clay and horse or cow manure, and covering up with the soil in the nursery row.

Kerf Grafting.

In connection with the grafting of large stocks, a method of setting the scion is sometimes followed differing slightly to cleft grafting. By this method the stock is not split, but a kerf or notch, as long as the scion, is made each side of the stock,

trimmed with a knife, and the scion cut wedge-like to fit. It is claimed as an advantage over the cleft grafting that the wound heals more quickly, and the probability of growth is just as sure. A disadvantage of this method is that the scion is not held in position so firmly.

Bark Grafting.

This is a method of grafting that does not injure the stock so much as cleft grafting. The lower end of the scion is cut clean across with a sloping cut 1 inch to 2 inches long and inserted under the bark of the stock after the top has been cut off. It is then bound and treated in the same way as recommended for the other methods.

Whip Grafting.

This method is used almost universally for root grafting, and for small limbs and stocks. In making a whip graft, the stock is cut off and a slanting cut is made at the top of the stock with a sharp knife. The knife is then placed on the cut surface near the top, and the stock is split in the direction of its longest axis thus forming a tongue. The scion is treated in a similar manner, and the two are forced together—the tongues helping to lock the scion and stock together.

Some difference in the size of the stock and scion may be disregarded, provided one side of each makes a good union. When roots are whip grafted it is not necessary to use grafting wax because the soil will keep out the air sufficiently. In making root grafts the scion is made with three or four buds, and the piece of root of corresponding length.

Splice Grafting.

This method is similar to whip grafting with the exception of the tongue. The scion and stock are both made with a sloping cut, brought together and tied in the usual way.

Veneer Grafting.

In this method the stock is cut off and half cut through a few inches lower down, and the piece removed; in other words, the stock for a length of 1 to 3 inches from the top is halved, the scion being treated in the same way and the two brought together and tied and treated as for the other form of grafts.

Herbaceous Grafting.

By this method the stock is not beheaded. A tongue is made on the side of the stock and the scion is cut to a thin wedge shape and inserted between the tongue and the stock. The head of the stock is removed when the scion has made satisfactory growth. By the other methods of grafting the stock has to be severed, and in the event of the scion failing the stock becomes useless, whereas in herbaceous grafting the propagation can rework the misses. This method is satisfactory when applied to custard apple and various other fruits.

Stocks.

The first aim of the propagator is to produce strong, vigorous stocks, best suited for the particular class of fruit tree he wishes to work. As the life and health of a worked fruit plant is largely influenced by the stock on which it was worked, too much care cannot be exercised in selecting the seedlings.

To raise seedling plants, seeds should be selected from well developed fruit, taken from a vigorous tree. On being taken from the fruit, the seed of evergreen trees should be washed, then dried in the shade and immediately planted. With deciduous fruits it is stratified in damp sand until the following spring.

Seed-bed.

A fine, well-worked soil is an incentive to good germination, and the seed should be planted with a covering of up to half an inch of soil, well pressed down, and the bed should be kept moist and well shaded until the seedlings have hardened their first two leaves. The seedlings will require constant attention as regards watering to ensure an even vigorous growth, until within a week or so of transplanting, when they can be hardened off by the cessation of watering. It is not wise to transplant when the seedlings are making young soft growth.

Selection of Seedlings.

When planting out in the nursery rows all plants with curly or malformed roots must be discarded.

Site for Seedlings.

The ground intended for the reception of the seedling in the nursery must be thoroughly worked and brought to a fine tilth. The surest way to do this is by honest hand digging, thus ensuring a greater capacity for holding water, and the admittance of air—both vitally important to the growth of the young seedling.

By making the nursery rows 2 ft. 6 in. apart the use of horse-drawn implements will save time and labour.

In transferring the seedlings from the seed-bed to the nursery care must be taken that they are not allowed to become dry. A proportion of the tops must be cut away to balance the loss of some roots and to allow the plants to adjust themselves to the shift. In most varieties of stocks they are ready the same season for the insertion of the bud, but in the case of stocks for grafting it sometimes takes two seasons.

Budding.

This is a method of propagation more practised in plants than in any other. It consists of inserting a single detached bud from the parent plant under the bark of a seedling or young limb known as the stock. The operation of budding can be performed when the sap in the stock is rising and showing, when the bark is raised, a light green colour, and when mature buds can be obtained. These conditions may be obtained in the early spring and again in the late summer.

Selection of Bud Wood.

The buds used for budding must be selected from a proved productive tree of vigorous habits and growth; clean healthy shoots with well developed buds are essential. In all these operations it is hardly necessary to state that the tools should be first class and keen-edged.

When Buds Fail to Grow.

There are times in the budding season when the buds fail to grow although the bark of the stocks is lifted. This is explained by a study of the growth of a plant. When the sap is moving upwards a jelly-like mass is deposited on the outer surface of the wood under the bark and there is a thickening of the girth of the plant. In its descent the sap follows a different course—merely hardening the jelly deposit with no increase in girth. One of the surest signs to follow for successful budding is to note the colour when the bark is lifted. If it is a light green colour the time is favourable; if, on the other hand, it has assumed a yellow appearance, it is better to wait for the next upward flow of sap. The operation of budding in itself is quite simple and a good result is easy of attainment, provided the necessary conditions before mentioned are observed.

The stocks are allowed to grow until they are the girth of a pencil or somewhat larger, and the bud is usually inserted at or near the surface of the ground.

For the reception of the bud a T-cut is made—the cross cut is usually made first and after making the last cut the knife is twisted to right and left before taking it out, in order to loosen the bark. The bud is cut off the bud stick as close as possible to the bud and with about half an inch of bark on each side of the bud.

Some propagators advocate taking the small portion of wood behind the bud out before insertion, but it is not absolutely necessary. The bud should be tied in its place fairly tightly, beginning the tie at the bottom end.

Tying Material.

Raffia makes a satisfactory tying material, provided it has been moistened with water before it is used. At the expiration of ten to fourteen days the tie must be cut, otherwise girdling of the stock will result. When the bud is set late in the autumn it does not start into growth immediately, but remains green and dormant until the following spring when it starts into growth.

Stimulating Growth of Buds.

When buds are slow in starting into growth the stock cut partly through causes more sap to be directed to the bud; on no account at this stage should the stock be completely severed.

In several varieties of fruit trees the young growing tree is trained to a stake to keep the stem perfectly straight.

The young trees at a certain stage are headed to form the permanent head. This operation is not performed until the tree has attained at least a foot of growth above the desired height, thus ensuring a good firm stem and fuller buds.

Budding old Trees.

This method of budding can be carried out on old trees, but as it is a difficult matter to insert the buds under the old hard bark of the stems and branches, it is usual to head the trees back to the desired height and allow them to make young shoots. These can be selected and budded on the following season. Trees headed back during winter may generally be budded the following autumn.

In Arching.

This method is really grafting by approach, inasmuch as the stock is taken in a receptacle, or planted in close proximity to the tree from which it is desired to propagate.

Bud Selection.

It is evident that trees worked by budding and grafting will possess all the good or bad characteristics of the parents; such being the case, it is very important that every care should be exercised in the selection of scions and buds from only the most prolific, high-class, vigorous trees.

Stock in Relation to Growth.

It has also been proved that a vigorous tree is retarded in its growth if stock of a less vigorous strain is used for the reception of the scion or bud. It is a fairly safe rule to work most varieties of fruit plants on stocks of their own genus, as, for example, sweet orange on sweet orange stock, lemon on lemon stock, peach on peach stock, anona cherimoyer on anona cherimoyer.

Although nearly any bud on a tree may be successfully inserted and made to grow, only clean, healthy shoots with well-developed buds should be selected; these will develop into strong, vigorous trees and be less likely to be attacked by disease.

FALL IN LOVE WITH YOUR WORK.

"We are fortunate in our manager—he is more than capable, he is in love with his work." That is what a man of many business interests said to "Country Life" the other day, in discussing a certain business. Isn't that the sort of man we are all looking for?

Yes, he is hard to find. Every executive worth its salt is on the lookout for him, and holds on to him when they get him. To be sure, there is a limit to what they can pay him, but they will pay up to the limit—and perhaps risk a bit extra.

The man who "watches the clock" or has a grouch against "the boss" will never go far—in that business. The probability is that he will not succeed in any other. His policy to do no more than he is paid for, means he will never be paid any more than for what he does—and he is cramping himself as well as his business. Mediocrity, or worse, is a-yawning for him.

It comes back to this: Every employee is directly interested in the business that pays him wages or salary. He is a partner in the concern, and its success is his success. This applies to business and industry throughout Australia, and the sooner it is really recognised the more likely we are to arrive at sound industrial relations.

You know how it is on station or farm. You would like your employees to take a personal interest in the products, and to rejoice when they top the market, or make a particularly good sale, or carry off the prizes. We believe this happy relationship exists on a great many country properties. The best advice that can be given is, "encourage it." We want to see it fostered in shop, and office, and factory.

Likewise, the best advice to employees is, "Fall in love with your work"—that way lies success. If you cannot fall in love with your present work, work up to the work you can; or, if necessary, change your work. As a witty American puts it: "An artist is a man in love with his work." Let's all try and be "artists."—"Country Life" (Sydney).

STOMACH WORMS IN SHEEP.

The sheep should be drenched with a mixture of arsenic and Epsom salts. The ingredients are 2 oz. arsenic (95 to 98 per cent. purity), 6 lb. Epsom salts, to 5 gallons water.

To prepare.—Bring 2½ to 3 gallons of water to the boil, then add the 2 oz. of arsenic and the 6 lb. Epsom salts. Stir and bring to a brisk boil. Boil vigorously for about five minutes and stir well. Then allow to simmer for half an hour longer, stirring occasionally. Add cold water to make up to the 5 gallons. This mixture will now be ready for immediate use.

Dose for grown sheep, 2 fluid oz.;

For weaners, 8 to 15 months, 1½ fluid oz.;

From 4 to 8 months, 1 fluid oz.

Lambs under three months old should have the dose reduced according to size and age of lamb. If the milk secretion is good, the lambs will not need drenching, but if eating grass freely they will pick up the worms and suffer more severely owing to their weaker constitution, therefore drench them if necessary. A flask can be procured suitable for administering the drench according to dose, otherwise a sauce bottle will be found suitable, but will require to have the dose measured properly. The sheep should be kept away from food and water for at least twelve hours before drenching (if not already starving), and about four hours after drenching (at least from water).

The sheep should be on all fours while being drenched, the operator holding the sheep between the knees with the left hand under the jaw and the right hand administering the drench with the flask. Should the sheep struggle or cough, discontinue pouring the drench and wait till the sheep becomes normal before continuing. It is usually found most convenient to run a number of sheep into a narrow lane (about 30 in. wide) for drenching purposes.

The worms hatch out freely with moisture during warm weather, at which time they increase quickly, but usually cause very few deaths until autumn and winter. Spring is the best and most effective time to drench to keep the worms in check. To reduce the worm trouble, the first two drenches should take place at intervals of eight days, and then continue the drenching at intervals of twenty-four days during summer and autumn. In doing this, with a change to fresh pasture, the sheep may be got free from worms after fifteen months' treatment.—J. CAREW, Senior Instructor in Sheep and Wool.

BLUESTONE DRENCH FOR STOMACH WORMS—

(*STRONGYLUS CONTORTUS*).

As a change from the arsenical drench, the bluestone and mustard drench can be successfully used, say, every third or fourth drench. The ingredients are 1 lb. bluestone, 1 lb. fresh mustard, 10 gallons water.

To prepare.—Suspend the bluestone in soft or rain water, secured in a piece of hessian. Mix the mustard in a little water until thoroughly moistened, then dilute with larger quantity and mix with bluestone water, which is made up to the full quantity of 10 gallons.

When all the bluestone is dissolved, it should be well stirred, and administered in correct doses.

Grown sheep, 4 fluid oz.;

Weaners, 12 months old, 3 fluid oz.;

Lambs, 4 months old, 2 fluid oz.

The bluestone water should not come in contact with metal; wood or enamelware is suitable. Care must be exercised in administering this drench, as it is a bigger dose than the arsenical dose, and takes longer to swallow. The sheep are more apt to take it on their lungs, which is injurious and may prove fatal. This drench is useful if administered after giving the sheep the same treatment as recommended for the arsenical drench.—J. CAREW, Senior Instructor in Sheep and Wool.

CATTLE BREEDING AND WORK.

By H. ANNING, Wetherby, via Richmond, Q.*

I MAY mention at the outset that in writing about cattle I am merely giving utterance to the results of my own experience and observation for the consideration of the uninitiated, and have no wish at all to lay down the law to cattlemen. It is a big subject, and as one old timer said to me once: "You can never learn the lot of it." Seldom can two cattlemen be found to agree on the subject, even after spending their lives at the game.

The Importance of a Quiet Herd.

One statement may be made, with which all must agree. Of course, the chief end, aim, and object of men engaged in cattle raising is to make money, and to do that it is essential to have a quiet herd. Different men may argue as to the means whereby cattle may be thoroughly quietened, but I believe cattle are something like men, *they want a home*, and a nice one at that. Therefore time and money spent in picking good camps, well shaded, soft, and handy to water, and the thorough breaking in of cattle to those camps, is very well spent indeed. Weaners should be herded regularly every year, and by a good man. The best man is none too good. They should be fed and watered every day as carefully as fat bullocks, put on the same camp every day at lunch, where it is advisable to have some salt in troughs. From a month to five weeks is long enough to keep them in hand. They will never forget the handling or the camp.

Types of Cattlemen.

Speaking of cattle, the figure of one man rises before my eyes—James Tyson, the cattle king. He was a great man, honest with himself and the world, shrewd, clever, and observant; a fine bushman, a good man over men, and one who knew how to pick his men. Living and working hard himself, he expected his men to do likewise, consequently he was often bitterly reviled. Of the many stories told about him, one is most instructive. When he was quite a lad he had the hardest job he ever took on. His work was to hold cattle on new unfenced country. Cattle don't like leaving their homes. If taken away from sour, poorly grassed country, and put into richly grassed paddocks they will hang on the fences and sulk for months. Placed on unfenced country, they will naturally keep making back, and once started they waste very little time, making across country in a direct line—they are fine bushmen. It takes months and months of careful patient work to settle them down on new pastures.

Tyson found his job was no joke. Getting up early, he used to put a bit of tucker on his saddle and ride round the tracks. When he found any heading back he followed these until he overtook the cattle, sometimes having to ride 30 to 40 miles before coming up to the leaders. Then he had to drive them back, watching them on his own at night. After these jaunts he used to arrive back, hungry, sore, and exhausted for want of sleep. It was hard, unthankful work, and the cattle never seemed contented. He was decidedly pleased when he got another job.

An old chap, with a white and patriarchal beard, took over from him; a slow peaceful-looking old joker. Probably he never put a horse out of a walk! "My word," thought Tyson, "there won't be many cattle here in three weeks' time." However, he was wise enough to say nothing. Months afterwards he came back, and rode up to the old chap's camp. He was asleep! Tyson woke him up, and the old man asked him to stay for the night. In the course of conversation he told him the job was all right, but a bit too lazy-like. The cattle were quiet and settled down. To verify these astonishing statements Tyson took a ride round next morning with his host. What he saw fully bore out the old man's assertions. "The difference between us," he said, "was that the old man understood cattle, and held them with about one-tenth of the riding I had to do, and the longer he stayed on the job the quieter the cattle became, until finally he found it a bit lazy."

Because Tyson was able to learn vital lessons so quickly and easily must have accounted for much of his success in after life. Tyson was a great man all right, and nothing was more typical and characteristic than his final leave-taking. He knew his hour was nigh, but he made no fuss, and worried no one. He had done his life's work, and was about to turn in for his last camp. He was content to pass out, and let the future unfold itself.

* In the "Pastoral Review" for June.

The "Galloping Musterer and Others."

I have met many different kinds of cattlemen. There is the "galloping-musterer" (usually a young man). He wears fierce-looking spurs, carries a diamond-plaited whip, with curious ornamental handle, a cabbage-tree hat, and often a beautiful silk handkerchief around his neck. He will ride anything and through or over anything. He starts away from camp just after daylight at a gallop, and men and boys follow, through timber, over holes, &c. He pulls up for a few seconds and in a breathless way tells Joe to take Jimmy and Friday and clear down to One-Tree Camp. Starts off again and repeats the order to two or three others about another piece of country. All his work is in keeping, and young men adore him (as a rule).

The best I have seen were old slow-going chaps. One in particular I have in mind told me he had no time for cattle, but preferred billiard-marking, only he couldn't live in town. I was somewhat young when I met him, and fancied myself more than a little, and felt rather a contempt for the old chap and his sentiments. He was a little roly-poly of a man. No leggings or whip, and only one short little-rusty spur. He rode a rather unambitious sort of prad. He had a rowdy herd of "baldies" to deal with, and was just commencing a bullock muster. I knew the country and the cattle, and expected the old fellow to resign after a week's work. However, he jogged placidly out, and commenced to split up the men. By 10 a.m. we had the camp on, and there had been practically no galloping. He always seemed to be just where he should be to stop a mob from galloping.

When the last man came in with a lot, he rode out. "Hullo!" he said, "you've missed some cattle. There was a big bullock running out there with a white stripe along the ribs, and there were ten or eleven other bullocks with him." He cantered out, and after a little while brought them along himself, with the help of a young new-chum lad. He sauntered through the muster and made a good delivery, and after a while men and boys began to think that it must be something more than good luck. Cattle on that place steadied down marvellously. He could ride up to a camp, and the cattle did not even trouble themselves to get up and stretch, and that is the way cattle should be before much money can be made out of them.

PIONEER DROVERS—A DISAPPEARING BAND.

By WILFRED STEELE, Yeeda, via Derby, W.A.*

WITH the various railway systems of the Commonwealth encroaching further into the vast interior of Australia, long overland droving trips are now few, but the following narrative will recall some famous cattle droving feats, and perhaps serve to show the danger and hardships encountered in opening up the distant tracts of country in the Northern Territory and Kimberley.

In 1872 D'Arcy Uhr overlanded the first cattle to Darwin, although cattle had years before this penetrated into the Territory along the Queensland border line. The next man to follow was Tim Nelson, who journeyed a mob of 100 bullocks along the overland telegraph line from Undoolya to Darwin; this station is near Alice Springs, in the heart of the continent. Three years later followed Nathaniel Buchanan, known throughout the North as "Bluey," with cattle from Rule and Lacey's station, Aramac, in Central Queensland. These cattle went to Glencoe Station.

Alfred Giles in 1878 left Chowla Station, on the Darling, with 2,000 cattle and 10,000 sheep, proceeding down the Murray across to the Burra, on to the Peake Telegraph Station, and along the overland telegraph line to Katherine River. These cattle formed the nucleus of the herd for Springvale and Delamere. Springvale was later abandoned, and Vestey's Manbuloo now occupies that area. The sheep and cattle later went on to the shorter and more nutritious pastures at Newcastle Waters, 260 miles south of the Katherine, and the sheep were finally removed from Newcastle about 1902. This run has long been the property of Messrs. Lewis and Sir Sidney Kidman.

This trip of Alfred Giles and his brother, in my opinion, takes the credit of all pioneering trips in the history of Australia. By far the major portion of the distance travelled, about 2,200 miles, was over unoccupied country, and it was necessary for well-sinking parties to travel in advance of the stock to sink wells and scoop for water in the sandy river beds. The trip occupied just on two years.

* In the "Pastoral Review" for June.

In the vicinity of Alice Springs natives lured from the droving camp some of the boys of the party and murdered them. Fifty years have gone by since this intrepid overlander accomplished this famous trek, and he resided at his station, Bonrook, near Pine Creek, until a few years ago. He is now living at Adelaide, ripe in years, rich and unique in experience, and it is regrettable that he has not received some suitable recognition for his great achievement. Honours are won for far lesser feats to-day.

Mr. Giles is the father of the late Lady Campbell, a very heroic woman, who died a few years ago at Waterloo Station, in the Wyndham district. His great enterprise was on behalf of Dr. William James Browne, a pastoral pioneer of South Australia, who controlled Leigh's Creek, Nilpena, Wilpena, Wonaka, Arkaba, Booborowie, Moorak, and the famous Buckland Park, in addition to many other smaller properties. Dr. Browne's brother, also a medical man, accompanied Captain Charles Stuart in the historic expedition of 1844.

Arrived in Darwin also in 1879 with bullocks, Frank Hann, of Lawn Hill Station, near Burketown. Hann, small and slight of stature, but with the heart of a lion, did much exploratory work in different parts of Australia. He did extensive peregrinations amongst that rugged country of the King Leopold Ranges, between Derby and Wyndham. Many of his marked trees I have seen on the Charnley River and elsewhere, and on several of these I cut away the encroaching bark that was gradually effacing Hann's markings (FH over 1898).

Hann took up Grace's Knob, a rugged run on the outermost limit of settlement, 200 miles north of Derby. The Hann River, the largest tributary of the Fitzroy, is named after him. He also blazed the track from the goldfields to Oodnadatta, and crossed and recrossed that illimitable plain of mirage and thirst, where to-day speeds the luxurious "Trans." train. Hann died several years ago in straitened circumstances.

The influx of cattle into the Northern Territory in the early eighties went on apace, and the following drovers came across from Queensland with cattle for stocking purposes:—Scrutton, Burke, Blair, Fraser, Hayes, Wallace, and Redford. The first named long resided at Borroloola, where he owned Bohemia Downs, and he was also one of the pioneers to Somerset, on the apex of Cape York Peninsula. Redford was also resident near Borroloola, as the manager of Amos Bros. and Broad's Macarthur River Station.

In 1882 "Bluey," brother of W. F. Buchanan, of Killarney, New South Wales, again entered the Territory with 7,000 cattle on behalf of Fisher and Lyons, to commence what is to-day Victoria Downs. Farquharson the same year also contributed with a mob to form the nucleus of this herd, which is to-day about the largest in Australia.

On 15th October Saunders and Johns arrived on the Katherine overland from Robourne, Western Australia, on an exploring quest. They took a route different and more direct than that of Forrest, two years previously. These were the two first parties from the West to the overland telegraph line.

James Warley entered the Territory also in 1882 with cattle from the Moonie and Balonne Rivers in South Queensland. This was a very long trip, with the destination at Glencoe. Settlement in the following years continued to penetrate still further west, and Sam Croker passed the O.T. line with heifers for W. F. Buchanan's Wave Hill Station. This famous run later branded 25,000 calves in a season.

In March, 1884, W. Button passed the Katherine with 2,000 odd breeders to stock the country acquired by Osmund and Panton, on the Ord River in Western Australia. Other mobs followed to stock this country also, and it eventually became a very large herd, now held by Vesteys. "Bluey" Buchanan took a prominent part in the stocking of the Ord, and altogether his part in the opening up of the Northern ranches was second to no other. The Ord River cattle came from Avington and Beaufort, and the trek across Queensland, the Northern Territory, and into Western Australia was a most creditable performance.

In 1885 and 1886 two families that overlanded across to Western Australia were the McDonald Bros. and the Durack Bros., and their names are still to-day associated with the country that they pioneered. The trip of the McDonald's is, I think, the longest on record, and, in my opinion, the only one to challenge that epic feat of Alfred Giles. They left their Goulburn home in New South Wales with cattle and bullock wagons, crossed Queensland, thence by Settlement Creek over the Territory to Hall's Creek, followed the course of the Margaret River down (now the famous Gogo Station of the Emanuels, taken up by the astute head of that

house, Isidore Emanuel), and finally halted at Fossil Downs, where they built up a large herd of cattle. This station is situated about the junction of the Fitzroy and Margaret Rivers, some 230 miles from the cattle shipping port of Derby. This feat of the McDonald Bros. is a record in that it penetrated the furthest west. For nearly two years every morning at early dawn the heads of the bovines were pointed west for something like 2,500 miles, and when the distant goal towards the setting sun was eventually reached, it was with the original herd much reduced in number. Dan McDonald, of Goulburn, owns Fossil to-day.

The name of Durack has always been intimately associated with the early settlement of Kimberley, and they are still large landholders in the Wyndham district. The Durack Bros., like the McDonalds, overlanded their own cattle from Queensland, being settled about the Cooper River. Losses in cattle overlanded by them greatly increased the expenses per head of those finally delivered. Mr. M. P. Durack represented Kimberley in Parliament a few years back, and last year was chairman of the Beef Commission, inquiring into the disabilities of the industry, and no man is better versed than M.P. on the cattle question of the North.

There are other names of early overlanders that I have omitted to mention. Most of these pioneer drovers have gone still further west to attend the final muster. They have all played a prominent part in the opening up and development of these far-flung Northern ranches, but their great exploits will soon be entirely forgotten, and I trust that the powers that will be—when the railways cross from east to west, over the great droving route—will perpetuate the names of these pioneers by naming the stations after them, and not choose names of politicians as on the "Trans." east-west route.

The early droving route took the course of the coast, named so, but actually many miles from the shore of the Indian Ocean. The present tableland track was then unknown, and many of the mobs were held up by drought for months at a time, the road ahead had to be explored in advance of the cattle to find water supplies for the watering of such large mobs, rations—rough in those distant days—were unprocureable over immense distances, natives were hostile, and disease was rampant with man and beast. Droving was a very different occupation in those days to now.

The writer, in April of 1904, was a member of a party that took the first cattle east from Wave Hill, and accompanied them for thirty-one weeks, covering waterless stages of 95 and 60 miles, so is in some small degree qualified to judge what droving hardships must have been to those pioneer drovers.

From 1904 the route from the Victoria has been via Murrarji to Newcastle Waters, and the line of trek is marked by many graves on the roadside—those who have fallen out on the march from malaria and berri-berri. Remote was the chance for one that seriously fell ill on this stage. The drover, often short handed, had to proceed on with the cattle, and there were many lonely deaths, with only the omnipresent willy-wagtail to twitter a requiem.

That some of the droving trips of more recent years were no picnic, I recall the overlanding of 2,000 odd bullocks from Lissadell in 1905, in charge of Walter Rose. This was a very dry year, and the Tableland route impassable. Rose, taking the old established coastal track towards the Katherine, found his progress beyond the Roper stayed, and yards were built to hold the bullocks. Then disease broke out in them, which necessitated letting them go and riding the tracks, the cattle attempting to go back west. Rose then journeyed down to Newcastle Waters for nearly 200 miles to find impassable dry stages further south and east. This indomitable drover again headed for the coastal route, and when near Macarthur River Station left the track and went sheer bush towards Westmoreland. So rough was the going on this cross-country stage that the plant dray was abandoned, and is likely to be there to this day, or what the white ants, bush fires, and brother "jacky" have left of it. Three men died in this party, and for hardship and distance this trip is well in the front during the last quarter of a century of droving. Some of these cattle travelled right into Bellevue, the late Lumley Hill's beautiful station near Brisbane.

The first drovers to lift cattle from the western ranches to the east went out in 1903, and the following year "Jumbo" Smith and Blake Miller lifted Victorias, also Steve Lewis, John Dick Skuthorpe, and Charles Phillot came in with Wave Hills. All these mobs comprised from 1,000 to 1,500 bullocks, and this was the opening of the cattle route via Murrarji.

Many of those early pastoral pioneers like Dr. Browne and C. B. Fisher lost an immense amount of money on these Territory ventures, and those that have followed have not yet been rewarded on their enterprises. The industry in the North is still depressed, virtually on its back, and those that hang on look and wait for something that never comes—a boom!

HOW THE THOROUGHBRED HORSE CAME.*

WITH England rests the proud achievement of having given the Thoroughbred horse to all the civilised nations of the globe. Nevertheless, the horses upon whom have been bestowed the title "Thoroughbred" can in no wise be reckoned indigenous to the soil of Britain, being, so to say, a manufactured article. The word Thoroughbred only came into use after the introduction of Eastern blood into England, and was alone given as a title of distinction to the progeny of the Royal mares imported by Charles II., and other mares of purely Eastern blood, and their descendants, begotten by Eastern sires and their descendants, whether imported from Arabia, Barbary, Turkey, or Persia.

Early Sires Imported.

Thanks to the love of horses inherent to many of the great nobles and wealthy commoners of England, they commenced to improve the native breed by the introduction of Eastern blood as early as the reign of King James the First, who set them the example by giving Mr. Markham, a merchant trading to the Levant, 500 guineas for an Arabian, described by the Duke of Newcastle as "a small bay horse of not very good shape"; and as there is no account of any of his progeny having distinguished themselves he could have done the State but little service.

The two next Eastern sires of note brought into England were the Helmsley Turk and Sir Thomas Gresley's bay Arabian. The former, who was imported by Henry Villiers, the great Duke of Buckingham, had a most distinguished career at the stud, being the sire of Mr. Place's Bustler (a name to be found in all the best old pedigrees), and Mr. Cooke's Vixen, who was out of the Barb mare who Ered Dodworth, the first Anglo-Barb foaled in England.

Gresley's bay Arabian, who was brought into England a year or two later than the Helmsley Turk, was put to the latter's daughter Vixen, with the result of getting the Old Child mare, the great-grand-dam of Mr. Heneage's Silvertail, who bred Careless (winner of twenty races) and Fearnought (winner of five races) to Regulus; while she also bred Warren's Sportsman (winner of seven races) to Cade, when Pot-8-os and all the grand horses descended from that equine celebrity.

Some Turks went to England.

During the reign of the unhappy Charles I., from 1625 to 1649, there is no account of any Eastern sires of note being brought into England beyond the D'Arcy White Turk and the D'Arcy Yellow Turk; but when Oliver Cromwell ruled the realm under the title of Lord Protector, General Fairfax imported the Morocco Barb, maternal ancestor of Besto, while his studmaster (the same Mr. Place as owned Bustler) imported the White Turk, subsequently known as "Place's White Turk," who did the State no little service, and was a great help towards laying the foundation of the British stud by getting Mr. Croft's Commoner and Wormwood, while he was also the maternal great-grand sire of Cartouch, Grey Ramsden, and Windham, all horses of very high form.

Soon after the Restoration, with Charles II. on the throne, both breeding and horse-racing received an impetus from the Merry Monarch's love of sport as well as of fine horses. He caused the Barb mare in foal with Dodsworth mentioned above to be imported, and also a number of Arabian and Barb mares, on whom the title of "Royal mares" was bestowed, but his Master of the Horse, Mr. Fenwick, failed to obtain any Eastern sire of note for his Royal master.

In the reign of James II., however, there was brought into England by the Duke of Berwick from the siege of Buda (1686) a sire destined to hold a very high place as one of the best early progenitors of the Thoroughbred horse—viz., the Stradling Turk, who, having been purchased from the Duke by Mr. Lister, a gentleman resident in Lincolnshire, became, under the name of the Lister Turk, a famous stallion in that county, where he begat Snake, Coneyskins, Piping Peg, and the dam of the Bolton Sweepstakes.

These were all celebrated horses from whom the blood of the Lister Turk has come down to the horses of the present day; and as no fewer than five strains of this famous Turk were to be found in Eclipse, it would make a rather long sum in addition to tell how many strains of the blood of this Buda warrior are to be found, say, in Mr. Jinks's pedigree chart.

This fact surely tells us that the whole credit of the fine horses now comprising the British breed must not be given to the Darley Arabian, the Godolphin Arabian, or the Byerly Turk, an idea entertained by many who have only cursorily glanced through the pages of the Stud Book.

*From the "Live Stock Journal" (England).

James's successor, William of Orange, had but little time from his wars to give to either breeding or racing, and yet two very notable horses of Eastern blood were brought into England in his reign—viz., the Byerly Turk and the Black Barb Chilaby. The former, like the Lister Turk, was another "warrior," called after his owner, Captain Byerly, whose charger he was at the battle of the Boyne, which sealed the fate of the Stuart dynasty; and Chilaby was imported by King William himself, as was also the Barb mare Slugey, in foal to him with Greyhound, who, although foaled in England, was a full-bred Barb.

The blood of the Byerly Turk comes down to our time chiefly through his sons Basto and Jigg, sire of Partner, and through the latter's grandson Herod; while the blood of Greyhound, although he got several fleet runners, was subsequently known only through Lord Halifax's Sampson, whose dam was a Curwen Barb mare, and must not be confounded with Sampson, the son of Blaze, who was sire of Engineer and Bay Malton, who were the early progenitors of several of the great horses.

Yorkshire's Good Work.

It was early in the reign of Queen Anne (1702-1714) the arrival of the Darley Arabian in Yorkshire (where the Leeds Arabian had been located a year or two previously) occasioned extraordinary rivalry among the noble and wealthy families resident in the three Ridings for the possession of Eastern blood; and as this not only increased as time went on, but extended to other parts of the kingdom, a great improvement took place in our breed of horses. During the first three decades of that century a number of the following Eastern sires were brought into England, and located in different parts of the country, while the others were imported later, viz.:—

ARABIANS.—Aloock, Bethell, Basset, Bell's, Bloody Buttocks, Bloody-shouldered horse, Conyers, Chesterfield, Cullen, Coombe, Curwen's chestnut, Cyprus, Damascus, Devonshire, Darcy, Fletcher, Godolphin, Gibson, Harpur, Hampton Court, Honeywood, Hill, Johnson's, Leeds, Lexington, Somerset, Sutton, Lonsdale, Lord Brook's, Sir W. Morgan's, Newcombe, Newton, Northumberland, Oglethorpe, Oxford Bloody-shouldered horse, Panton's, Portland, Pulleine, Richards, Stanyon, Sannach, Sedley, Wildrington, Thompson's Grey, Wilson's, Wilkinson, Woodstock, and Wynn.

BARBS.—Cole, Compton, Crapple, Croft's Bay, Curwen's Bay, Curwen's Gay Morocco, Hutton's Bay, Hutton's Grey, King William's Black, Lowther Bay, Lowther White-legged, Rider Chestnut, Rutland Black, Saint Victor, South, Tholouse, Taffolet, Vernon, and Wolseley.

TURKS.—Akaster, Belgrade, Brownlow, Budlington, Byerly, Crawford, Ely, Faulkner Grey, Sir E. Hale's, Holderness, Lambert, Lister, Newcastle, Orford, Stamford, Strickland, Selaby, Shaftesbury, Turk (sire of Flanderkin), Wastell, and Williamson.

OTHERS.—Duke of Rutland's Persian, Sir T. Gascoigne's foreign horse, and Sir Wm. Goring's foreign horse.

How they Mixed.

Every one of these Eastern sires "did the State some service," but the blood of the Darley Arabian, the Godolphin Arabian, the Leeds Arabian, the Oglethorpe Arabian, Curwen's Bay Barb, the St. Victor Barb, the Compton Barb, the Lowther Bay Barb, the Taffolet Barb, the Akaster Turk, the Byerly Turk, and the Lister Turk is to be found in greater quantities in the pedigrees of the present day than that of their compeers. Nevertheless, there is no room to doubt it was owing to the crossing and recrossing of the whole of the foregoing Eastern sires, and the thorough amalgamation of their blood, that has given to Great Britain the finest breed of light horses in the world, and the descendants of whom are now to be found distinguishing themselves on the racecourse in every part of the globe.

THE JOURNAL A GREAT HELP.

A Mount Fox farmer writes, 1st July, 1929:—"The Journal is a great help to us, as it contains the right information for the man on the farm. Ours is a mixed farm. I wish the Department every success."

RURAL LIFE IN OTHER LANDS—III.

By the EDITOR.*

We ended our last talk with some reference to the new levels of land utilisation in French agriculture during and immediately after the World War. We will now go on to consider some points in relation to size of farms, to type of farming, and later offer some more or less suggestive information on the possibilities of increasing our trade with France. Small properties have been the rule in France for centuries. The division of the land into very small holdings dates back to the enfranchisement of the country people some hundreds of years ago. It is a fairly common belief, or at least I have found it so, that the system of subdivision of farming lands into very small areas is a relic of the Napoleonic regime, but as a matter of fact, even under the feudal system, small holdings were farmed, and since that time the subdivision of land has continued. From time to time there has also been a counteracting movement, and great holdings such as Crown lands and the estates of the nobility have been consolidated.

Areas and Tenure of French Farms.

To some extent, even in Australia we see evidence of this sort of reaction, where land that was originally cut up into small areas has become gradually part and parcel of large estates under various forms of tenure.

At the time of the Revolution of 1790, there were about 4,000,000 landowners in France, of whom the greater proportion, perhaps 80 per cent., were small farmers who owned something like 40 per cent. of the land. After the Revolution large holdings were split up and divided among landless farm labourers and holders of small areas little larger than what we would call allotments. From then on the number of peasant proprietors continued to increase until about forty years ago the rural holdings ranged in area from less than an acre up to, in rare cases, some hundreds of acres, and averaging a little more than 10 acres each. A vast number of holdings were less than 25 acres in size.

To-day, it often happens that several of these small holdings belonging to one owner are scattered round in different localities in different directions at different distances from the villages in which a vast majority of farmers live. And that is a peculiarity of French rural life, and nowhere else in my knocking about have I seen such a development of this communal or community instinct. The village with its Mairie or Town Hall, its Church and its Chateau is in most Departments the centre of community life. The people live in the villages and go backwards and forwards to their farms. There is less of that individualism that is such a marked characteristic of British people and other races of Northern Europe. Implements, machinery, and even draught horses are often community-owned on a co-operative basis. All the same, nothing will part the French peasant from personal ownership of his land, no matter how small the area may be.

Pride of Ownership.

The great ambition of the rural worker in France, if he is not already a proprietor, is to own a bit of land. I also noticed this characteristic, this love of the land, very markedly evident in other European countries, and if their people are ever induced to migrate they carry this characteristic with them.

I remember once meeting a Swede, a new chum, in a country district in Queensland. He was slaving like a working bullock on double overtime on a bit of the hungriest, gravelly, ridgy, gum-topped box and spotted-gum country I have ever seen, and trying to make a farm out of it. Talking to him on his prospects, in his eyes one saw the pride of ownership, a pride that one was afterwards to see reflected even more brightly in the eyes of the small farmers of France and other Continental countries. He told me, and he was only a young man then, that when he left his homeland—Sweden—his one idea was to come to Australia where he might realise his life-long dream of owning ten acres, ten cows, and becoming a J.P. like his former employer in the old land. Out of the timber on his land he had hewn one of the neatest of slab houses—he was a sort of a Tommy Gorman with the broad axe—and all the fencing and other structures on his block were put into the ground to stand up and stay there.

* In a Radio Lecture through 4QG.

I ventured to suggest that on the country he had selected there was little likelihood of his ever achieving his very modest ambition. Many months later I met him again with all his belongings piled on a German wagon with a well-worn single furrowed plough and set of harrows in tow behind the outfit. Those and two poorly-conditioned horses comprised all his worldly belongings. He had been compelled to abandon his hungry holding.

"Ey yove, Yack," he told me, "Ah baint beat yet, no by gum! Dot varm of mine—vot you call it?—vouldn't give handieoot tucker mit. You remember dat oder varm, Yack, dad vas not von bit goot. De Devil he yump mit me and run mit me round der stomp. I chase him altogether alretty. Bat den I find dat all de time he chasin' me. Dot varm keep me poor and de Devil he keep me ver' mooch poorer, altogether yet so soon, but this time I vill jolly vell vin."

It was a new district, and forfeiting the one selection he had drawn another—as sweet a bit of alluvial river flat, backed by a wall of vine scrub that would fire the fancy of any farmer—and had just arrived on the new block. Though late in the afternoon, he unyoked, watered and fed his horses, yoked them up again to the plough and started in on a small stretch of clean, open country and kept going turning over the furrows while daylight lasted. Fired with the pride of ownership he eventually made that farm one of the best in the whole of that rich district. He more than realised his ambition, and when I saw him last he was milking, not ten, but a hundred cows, was chairman of the local butter factory, chairman of the shire, and a J.P. His energy, his love for his land, and his pride in its ownership were typical of the hardworking peasant proprietors of Europe. Queensland could do with many more like him.

Love of the Land.

The small farmers in France cling like a bank to a security in the possession of their land. The characteristics and producing capacity of each tiny field are known and family traditions have been built up as to methods of cultivation and caring for these little patches of country, the boundaries of which are often marked only by small white corner stones, suggestive of surveyor's pegs, and one straight separating furrow.

Naturally in these older countries habits, customs, and practices change very slowly, and in a French village, especially on market days, one can easily imagine oneself back in the Middle Ages.

Changes in ownership are not very frequent as in a new country like Queensland. All the traditions of the countryside are rooted in the soil, and holdings remain in the one family for generations.

Changes in Ownership.

It has been said that the subdivision of farming country became more frequent during the war, but it is probable that these reported changes were more "on paper" than real. Many cash-and-share renters had purchased, it was said, the lands they had previously cultivated because, in general, the price for agricultural products had increased more rapidly than had land values. But it is more probable that large holdings were purchased by merchants and manufacturers who had made large profits during the war than that these properties passed into the hands of peasants. The depreciation of the franc also rendered it possible for foreigners to acquire land more easily than natives of the same class, and a very considerable number of immigrants from other countries have settled on the soil of France.

There has been no sudden change in the system of land tenure comparable with the splitting up of the large estates of Russia and Roumania, and if more land has passed into the hands of the peasants since the war the movement has been a continuance of the tendency that has been in operation for more than a century.

France is a land of small farms well tilled. This fact goes a long way towards explaining how a country about one-fourteenth of the size of Australia is able to grow enough food to supply nearly all the requirements of a population nearly eight times as great.

France's Food Supplies.

And talking of food supplies, before the war France was practically self-sufficing with regard to meat supplies. It is estimated that foreign sources furnished but 2 per cent. of the total consumption. There was a deficiency in pork and pork

products and in mutton. The latter was largely made up by the importation of sheep from the French colony of Algeria. There was an exportable surplus of beef and cattle. During the war the import duties were removed and very large quantities of meat, especially beef, were imported by the Government for the army. After the war, as was to be expected, these large shipments declined. Some years later, however, the trend of imports took an upward turn and the quantities imported since have been steadily increasing. Through the necessity of eating imported frozen meat during the war, many people lost their prejudice against it and now continue to consume large quantities of this class of food.

Workers are now so much better paid relatively that they can afford a much greater proportion of meat in their diet. This increased use of frozen meats is in common with an increased consumption of such meats in western European countries. Before the war England took more than four-fifths of the world's chilled and frozen meat exports. With the continental markets becoming more important, the proportion of this type of meat taken by England was reduced to only two-thirds of the world's exports, the remainder being absorbed largely by continental European markets. France, since 1914, has usually been the most important continental importer of such meats, a fact of which possibly we in Australia might take more notice.

Possibilities of Business for Australia.

Coming to general conclusions from our very sketchy study of rural economic conditions in France, one has naturally had an idea of suggesting the possibilities of France as a market for Australia.

The tremendous losses of man power, the destruction of property, and the devastation of the soil itself have taxed the recuperative powers of France to the utmost. Yet during the interval of the comparatively few years since the armistice France has, unaided, practically completed the restoration of the ten devastated Departments. Hundreds of thousands of farms and dwellings have been re-equipped, and since 1923 industrial and commercial activity have given steady employment to all available labourers, and hundreds of thousands of workers have been recruited from neighbouring countries.

Employment at good wages has rendered possible the establishment of a higher standard of living in urban and industrial centres than has ever been before enjoyed among the masses of the French people. More wheat and more meat are in demand as well as better clothing and more luxuries. This fact is of great interest to the farmers of Australia, as is also the fact that more cereals are being consumed on farms, thus keeping from the markets certain supplies of food that now must be imported from abroad.

Before the World War agriculture was steadily losing its position of pre-eminence in the national economic life of France. Field-crop production had been on the decline more than two decades and the country lands had been slowly going to grass. Live stock numbers had not increased proportionately to the greater available home-grown and imported forage and fodder supplies, but the live weights and quality of animals and the yield of milk had increased. The sale of live stock and animal products formed more than 70 per cent. of the farmer's income. France was practically independent of outside sources of meat supply, and had become an exporter of dairy products.

This situation was reached, as I have said in a previous talk, as the result of a series of adjustments to changes that had occurred in world agriculture. The world market became flooded with American cotton, and Australian wool, and the French farmer abandoned flax, hemp, and wool production and turned his attention to meat. Now the world market is being flooded with frozen meat, and the farmers of France are turning more and more to dairying.

The per capita consumption of meat, butter, milk, and wheat is increasing. France cannot meet the demand for increased supplies of animal products without abandoning still further the area under grain which, under the wasteful system of scattered land holdings, cannot be economically produced in competition with the broad acres and power farming of the newer countries like Australia. The possibilities of the French market, for our frozen and canned products particularly, is, in my opinion, well worthy of our attention.

CARE OF THE CAR. THE WEEKLY OVERHAUL.*

Once having purchased the new car and got it safely home, the question naturally arises: How much care and attention is necessary when the vehicle is in frequent use, and what are the most important jobs which should be done, say, once a week, in order to maintain its efficiency? Various owners have various systems, but all no doubt agree that the most important jobs are those which centre in lubrication.

Follow the Oiling Chart.

It cannot be urged too strongly that the oiling chart which is issued, or should be issued, with every instruction book is one of the most important documents which comes into the hands of the new owner-driver, and he should study it until he is familiar with every point on the car which needs attention. He should also know how often each one requires it.

To carry out the programme which is here suggested, at least two hours will be required, but as such tasks should devolve into labours of love they should not be looked upon as waste of time, and often the stipulated period is exceeded in the enthusiasm of the moment, which is all to the good.

The Engine.

The first consideration should be the engine, and of prime importance is the level of the oil in the sump. It is preferable to ascertain this level after the engine has been running for a few minutes, rather than to withdraw the dipper rod when the oil is quite cold. In any case, it is not sufficient merely to withdraw the dipper rod, as the reading thus obtained may be erroneous owing to the influence of capillary attraction, which causes the oil level to show slightly higher on the rod than it actually is in the crankcase. The correct procedure is to wipe the rod quite clean and then take the reading.

On no account should the gauze filter be removed when adding fresh oil. On a cold morning it may mean that the lubricant will take some time to pass through the filter, but patience must be exercised, as it is essential that all impurities should be separated and trapped before the liquid enters the sump.

It is a mistake to oil a magneto or dynamo once a week. Actually these instruments require very little lubrication, and at fairly long intervals, but there is no harm in applying the spout of the oilcan to such parts as the throttle controls and advance and retard mechanism. It is a good plan also to inject oil on to the starting handle shaft bearing as the ingress or dust or dirt at this point frequently accounts for what is regarded as a stiff engine.

Whilst the engine is still exposed, the operator should make sure that the high-tension lead terminals, both on the magneto and plugs, are quite secure, and he should also examine the joint made by each plug with the cylinder head in order to make sure that there is no leakage which is leading to a loss of compression.

Should there be signs of partly burnt oil or oil bubbles round the joint, the plug must be tightened up slightly. Before replacing the engine bonnet make sure that the earth lead from the magneto is quite clear of metal parts, and especially those which warm up when the engine is running.

The writer invariably turns his attention next to steering connections. Even the shortest run over wet roads demonstrates the fact that these parts receive far more than their fair share of mud and water which is thrown up by the front wheels, and the object of lubricating the yoke ends and pivot pins weekly should be not only to provide the essential film of grease, but to force out grit and water which may be working their way in.

The Front Axle.

Although it entails slightly more trouble, it is an excellent plan to jack up the front axle before commencing operations, so that both road wheels are clear of the ground. Each wheel in turn can be spun round so as to make sure that it is running freely, whilst there is the additional benefit that the loads on the steering pivot pins will be reversed, permitting lubricant to ooze freely over surfaces which normally are tightly pressed together.

During the weekly overhauls, which take place within the first few months of the life of a car, it is desirable to force through each bearing at least one complete greaser-full of lubricant, and if an assistant can be obtained he will lightly swing the steering wheel from one side to the other, whilst the first operator screws down each

*In the "Farmer and Settler."

greaser in turn. In this way the free circulation of the grease will be facilitated. Needless to say, if it has been decided to wash down the car, this should be done before the greasing is started.

The front axle should now be lowered again, and a choice of two methods of examining and lubricating the transmission presents itself. There is really only one main point which requires grease once a week, this being the clutch withdrawal mechanism, and the writer has found that it is almost as simple, and far quicker, to lie at full length under the car to do the job rather than to remove the floorboards.

Before passing to the rear of the car, it is a good plan to oil the change-speed gate, but, again, if unit construction with central control is adopted, the gearbox will look after itself. When the final drive is by an enclosed propeller shaft, the tubular casing taking the torque, the layout will require no attention, but if the shaft is of the open type, a triangular or other form of torque member being fitted, its anchorage to the chassis at the forward end may, and probably will, require periodical lubrication.

The Back Axle.

In so far as the back axle is concerned, the main points which must be watched are the brake-cam spindles. As a general rule, screw-down greasers are provided, but these very soon become coated with mud and are liable to be overlooked. Usually they are in a rather inaccessible position, but this should make the owner-driver all the more careful to see that they receive their proper quota of grease.

THE FARM TRACTOR.

BATTERY OPERATIONS.

By E. T. BROWN.*

It is commonly thought that the object of a battery is to store electricity. This is only true to a certain extent. The electrical energy that is passed into it when it is charged is converted into chemical energy. Chemical energy is reconverted into electrical energy when the current is tapped—that is, when it is being discharged. The active materials in this type of battery are lead oxide and spongy lead. The former is on the positive plates; the latter on the negative plates. These materials are held in suitable grids and immersed in a solution of pure sulphuric acid and distilled water. This acid solution, termed the electrolyte, consists normally of one part of acid to three or four parts of water. The plate grids are made with lugs to which the terminals are attached. The plates are contained in a sealed vessel.

The action that takes place can best be described by starting with a fully charged cell or battery. When current is taken therefrom a chemical action takes place. Some of the lead oxide on the positive plates and some of the spongy lead on the negative plates is converted into lead sulphate. This conversion causes water to be formed; hence the electrolyte in a discharged battery always has a lower density than that in a fully charged accumulator. During the discharge period only a small quantity of the lead oxide and the spongy lead is affected—that is, only a small proportion of the total quantity of the active materials present is involved in the change. When the battery is being charged, either from the dynamo in the case of a motor-car electric lighting and starting set, or from an outside source in the case of a battery used for driving the vehicle, the current is sent through in the reverse direction—namely, from the positive to the negative plates. The lead sulphate that was formed during the discharge is converted into lead oxide on the positive plates and into spongy lead on the negative ones. The density of the acid solution rises, since charging implies that the water formed during discharging is again converted into sulphuric acid.

Charging the Lighting Battery.

When a farm tractor is fitted with an electric lighting set a dynamo is also installed. This form of electric generator is situated on a convenient part of the engine, and driven by a belt or chain from the valve and ignition gearing. The dynamo need not be described at this stage, but it may be mentioned that a device known as a cut out is incorporated, this breaking the circuit from the dynamo to the battery until such time as the current generated by the former possesses a higher voltage than the current stored in the battery. Were this device not employed the battery would discharge itself into the dynamo. The dynamo should be switched on to charge the tractor battery for an hour every day the machine is in use and at all times when the lamps are illuminated. This generally serves to keep the battery fully charged, unless the outfit be used solely at night, when occasionally the battery may have to be charged from an outside source.

*In the "Farmer and Settler."

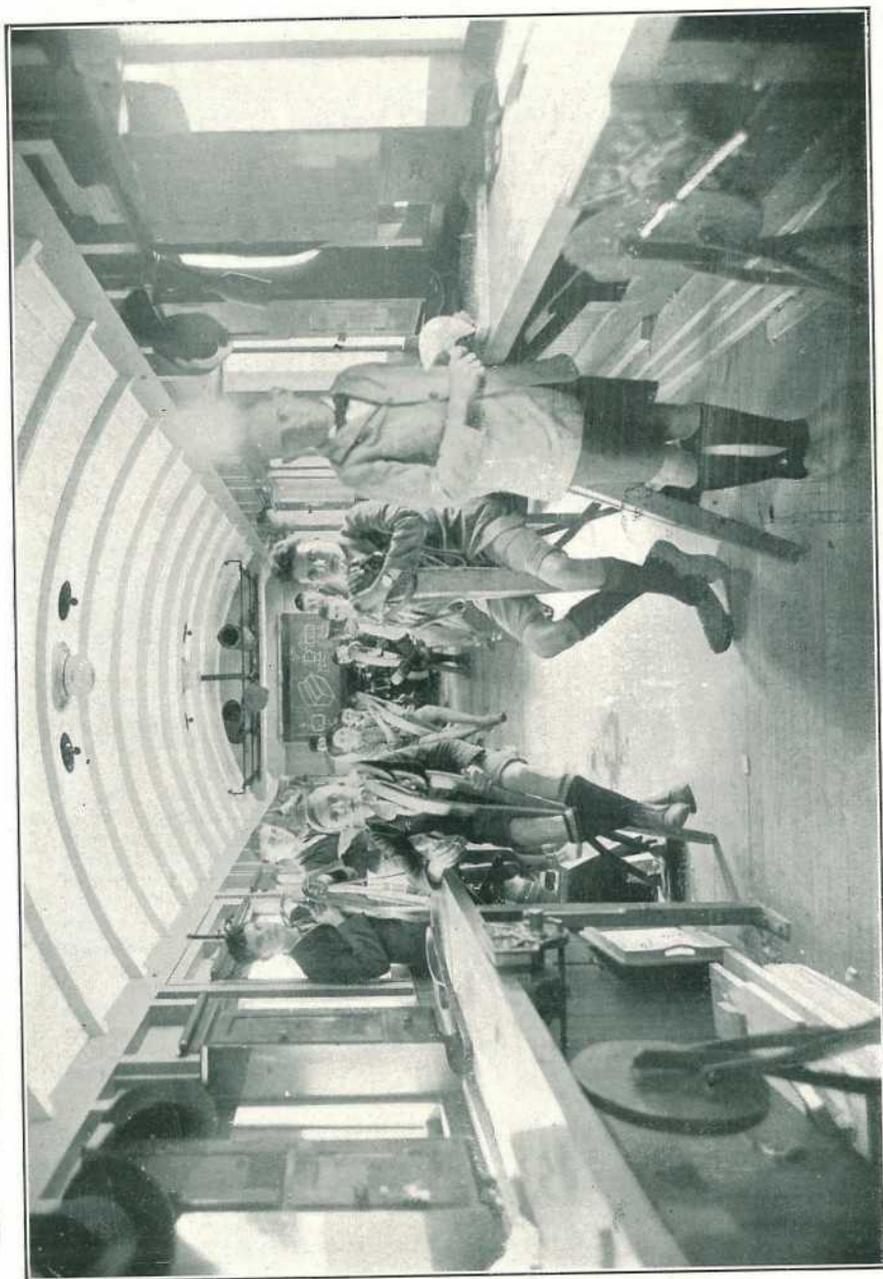


Photo.: Dept. of Public Instruction.]
 PLATE 71.—TRAVELLING MANUAL TRAINING SCHOOL—LEATHERWORK CLASS.

In Queensland, wherever possible, technical education is brought within reach of the country lad. This is an interior of a "School on Wheels." The wide service of the scheme can be appreciated when it is remembered that Queensland with a population of fewer than a million people has nearly 6,000 miles of railway.

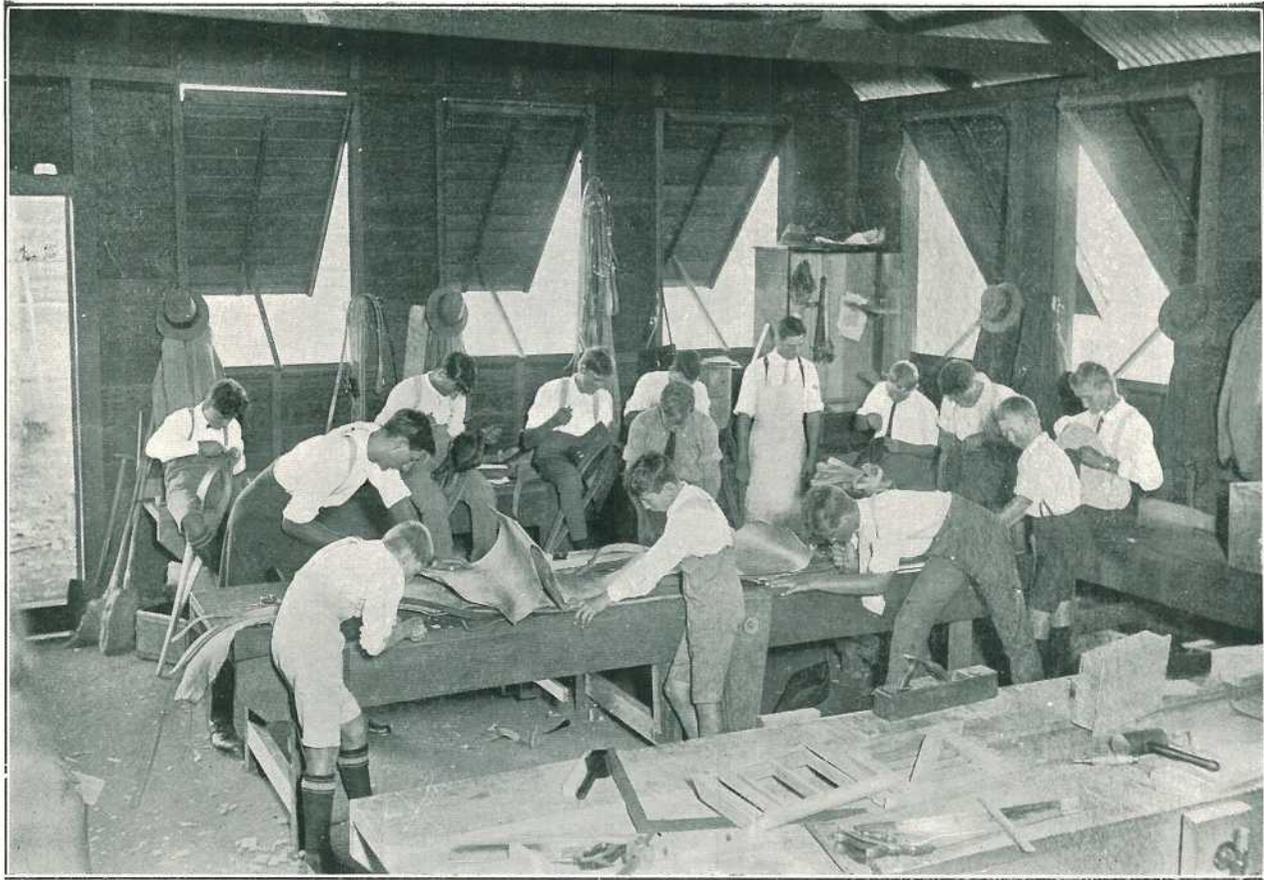


Photo.: Dept. of Public Instruction.]

PLATE 72.—LEATHERWORK CLASS AT A RURAL SCHOOL.

In the centres of the more closely settled districts Rural Schools have been established in Queensland, and in these the mechanical aptitude of the young Queenslander is practically encouraged; and he learns the value of organised work as well as the elements of arts and crafts.

PIG FARMERS' SCHOOL AT GATTON.

ADDRESS BY THE PRESIDENT OF THE ROYAL NATIONAL ASSOCIATION.

SUBJOINED is a brief summary of an address delivered by Mr. Ernest Baynes, President of the Royal National Agricultural and Industrial Association of Queensland, to members of the 1929 School of Instruction for Pig Farmers at the Queensland Agricultural High School and College, Gatton, and which contains many points of interest. Mr. Baynes returned recently from a tour to South Africa and New Zealand, and the student farmers were given the benefit of his close observations of agricultural conditions and practice in those countries. His address was greatly appreciated. Summaries of other interesting lectures delivered at the same school will appear in the September issue.

The Royal National Association.

The Royal National Association is intensely interested in the work of Queensland pig raisers who are establishing high standards in their important industry. The schedule of the Brisbane Show has set out the practical way in which the Association is assisting the pig breeders of the State, and much more is being done than that schedule indicates. New and commodious pavilions have been erected for housing this year's exhibits, and all necessary conveniences had been provided. In addition, sound educational work is being carried on in co-operation with the Department of Agriculture and Stock and the Agricultural College in the course of the year. The value of this activity may be appraised by studying the pork products section of this year's display in the Live Stock and Meat Industry Hall at the Brisbane Exhibition, which will provide a striking object lesson of the value of eliminating all waste and the utilisation of every by-product.



PLATE 73.—THE 1929 PIG SCHOOL AT GATTON COLLEGE.

A yard lecture by Mr. A. J. Mackenzie, Instructor in Animal Husbandry, discussing the merits of various types of Berkshires used in the College Stud for stud-breeding purposes.

The Country's Gift to the Nation.

Usually country people look to cities to supply the great citizens, thinking they are the product of the great Public Schools and Universities, but they are far from right. The great doers of Britain came from small towns and villages; Cromwell came from Huntingdon, Darwin from Shrewsbury, Nelson from a village; so did Cecil Rhodes, Hastings, and Clive. That fact was mentioned to show that residents of the country are not out of things.

Our idea of a good citizen is one whose life has made others wealthier, nobler, kinder and happier—one who has in some way raised the standard of quality of human life; who has assisted the human race and raised human values.

Cecil Rhodes's idea of a scholar was a manly, efficient, and athletic man, a man cut out to be a leader of men, and with courage to take up national affairs.

In South Africa last year, the lecturer found evidences of Rhodes's great citizenship wherever he went. He was far from a saint, but yet a great man who understood mankind, he saw that this was the young man's age and hoped and wished them to take their place—hence the Rhodes scholars.

On the young men of to-day rests the future of this great Commonwealth, and if they did not want to be left behind in the world's competition they must strain every nerve to become efficient; and remember—nothing but the best is good enough.

The Best is only Good Enough for Australia.

A few years ago, when opening the Townsville Show, the lecturer had stressed the necessity of the young men of this country eliminating from their vocabulary the words "good enough," and, co-incidentally, about a month after, the then Governor-General, Lord Forster, when opening the Brisbane Show, made the same remarks: No doubt, he also had noted a tendency among Australians to let things rip. There is no such thing as good enough, and if we wish and hope to retain a place in the world's markets we must remember nothing but the best is good enough for Australia and Australians. The slap dash idea of good enough is rather tempting, for it means travelling along the lines of least resistance, but that is only a slippery track for weavings. The farmers of the countries of the old world, who have not the good fortune to be in such an easy country in which to live as Australia, have made the standard of their products very high. As an example, the Danes set the standard for butter on the highest level, and when that level was threatened by New Zealand and Australia they set about improving their methods. There was no "good enough" for them. Boiled down, the best simply means efficiency, and it does not matter whether it is butter, bacon, flour, or meat; nothing but the best will do.

Conditions in South Africa.

In South Africa, the lecturer observed, the Freisian cattle are the most popular, and by concentrating on the breed the dairymen there had raised it to a very high level, and were actually sending large drafts of pedigree stock to England and the Continent, and making it pay. Country life there is far harder; for every one pest we have, they have ten, and they get droughts also. Africa is not as good as it looks, while Australia is better than it looks. But it has one great advantage over Australia—Capetown is only seventeen days from London; but in spite of that advantage farmers in South Africa, speaking generally, have a very poor time, and if it were not for coloured labour could not live.

After being in South Africa and studying conditions there, the lecturer said he is more convinced than ever that the ideal of a White Australia is the right one.

In South Africa the Government spent large sums of money on agricultural and pastoral education, and has a number of excellent agricultural colleges well equipped for research work—which is most necessary when one considers all their animal and plant pests. Africa is fortunate in having a great number of rich public-spirited men; men though they may live abroad do not forget what they owe to South Africa and richly endow all sorts of institutions.

"Cheque Book Farmers."

The lecturer met some of these men, they are called "cheque book farmers," who maintain valuable studs of horses, cattle, and sheep; men who import high price stock, irrespective of cost, and distribute the progeny at very moderate prices. These men do a great national service.

The improvement of their beef cattle is a very difficult matter, for the natives—Zulus and other powerful tribes—are big cattle owners who do not care about quality, numbers are what they want.

New Zealand's High Standards.

In New Zealand he found a very different country—a most highly cultivated one—a country of intensive cultivation where every acre on the farm is made to pay. It would be difficult to say what they carry per acre, but they have got the price of land too high, and as the holdings are small the sons of the owners are looking to Queensland; and with a little useful advertising we would get quite a number of young farmers with some capital to settle in Queensland. We do not want any more people in the towns, the country is calling for them.

The lecturer said that he did not know any country where there is a finer public spirit than in New Zealand. Go where you will you will find parks and institutions, all either dedicated to the public, or richly endowed by wealthy men who have done well out of the country. They, too, have some excellent State farms, but strangely enough no Agricultural High Schools similar to the one at Gatton.

Concluding, the lecturer said that he believed the greatest message he could leave with his hearers was that they return to their farms with a strong intention of doing bigger and better work in the pig-raising business, and while they had to look to their own livelihood let them remember the great national value of the work in which they were engaged. Let them do that work thoroughly and in accordance with the high ideals with which any great national service is inspired and guided.



PLATE 74.

THE OLDEST AND THE YOUNGEST STUDENT AT THE 1929 PIG FARMERS' SCHOOL OF INSTRUCTION AT GATTON.

Mr. E. Hill, of Beaudesert, and Master Arthur Mills, Gilston School Pig Club, Nanango.



PLATE 75.—THE 1929 PIG FARMERS' SCHOOL OF INSTRUCTION.

Farmers, Students, and Officials on a visit to the Metropolitan Bacon Factories as guests of the Queensland Bacon Curers' Association.



PLATE 76.—A YARD LECTURE AT THE PIG FARMERS' SCHOOL, GATTON COLLEGE, JUNE, 1928.

The Instructor in Pig Raising (Mr. Shelton) is discussing the merits of the Duroc-Jersey sow, used at the College in crossbreeding experiments.



PLATE 77.—WORK IS THEIR HOBBY.

The Staff at the Piggery at Gatton College who assisted in arranging the several demonstrations and whose services were available throughout the School term. On the right is Mr. H. Severns, the venerable "Pig Man," who has looked after the College Piggery for many years and has worked under several Principals.

OBITUARY.

THE LATE COMTE GONTRAN DE TOURNOUER.

The death occurred in St. Martin's Hospital on the night of 13th July of Comte Gontran Louis de Tournouer, B. Litt. (Sorb. Paris), Chevalier of Agricultural Merit, Officier d'Academie, and Librarian of the Department of Agriculture and Stock.

Although he was a notable Frenchman, coming from one of the oldest noble families of Brittany, the late Comte de Tournouer also qualified both in his service with the Australian Imperial Force in the Great War and in his private life in Queensland to the title of a good Australian.

Primarily interested in agriculture he possessed great literary attainments and his ability as a linguist—he could speak fluently every European language as well as Arabic—aided him greatly both in military and civil life. His father and two of his brothers fell fighting for France, each winning high distinction on the battlefield.

Comte de Tournouer was born at Pontivy, Brittany, on 27th August, 1885. He was educated in Paris and graduated in literature at the Sorbonne University. He was about to enter St. Cyr Military Academy when the fortunes of his family suddenly changed and he came to Australia to start life afresh. Going on the land he became engaged in sugar-growing and pastoral pursuits in the Wide Bay district. Later, he joined the Commonwealth Public Service, afterwards transferring to the State Service. He was on the staff of the Government Savings Bank when war broke out in 1914. He enlisted in the Australian Imperial Force for active service overseas on 17th August of that year. He embarked with the Australian Light Horse and saw service with that formation and the Camel Corps on the Eastern fronts; and transferred later to the Fourth Australian Divisional Artillery, and with that unit he was able to return to his native land as a Digger fighting in its defence. Invalided back to Queensland after meritorious field service he was appointed to the Military Censor Staff in Brisbane. After the Armistice he returned to the State Savings Bank and on the merging of some of the activities of that institution with those of the Commonwealth Bank he remained with the Advances to Settlers Board, and in October, 1922, was transferred to the Department of Agriculture and Stock.

In recognition of his services to General Pau's Australian Mission and other useful offices he was awarded by the French Government the honour of Chevalier of Agricultural Merit and Officier d'Academie. Sometime president of the Alliance Francaise in Brisbane, he was afterwards its vice-patron.

He was an able contributor to French and other periodicals on Australian life and agricultural and kindred subjects. On the lighter side of journalism he supplied much prose and verse, and occasionally topical cartoons, to the daily and weekly press, including the Sydney "Bulletin." He was endowed with a nimble and versatile pen—the ever busy tool of a gift of ready expression, of racy anecdote, of whimsical and often piquant humour and other attributes of a well stored mind. This happy combination



PLATE 78.

THE LATE COMTE GONTRAN DE TOURNOUER, B. Litt (Sorb.),
Chev. Merite Agric., O.A.

of gifts was unusual, but his learning always sat lightly upon him. With equal zest he browsed in the past and in the present; his mind fitted from antiquity to ultra-modernity, and he was ever ready to enter the lists of current and ephemeral controversy. Ethnology was one of his hobbies.

As a lightning sketch artist he was always in demand at gatherings of ex-A.I.F. men. A member of the Returned Sailors and Soldiers' Imperial League of Australia he rendered much unobtrusive service to old comrades—sometime of "the toughest veterans in Normandy," who were crocked in the war and to whom he was bound by a common link of suffering and whose lives he sought to brighten and lighten. In this service he forgot his own great physical disabilities—painful legacies of hard campaigning which hastened his own untimely and intensely regretted end. In his last illness he exhibited remarkable cheerfulness, fortitude, and courage. A widow and small daughter survive him, and to them deep sympathy is extended.

At St. John's Cathedral, on Monday, 15th July, a brief and most impressive service was held at which an old friend, the Rev. D. Morgan Jones, officiated and paid a touching tribute to the late Count's character, his gifts of mind and personal charm. The Union Jack and Tricolor draped the casket and on it rested a wreath of poppies.

That morning the late Comte de Tournouer was laid to rest in our own war cemetery at Toowong where the shadow of the Cross of Sacrifice falls athwart the Stone of Remembrance and as evening deepens extends across the Diggers' graves.

"He sleeps as in his dug-out yesternight,
With an old friend in reach on either hand;
God has the jewel, the courteous soul of him;
The dust that eased it lies till wars are done."

The Rev. Mr. Morgan Jones read the simple and beautiful burial service, and the sorrowing gathering at the graveside included Major H. R. Carter (Consular Agent for France), Messrs. E. Griffith Oxley (president), F. O'Sullivan (secretary), Leon Burguez, R. Beardmore, H. Tardent, Mrs. Campbell Brown, Madame Rochat, and Madame Tardent, representing the Alliance Francaise; Messrs. W. C. Warne (secretary) and W. C. Thompson (vice-president), representing the Limbless Soldiers' Association; Major H. Maddock and Mr. A. Rees, representing the Brisbane sub-branch of the Returned Sailors and Soldiers' Imperial League of Australia; Mr. J. H. Holliday (secretary), representing the State Branch of the R.S.S.I.L.A.; Messrs. R. Wilson (Assistant Under Secretary), G. Williams, H. Collard, and H. G. Crofts (Fruit Branch), H. C. Quodling, A. E. Gibson, C. S. Clydesdale, H. S. Hunter, and S. Burchill (Agricultural Branch), Lieut. J. F. Reid (Editor of Publications), Messrs. R. Veitch and J. A. Weddell (Entomological Branch), R. W. Peters (Cotton Section), G. R. Patten (Agricultural Chemist's Branch), R. B. Morwood (Plant Pathological Branch), H. S. Iliff and A. McGown (Stock Branch), M. L. Cameron (Dairy Branch), R. J. Holdsworth (Seeds Branch), A. A. Salmon (Accounts Branch), J. P. Orr (Registrar of Co-operative Associations), and J. Black (Commercial Section), representing the Department of Agriculture and Stock; Colonel Ray Stanley (Government Analyst's Branch), Dr. J. V. Duhig, Mr. T. C. Troedson and Dr. E. A. von Schulze (representing the Intelligence and Tourist Bureau); Mr. Arthur Avins and Lieut. G. Zuckswerdtd.

Answers to Correspondents.

To Soften Greenhide.

J.E.H. (Mapleton)—

After de-hairing the calf skins in a solution of lime water, as you have already done, soak them thoroughly in kerosene, and afterwards apply vigorously any form of grease, provided it does not contain any salt.

Stomach Worms in Sheep.

P.K.C. (Dalby)—The Senior Instructor in Sheep and Wool (Mr. J. Carew) advises as follows:

Regarding stomach worms in sheep, from practical experience I have found the arsenic and Epsom salts very satisfactory, especially when changed every third or fourth drench to bluestone and mustard. Leaflets on both of these drenches have been posted. Besides these I found that through drenching the same flock of sheep year after year many sheep take more dosing to keep them healthy than others, consequently individual treatment suggested itself with the result that certain sheep (breeding ewes) were marked for identification, and these were selected owing to their condition not improving. With these I increased the dose, and in some cases I doubled the dose before getting satisfactory results, and I am convinced that the worse the sheep is from stomach worm infestation the more arsenic they will stand, and further, that it takes more to dispel the worms, for in heavily infested sheep they become anaemic, showing swellings under the jaws. They also get a craving for water and consequently the fourth stomach where the *Strongylus contortus* is located contains more liquid than is usually found in a healthy sheep.

The benefit of changing to the bluestone and mustard every third or fourth drench will be reflected in the sheep. Dr. Clunies Ross, who has been conducting experiments in Central Queensland with carbon tetrachloride, reports that the most effective treatment known at the present time for stomach worm infestation in Australia is the use of carbon tetrachloride, a drug which is also of great value in treating liver fluke infestation. He states that less effective than this is bluestone (copper sulphate), but this drug has the advantage that it is cheaper, easily administered, and very safe. The object of the medicinal treatment of sheep is not only to cure them of the effect of worm infestation, but secondly, and more important perhaps, to kill the worms in them so that they can no longer produce eggs to contaminate the pastures further. He further states in practice, however, this is not practicable under Australian conditions:—(i.) Because there is no drug known which can be guaranteed to kill every worm and (ii.) because in many instances it is impossible to drench all sheep every three or four weeks throughout the spring, summer, and autumn months. It is possible, however, to reduce losses from worms to a minimum and to convert what is unsound country because of worms into payable sheep country.

Treatment with carbon tetrachloride is given in the following doses:—

Lambs, 1 cubic centimetre or 17 drops;

Adult sheep, 2 cubic centimetres or 34 drops.

Owing to the small size of the dose the drug must be given in such a way that none of it is lost. It may be administered conveniently (a) in gelatine capsules of 1 cc. or 2 cc. size, or (b) mixed with four parts of liquid paraffin—making a dose of 5 cc. for lambs and 10 cc. for adult sheep.

Before treatment.—The sheep should be yarded overnight and dosed on the following morning before being allowed food and water. They may be allowed food as soon as they have been treated with this drug. When administering capsules it is best to use a small balling gun, which can readily be made by taking a piece of stiff rubber tubing approximately 9 in. in length, with an internal diameter of $\frac{3}{4}$ in. A plunger of cane or wood should be smoothed down so that it runs easily in the barrel, and

should be sufficiently long to form a handle on which a guard should be fixed to allow the plunger to be driven home to $\frac{1}{2}$ in. from the end of tubing.

The operator stands in front of the sheep, the catcher opens the mouth by grasping both upper and lower jaws, the barrel is inserted and pushed backwards over the base of the tongue, and the plunger driven home to expel capsule.

Administering the liquid.—When the liquid is used it should be given by means of a metal syringe holding exactly 5 or 10 cc., according to whether lambs or adults are to be dosed, and fitted with a long slightly curved nozzle. The syringe is filled with the liquid, the nozzle inserted over the sheep's tongue, and the syringe emptied steadily. Owing to the fact that carbon tetrachloride evaporates quickly, only a small quantity at a time should be poured from the container into the vessel from which the liquid is filled. The ingredients for the copper sulphate drench are—Blue-stone, 8 oz.; water, 3 gallons. Dose for adult sheep, 2 fluid oz.; for 2-tooths, $1\frac{1}{2}$ fluid oz.; lambs, 6 to 12 months, 1 oz.; lambs, 3 to 6 months, $\frac{1}{2}$ oz.—which is stronger than the dose recommended by this Department, minus mustard.

A plan of treatment that would last over the year is also given as follows:—

(i.) All sheep to be treated in July. The degree of infestation both in sheep and pasture is at its lowest at the end of winter, owing to the fact that cold is unfavourable to the development of eggs and young worms. If thorough treatment of all sheep is carried out at this time the great majority of all worms will be killed, so that on the event of the warmer weather in the spring, when development becomes more rapid, few eggs will be passing out on the pasture.

(ii.) All young sheep and lambing ewes and if possible all sheep to be treated in September. Treatment at this time will again decrease the output of eggs.

(iii.) Treatment of young sheep and lambing ewes must be repeated at monthly intervals from November to May.

(iv.) All aged sheep other than ewes in lamb should receive at least two drenchings during the worst summer months. Though all aged sheep receive at least two treatments in January and March it is preferable, where only small numbers of sheep are to be drenched, for all sheep irrespective of age to be given the monthly drenchings from November to April.

Preventive Measures.—(i.) Burning-off paddocks. (ii.) Protection of young sheep. (iii.) Heavy stocking to be avoided. (iv.) The use of lieks.

In conclusion, Dr. C. Ross wishes to urge the necessity for sustained action in any effort to control worm infestation. He writes it is by no means an easy problem, and there is no sovereign remedy which is both very cheap, easy to apply and thoroughly effective. Stockowners must realise that the solution of this problem will depend on the thorough application of not only one but all the measures outlined, but they may be assured that success will more than repay all the money and energy expended. In connection with lieks, there are many on the market which are registered and carry the maker's guarantee.

FRUIT GROWING.

Winter Watering of Apricots.

H.G.H. (Wondeela)—

The Director of Fruit Culture (Mr. Geo. Williams) advises that there is no occasion to water apricots during the winter months. Light watering just before they come into growth would assist in stimulating the tree generally, and a further supply after the fruit has set would also be beneficial. The hidebound condition of bark suggests that the position is uncongenial, and a dressing of complete fertiliser prior to spring growth is recommended.

BOTANY.

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

Panicum gracile.

J.L.W. (Chinchilla)—

Your specimen of grass is *Panicum gracile*, fairly common in Queensland and New South Wales, and ranging from the coast to the interior. It grows in a variety of situations, and in better class soil in the West is fairly drought-resistant. It is relished by stock, and has a fairly high nutritive value. Most of the native Panic grasses are very useful in the general mixed pasture. We have not heard of a common name applied to it, but it has been referred to in several works on Australian grasses as the "Slender Panic Grass."

"Crane Bill" or "Native Carrot"; "Potato Bush."

E.J.T. (Charleville)—

The small plant with hairy leaves is a young growth of some plant of Geraniaceæ, I think *Erodium cymosum*, the "Crane Bill," generally regarded as a good fodder, and known in Western Queensland as Geranium or "Native Carrot." The latter name is, however, applied to quite a number of different plants.

The other plant with berries is *Solanum Sturtianum*, a species of "Potato Bush," fairly common in parts of Western Queensland and New South Wales. In the latter State, feeding experiments have proved the plant to be poisonous. The symptoms, as outlined by the investigators (Dr. H. R. Seddon and Mr. H. R. Carne), have been described as follows:—

1. The eating of the berries by stock leads to a fatal hæmorrhagic inflammation of the stomach and intestines.

2. Symptoms of illness are not manifested for a day or more after taking the parts and the first notice is that the animal becomes markedly depressed. Soon violent diarrhoea ensues and this leads to a marked weakness and wasting. Death usually occurs in from two to three days, though animals may linger longer. Other symptoms noticed were frothing at the mouth and slow breathing.

3. On post-mortem examination a most marked change was seen in the stomach and intestines. In this the lining membrane is dark red, and may be soft and tarry-looking. Blood and mucus are mixed with the bowel contents.

Tie Bush.

A.W.A. (Gympie)—

Your specimen is *Wickstroemia indica*, the "Tie Bush." The local name is applied on account of the fibrous nature of the bark. It has been suspected of poisoning stock on several occasions, but feeding experiments with it, conducted at the Stock Experiment Station, Yeerongpilly, some few years ago, show it to have very little ill effect on cattle. It is very hard to get cattle to eat it, and after about a fortnight's feeding, the animals become very emaciated, weak, and rather constipated, but no other ill effects follow, and it is doubtful if paddock stock would eat sufficient of the plant to cause trouble.

Asthma Weed—Rosemary.

M.C. (Lota)—

The Asthma Weed (*Euphorbia pulifera*), is very common at certain times of the year in the neighbourhood of Brisbane, particularly favouring edges of cultivation paddocks, and the ballast along railway lines. In fact, in a walk along any railway line in the neighbourhood of Brisbane during the summer months, you will see plenty of Asthma Weed, which is a reddish plant covered for the most part with small hairs, and exudes milky juice when cut or broken.

Rosemary does not grow wild in Queensland, though it may be seen in gardens. If you cannot get it from the local nurserymen I might mention that plants are sold in some of the Southern States, for instance by Messrs. Hazelwood Brothers, Epping, New South Wales, at 1s. 6d. each.

Plants Identified.

T.H.B. (East Barron, via Atherton)—Your specimens are:—

1. *Sida cordifolia*, the Flannel Weed, of Family Malvaceae, a common weed widely spread over the tropical regions of the world and very common in North Queensland.
2. *Ageratum conyzoides*, a native of Mexico and tropical America, very common as a weed in most tropical countries. It was introduced into Australia as a garden plant, and as a matter of fact is still planted extensively in the Southern States as a bedding plant, the cultivated forms however being somewhat more compact than the wild one. In Queensland it is most familiarly known as "Billy Goat Weed."
3. *Cenchrus australis*, Hillside Burr Grass, or Scrub Burr Grass, a native grass commonly known in Queensland by the absurd name of "Scotchmen's Lice."
4. *Antigonon leptopus*, a native of Mexico and Southern America, and commonly known abroad as "Mountain Rose" or "Loves Chain"; in Queensland, however, it is known by its botanical name. It belongs to the family Polygonaceae.
5. *Angelonia* sp., family Scrophulariaceae. We have had this plant in the Botanic Gardens, Brisbane, for some years, and it has always gone under the name of *Angelonia floribunda*, a native of Mexico, but we are not absolutely sure of the specific name being correct.

Central Western Plants Identified.

A.M.McL. (Springsure)—Your specimens are:—

- D.D. *Eremophila maculata*, Fuchsia Bush, family Myoporaceae.
 E.E. *Myoporum deserti*, Ellangowan Poison Bush, family Myoporaceae.
 F.F. *Gnaphalium luteo-album*, Cudweed, family Compositae.
 G.G. *Abutilon* sp., family Malvaceae. Specimen too small for specific determination.
 H.H. *Acacia excelsa*, Ironwood Wattle, family Leguminosae.
 I.I. *Loranthus exocarpi*, a species of Mistletoe, family Loranthaceae.
 J.J. *Petalostigma quadriloculare*, Quinine Berry, family Euphorbiaceae.
 K.K. *Alphitonia excelsa*, Red Ash, family Rhamnaceae. Generally regarded as a very useful fodder tree.
 L.L. *Solanum* sp. A species of Potato Bush, family Solanaceae. Members of comparatively large genera such as Solanum and Abutilon, in which many of the species are alike and not clearly defined, are often impossible to name specifically from small pieces.

Knotted Clover.

R.J.G. (Kinleymore, Preston Line)—

The plant is a species of Clover or Trefoil, but these plants are very hard to determine specifically before the flowering stage. We have spent some little time on your specimen however, and should say it is *Trifolium striatum*, the Knotted Clover, a native of Europe, naturalised in the Southern States, but not previously met with in Queensland, and we should say your plant was evidently introduced with Southern seed. The plant is of annual duration, but during the winter and early spring months gives a fair amount of nutritious fodder. If the plant flowers with you later, we should be glad of a specimen to verify the determination.

Black Mauritius Bean.

E.M.C. (Mackay)—

Your specimen is *Stizobolium aterrimum*, commonly known in Queensland as the "Black Mauritius Bean," and largely grown in some places as a green manure, particularly for cane. It is sometimes known in Queensland as the "Florida Velvet Bean," but the true "Velvet Bean" is a somewhat different plant. Though the "Black Mauritius Bean" is very widely cultivated in tropical countries, the beans seem never to be used for food. Allied species have been tried, but though the flavour was not unpleasant, they were found to cause purging and vomiting if eaten in ordinary quantities.

A Native Species of Passion Vine.

W.L. (Traveston, N.C. Line)—

Your specimen is *Passiflora Herbertiana*, a native species of Passion Vine. Both the leaves and fruits contain a prussic-acid-yielding glucoside, and if eaten in quantity would act on stock in much the same way as young sorghum and similar plants, death being very rapid.

Caustic Creeper.

INQUIRER (Brisbane)—

The specimens forwarded from Evesham Station, near Longreach, have been determined as follows:—The smaller leaved kind is the Caustic Creeper *Euphorbia Drummondii*, commonly known in Queensland by its botanical name. This plant is very widely spread in Australia, and reports about its poisonous properties are very conflicting. In New South Wales tests have found the plant to frequently contain a prussic-acid-yielding glucoside, the plant causing trouble in somewhat the same way as young Sorghum, death being very rapid. Numerous tests, however, have been made with the Queensland-grown plants of the same species, and the poisoning sometimes found was distinct from that of prussic-acid poisoning. In the more serious cases the most characteristic feature is stated to be a swelling which then exudes a clear amber-coloured liquid. The head and face then appear as if they had been badly burnt, but the sheep usually recover.

The other plant is another species of Euphorbia, namely *Euphorbia eremophila*, commonly known in Queensland as the "Bottle Tree Caustic." This plant is widely spread over the Australian States, going from Eastern Australia right over to Western Australia. Where it grows it is generally regarded as poisonous.

"Cunjeboi."

S.W. (Brisbane)—

The specimen forwarded with your letter of even date is *Alocasia macrorrhiza*, commonly known in Queensland as "Cunjeboi." This plant contains in its tissues a considerable number of raphoides of calcium oxalate. These are contained in small capsules, which become ruptured when the plant is chewed, with the consequence that they enter the tender parts of the mouth and cause intense pain. It belongs to the family Araceae, and this is a property that occurs more or less through the family. The roots, however, after cooking are quite edible, as for example in the well-known "Taro" and "Dasheen," both very closely allied to the "Cunjeboi."

Guinea Grass.

D.S.McN. (Nambour)—

The specimen forwarded by you is Guinea Grass, *Panicum maximum*. As the name implies, it is a native of Guinea in tropical Africa, but is now widely spread throughout all the tropical and subtropical regions of the world. It is a tall growing grass, forming large tufts of leafy forage, which makes a change from the common Paspalum and Rhodes grass. It is a drought-resistant grass and is adapted not only for feeding but also for chaffing and ensilage. Though the grass has been reported on favourably, it never seems to have taken on extensively. Along the North Coast line it is most abundantly seen as a weed in cultivation, particularly of orchards.

***Paspalum platycaule*—Carpet Grass.**

R.M. (Mooloolah)—

Paspalum platycaule, or Carpet Grass, is a native of the warmer parts of America, but now widely spread over the tropical regions of the world. It is very common in North Queensland and less so in the south. It has rather a mixed reputation as a fodder, but seems to be a useful grass for growing in poorer soils than those in which the ordinary Paspalum will thrive. It is very similar to, and has been confused with the smaller grass, Paspalum or *Axonopus compressus*. This has somewhat narrow leaves, and is considered a better fodder. You could, perhaps, employ it for smothering out the *platycaule*.

Figs and Other Queensland Plants.

B.F.K. (Teneriffe, Brisbane)—

1. Is the name *Brachychiton* to be preferred to *Sterculia*? We think so. The only true *Sterculia* would then be *S. quadrifida*. If you are publishing notes on the timbers, however, we would advise you to use both names, giving one of them in brackets.
2. What is the distribution of *Erythrina vespertilio*. From the coast right to the far interior, travelling into Central Australia. It goes along the whole range of the coast at least as far north as Cooktown and then along to the Northern Territory.
3. What is the range of *Erythrina indica*? Mostly the islands of Torres Strait, and in coastal localities as far south as Bowen, growing practically on the sea beach. It has been recorded from Tallegalla by the late F. M. Bailey. This last is rather an isolated locality.
4. In what parts of Southern Queensland has *Embothrium Wickhami* or a variety of it been recorded? The normal form is confined to North Queensland, but a variety, *var. pinnata*, occurs on the mountain ranges of south-eastern Queensland, the only two localities we know being Lamington National Park, and Springbrook. The same variety grows on the Warrego in New South Wales.
5. The distribution of the six principal Figs? This is rather hard to give, but we should say the following are among the commonest Queensland Figs:—

Ficus macrophylla, the Moreton Bay Fig, mostly in the south, but in a few isolated localities as far north as Bowen.

F. Watkinsiana, almost the commonest fig in the rain-forests or scrubs of south-eastern Queensland. It is very common on the ranges in the South, on the Bunya Mountains, and at Kin Kin.

F. Cunninghamii, along the whole coast, trees attaining a very large size.

F. p'atypoda, common along the whole coastal country, often in the open forest.

F. p'eurocarpa, common everywhere on the Atherton Tableland.

F. colossa, Northern Queensland. The big tree you see in so many photographs of Northern Queensland is supposed to represent this species.

F. glomerata, very common along the rivers from the Wide Bay district to the Gulf Country.

PIG RAISING.

(Selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.)

The Best Bacon Pig.

W.J.S. (Inglewood)—

The question as to the most suitable breed of pig is largely a matter of personal opinion, for practically every breeder has his own fancy, and the bacon factories have not definitely stated which type they prefer.

A series of experiments are in progress at the Gatton College in which representative pigs of various breeds are being crossed for the production of pure and cross-bred pigs, the objective being the production of the most suitable type of bacon pig. Special features being emphasised in these experiments are, prolificacy, early maturity, suitability for market requirements and economy in production.

The Poland-China pig appears to be a very useful type for the production of pork and bacon pigs, particularly when it is crossed with a more lengthy breed like the Tamworth and similar types. We would not recommend the breeding of purebred Poland-Chinas for bacon production, for the reason that the crossbred pig appears to give better results. The same may be said with regard to the Duroc-Jersey, although no doubt it would be possible to produce a purebred animal in this breed suitable for market requirements.

The Berkshire has been a very popular type for many years, and during recent years the Tamworth crossed with the Berkshire has been a very popular one. The Berkshire-Yorkshire cross is also a particularly good one, particularly for the production of porkers or bacon pigs where the conditions are specially suitable, and there is no doubt that there are many advantages to be obtained in the use of the cross by using a Yorkshire boar.

Prices for stud pigs can be usually based on a valuation of approximately one guinea per month, starting at about four guineas at three months to approximately twelve guineas or so as yearlings.

Specially selected boars or extra good quality sows in-pig would, of course, be higher than inferior quality stock. We believe in better quality pigs, and strongly recommend breeders to secure the very best it is possible to obtain in the breeds in which they are interested.

IS THIS A JERSEY RECORD ?

From the English Jersey Cattle Society, 19, Bloomsbury Square, London, W.C.1, come particulars referring to the cow Rosemary. Her last calf was born 25th April, 1926, and up to 25th April, 1929, she has given 23,670½ lb. of milk, and was then still giving 10 lb. of milk per day. Her last butterfat test was—evening 6.2 per cent., morning 5.45 per cent.

Owned and bred by Mrs. H. E. Jerome, Pittern Hill House, Kineton, Warwickshire, she was born 1st July, 1914, and has had eleven calves, ten of which are heifers.

Her weight is only 8 cwt. 14 lb., so that in three years she has given more than twenty-six times her own weight in milk with the one calf, and still giving a gallon of milk a day.

The English Jersey Cattle Society asks if this is a record.

PHYSIOLOGY OF MILK PRODUCTION.

Recent research has thrown much light on the physiology of the act of milking, on which subject some varying theories were previously entertained. An American authority, writing in the "Guernsey Breeders' Journal," states that as soon as the milking act begins a small quantity of milk is removed from the cistern and larger ducts. There then follows a short period when only a small quantity of milk can be obtained. Soon there seems to be a great inflowing of milk into the udder. One says that the cow has "let down" her milk, or that the milk has "poured in." It is this reaction that has caused many to come to the conclusion that milk secretion goes on at a rapid rate during the act of milking.

In addition to the manipulation of the teats at the beginning of milking there are other types of stimuli which cause some animals to let down their milk. There is apparently considerable variation, and animals once becoming accustomed to certain types of stimuli react more quickly to that and sometimes will not respond to the ordinary causes. This factor undoubtedly is extremely important with large producing cows, and explains why some feeders and milkers get much better results from certain cows than others.

It has been found unnecessary to remove the milk to produce the effect described. The sight of the calf, the manipulation of the teats and massaging of the udder, or the swinging of the udder during a long walk from pasture produces the same effect. It seems evident, therefore, that the reaction is not due to a simple release of pressure in the udder. It seems very probable that it is a nervous reaction. This idea is further substantiated by the reaction of some cows to other types of sensory stimuli, such as the noise of milk pails and other dairy equipment. The noise of the milking machine will also cause these phenomena. Some cows will respond only to feed, and unless fed at milking time will "hold up" their milk. The "letting down" of milk may also appear spontaneously when the interval between milking is increased. It is said, however, that the process is more gradual under these circumstances.

The time that passes from the moment of the stimulation to the "letting down" of the milk varies with individuals between one-fourth and two minutes. It is thought that fresh cows react quicker and more clearly. A noted authority states that not every stimuli applied to the teat will cause the reaction. Stimulation with a needle or an electric current was without effect.

General Notes.

Protection of the Large Spotted Opossum.

An Order in Council has been passed providing for the total protection of the Large Spotted Opossum or Cuscus (*Phalanger maculatus*).

Aliens and the Sugar Industry.

A regulation has now been passed whereby any person engaged in any phase of the sugar industry who employs therein any alien to whom "*The Sugar Cultivation Act of 1913*" applies, must furnish to the Under Secretary, Department of Agriculture and Stock, on the 31st December in each year, a statement in respect of such employees. Any person who is guilty of any contravention of this regulation shall be liable to a penalty not exceeding ten pounds.

Registration Envelopes.

The Postal Department invites attention to the fact that, in order to meet the convenience of persons and firms who would find use for registration envelopes of foolscap size, it has introduced an envelope 9 inches by 4 inches, manufactured of stout paper, and eminently suitable for the transmission of legal documents. The price of the envelope, which is impressed with postage to the value of 4½d., is the same as that charged for the smaller registration envelope—namely, 5½d.

Staff Changes and Appointments.

Constable J. E. Linnane, Merinda, has been appointed Inspector of Slaughter-houses.

Mr. W. W. Farquhar, Shire Clerk at Eidsvold, has been appointed Officer under and for the purposes of the Animals and Birds Acts, in the room of Mr. R. Farquhar, deceased.

Messrs. J. Legg, D.V.Sc., M.R.C.V.S. (Townsville), E. C. Lake (Mareeba), and D. A. Logan (Mackay) have been appointed Collectors of Royalty for the purposes of the Animals and Birds Acts.

Mr. J. L. Froggatt, Department of Agriculture and Stock, has resigned his position as Entomologist as from the 14th August, 1929. Mr. Froggatt is taking up the position of Entomologist to the Territory of New Guinea.

The appointment of Mr. G. P. Randles, of Zillmere, as an Inspector of Slaughter-houses, has been confirmed as from the 21st January, 1929.

The appointment of Mr. Thomas Douglas, Kingaroy, as an Inspector under "*The Diseases in Stock Act of 1915*" has been confirmed as from the 4th January, 1929.

The appointment of Mr. K. King, Cooran, as an Inspector under the Diseases in Plants Acts has been confirmed as from the 23rd January, 1929.

Mr. S. R. C. Harding, Manager of Westgrove Station, has been appointed an officer under and for the purposes of the Animals and Birds Acts.

Mr. W. S. Waugh, of Dalby, has resigned his position as Acting Inspector under "*The Diseases in Stock Act of 1915*" as from the 31st July, 1929.

Mr. J. W. Thompson, of Mayne Junction, has been appointed an honorary officer under and for the purposes of the Animals and Birds Acts.

Mr. B. Dumbavand, Inspector of Slaughter-houses, Ingham, has been appointed also an Inspector under and for the purposes of the Diseases in Stock Act.

On account of ill-health, Mr. W. S. Harding, Inspector of Dairies, Rosewood, has been retired from the Public Service as from the 21st June, 1929.

Mr. Kenneth McL. Gordon has been appointed an Inspector on probation, Agricultural Bank.

The following have been appointed Honorary Inspectors under and for the purposes of the Diseases in Plants Acts:—Messrs. William Smellie, Langshaw; Cecil Quodling, Eel Creek; Bert Du Rietz, Eel Creek; Michael Nolan, Langshaw; and Arthur Robert Deighton, of Yandaran.

The retirement of Mr. F. G. Connolly, of Rockhampton, from the Public Service, as from the 30th June, 1929, has now been cancelled.

Atherton Maize Board.

The period of time for payments by the Atherton Tableland Maize Board has now been fixed from the commencement of the season in each year during which the board may be constituted under "The Primary Producers' Organisation and Marketing Acts, 1926 to 1928," until the commencement of the season in the next year. This period of time has been prescribed in accordance with a section of the Acts which lays down that the payments to each grower of the commodity delivered to the board are to be on the basis of the net proceeds of the sale of all the commodity of the same quality delivered to and sold by the board during such period of time as may be prescribed.

Peanut Board Election.

Nominations for the appointment of members to the Peanut Board are:—

District No. 1 (Nanango District) two members—

Charles Frederick Adermann, Wooroolin.

Frederick Christian Petersen, Kingaroy.

District No. 2 (Central District)—

Alfred Skinner Clark, Sandhills.

District No. 3 (rest of Queensland)—

Albert Charles Perske, Degilbo.

Only four members were required and the old board with the exception of Mr. Malcolm Redman, who did not seek re-election, will be appointed for a further term of one year as from the 1st September, 1929. Mr. Petersen is the new member on the board.

The Royal Society of Queensland.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre of the University on Monday, 24th June. The President, Dr. J. P. Lowson, was in the chair.

Mr. G. H. Hardy read extracts from his paper, entitled "Revisional Notes on the Tribe Brachyrrhopalini; with Remarks on the Habits of and Mimicry Amongst Robberflies." He discussed the generic alliances of species included in the tribe, and incorporated keys to the five genera and fifteen species constituting the group. Observations on the habits of robberflies indicated the possibility that mimicry amongst robberflies may occur, and evidence may be obtained from the fact that certain species regarded as being wasp mimics have habits differing from those of their nearest allies. Particular attention was drawn to *Erythropogon limbipennis* (Macquart), which does not seem to be predaceous.

Dr. T. G. H. Jones read extracts from his paper on "A Contribution to the Chemistry of the Oily Exudate of the Wood of *Pentaspodon motleyi* (Papua)."

The exudation from the wood of *Pentaspodon motleyi* on examination has been found to consist essentially of apparently homogeneous acid material, for which the name pentaspodonic acid is proposed. Conclusions as to the constitution of this acid are drawn from various experiments recorded, and it is considered that the acid has a molecular composition $C_{22}H_{34}O_6$. Two unsaturated linkages are present in a long side chain attached to a benzene nucleus. The acid, which is monobasic, also contains one phenolic group.

The Secretary, Mr. F. A. Perkins, M.Sc., read extracts from the paper by John Legg, D.V. Sc., and J. L. Foran entitled "Some Experiments on Tick-infested Cattle with Arsenical Dipping Fluids." The following took part in the discussion which ensued: Dr. Jones, and Messrs. Pound, Jones, Perkins, Henderson, and Schindler.

Mr. H. A. Longman exhibited a small slab of fossiliferous limestone which had been found by Miss Marion Rowland amongst rocks considerably above high-water mark on Magnetic Island, North Queensland. This slab contained, amongst other remains, several specimens of Barnacles, apparently *Coronula* sp., present-day species of which are found parasitical on whales. Evidently this slab had been detached from its original statum, and if this could be traced it would be of considerable interest.

Mr. Longman also exhibited specimens of the lower jaws of *Macropus anak* and *M. raechus* from the Darling Downs, which he considered were distinct species as indicated by Owen. He could not agree with De Vis in "lumping" both of these under *Macropus anak*.

The Astor Aeroplane—a Pioneer of Commercial Aviation.

A winged visitor has come up from the South. It is the Astor Radio Aeroplane, the pioneer of aviation applied to commerce in Australia.

Owned and operated by the distributors of the famous "Astor" Brand of Radio Receivers, the Astor Aeroplane has come north under the instructions of the Queensland Distributors—Queensland Pastoral Supplies, Limited, of Brisbane—in continuance of a Commonwealth-wide campaign on behalf of Astor Radio, in which it is planned to cover 800,000 square miles. Already both Victoria and South Australia have been extensively toured and practically every town of prominence visited, including several in which an aeroplane has never before landed.



PLATE 79.—CAPTAIN FRANK ROBERTS.

An ex-Australian Air Force pilot, and a pioneer in the field of commercial aviation in Australia.



PLATE 80.—THE ASTOR AEROPLANE. A COMMERCIAL PIONEER ON COUNTRY AIRWAYS.

The Astor Radio Aeroplane is a Gypsy-Moth of the latest pattern fitted with the slotted-wing safety device, it is distinctively painted in the black and orange colours of the "Astor" brand. The pilot is Captain Frank Roberts, an ex-war pilot with a distinguished record, who has been engaged in pioneer flying for some years.

Apart from the commercial value of this aerial campaign in introducing radio to the scattered population of this State, the Queensland Pastoral Supplies, Limited, are to be complimented on the singular service they are performing in thus commercially pioneering country airways, and in the awakening of country authorities to the need for establishing properly marked out landing grounds.

The value of commercial aviation to Australian commerce is incalculable, but it will afford some idea of the benefits received when we consider that the special Astor Sales Organiser travelling in the "Astor" plane as passenger completed a gigantic sales tour embracing visits to over 200 towns in the space of little over three months, while it would have taken him approximately eighteen months to have covered the same territory by rail and road.

The lack of suitable landing grounds, however, has proved a formidable obstacle to the successful accomplishment of this enterprise; in some cases the "Astor" plane being compelled to make risky landings, in one instance in a main street, in another in a marsh.

The response of country municipalities and shire authorities to the responsibility of establishing landing grounds both in Victoria and South Australia has been very encouraging, and this responsibility is becoming recognised in Queensland where the conditions of aerial travel is otherwise so excellent.

A Bush Remedy.

Few people realise the value of the common milk thistle. The milk from this plant is about the best cure for warts that I know of (says a correspondent of the "Sydney Mail"). While going to school in the bush I was told by an old shepherd that the milk would take a fine crop of warts that I possessed right away. I followed his advice, and a few applications of the fluid proved him to be right. That gave me an idea, and I next tried it out on warts on the teats of our milking cows. These growths disappeared, too, and I now never fail to recommend the thistle as a cure for any kind of warts. Tea made by boiling the stalks in water and then straining the fluid is particularly soothing to the nerves, and I have met people who were very insistent that milk thistles would eventually prove to be the only cure for cancer.

Still Room for Adventure.

"The Elizabethan merchant," did his full share in building the British Empire. He was at once an explorer, a trader, a fighter, and a diplomat, and in the latter capacity was not possessed of a too sharply-drawn idea of propriety. While to-day there are no such uncharted territories left, there remain opportunities, for him who would, to make his life one of adventure. The spirit of adventure can be as much a state of mind as a condition of geography. If properly encouraged, the young men of this country could and would build into their lives days of fascinating romance, achievement, or overcoming of obstacles. They need not go to foreign countries to do so. When a young man in America or Canada applies for a post, he asks: 'What is the chance to work up?' and a favourable reply is regarded as of even more importance than the immediate wage. I would like to see that spirit permeating every young man in England to-day. Adventure leans on courage, on enthusiasm, on willingness to risk, on strength of purpose, on indifference to obstacles, and on appreciation of the value of time."—Mr. Gordon Selfridge.

Individuality.

"Those who awake in early life to a fear that they are in danger of being intellectually equipped with bows and arrows to fight in a world where their elders and betters use powder and shot, dimly recognise that individuality is their heritage, and they seek it—or the atmosphere in which it develops—within the confines of their environment. One does not have to be a student of the art of education to come in contact with this ideal," said Mr. H. Lynton Fletcher, of the B.B.C., in a lecture before the Royal Society of Arts on "Educational Broadcasting." "All our literature is full of it. Pestalozzi gave it to the world; Froebel philosophised about it and developed it; Herbert wove a psychology round it; Montessori is full of it; William James never allows one to forget. Sanderson of Oundle applies the principles which underlie it, as, in a lesser degree, Thring of Uppingham did before him. Every psychologist, philosopher, and schoolmaster writes and speaks of it. It is, in fact, universally recognised as the great ideal of education."

The "Astor" Wireless.

The "Astor" wireless, which is so well and favourably known in New South Wales and Victoria, is now being handled in Queensland by the Queensland Pastoral Supplies, Limited. The "Astor" embraces the shielded neutrodyne plus the new screen grid valve and one dial control.

A wide range is kept in stock embracing the all electric and battery series. It is only necessary to turn the switch and one dial to get into touch with Japan, New Zealand, and all Australian stations. Also the duo symphonic radio, which embraces gramophone and wireless. So perfected are the "Astor" sets that the agents give an unconditional guarantee or money back. Easy terms can be arranged if desired. A fine art wireless catalogue setting out the various models is now ready, and will be sent free on application.

Most of the "Astor" models will give daylight reception of all Australian stations.

The catalogue may be obtained by applying to the Queensland distributors, the Queensland Pastoral Supplies, Limited, Brisbane.

Speed the Plough.

The plough is the forerunner of all implements, and the mainstay of thorough cultivation; therefore, the ploughing should receive careful attention. If we fail to plough the land carefully, we neglect the most important feature in the preparation of the land for a crop; whereas, if thoroughly ploughed at an even depth, other implements can also do good work, and the crop will grow more evenly than if badly ploughed. Many consider as long as the surface is turned over it is immaterial whether the work is done evenly or otherwise. Others, however, more experienced in cropping, will, no doubt, have noticed that a field ploughed unevenly, or one that has been roughly disced after ploughing, has practically the same effect—the soil is more or less in ridges. When this is so, there is a greater depth of the richer soil in some parts than in others. In other words, the soil is removed from certain parts, and heaped upon the other parts, thus leaving the well-ventilated or sweetened soil very unevenly distributed. The result of this is that the crop will grow better on the ridges, while in the hollows the foliage will wear a more starved or stunted appearance. It is, therefore, apparent that if an even crop is expected, it is essential that the land should be well ploughed, and afterwards well cultivated. Atmospheric nitrogen is composed chiefly of nitrates and ammonia, and reaches the soil dissolved in rain, as in other forms of water, such as snow, hail, fog, or hoar frost, &c. It is also absorbed by the soil from the air, especially when the soil is in a damp condition. Therefore, soil that has been thoroughly cultivated is in a better condition to draw and retain atmospheric nitrogen, hence the necessity of perfect cultivation.—The "New Zealand Farmer."

Beauty and the Bucket.

It is a common thing for a man who has a poor herd of cows to say that he has "no time for fancy points." He regards the cow which has beauty and symmetry as a "fancy" cow, and the horse that can win a prize as something not worth the attention of a "practical" farmer.

To what extent is this very general opinion justified? Is there in our show rings and in our studs any great difference between our ideas of beauty and of symmetry and the capacity to produce? We think not. Certainly there should not be.

The ideal Clydesdale of the show ring is the horse which, in the view of the most able of our judges, is perfectly equipped for his work. The Clydesdale horse is bred to give service in haulage, and the type we want is that which will give us the greatest power with the least fatigue and the least wear and tear. To ensure that there shall be the least wear and tear, we study conformation; we decide on the best shape of shoulder, on the length and set of pastern.

The ideal beef bull is the beast that will get steers which will carry the greatest quantity of desirable beef at the earliest age. Conformation is our guide again.

The ideal dairy cow is the cow which, year after year, will give us a strong, vigorous calf, and a profitable amount of milk and butterfat. Vigour, capacity for feed and dairy temperament are as necessary as the inherited capacity to produce, and so we look for these points. Conformation—show ring type if you will—is our guide again.

These desirable and "practical" points in a beast are usually associated with more or less beauty and symmetry of form. We call the beast beautiful, or good, which exhibits desirable points of conformation, because, after all, "handsome is as handsome does."—"Live Stock Bulletin."

The Home and the Garden.

OUR BABIES.

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

YOUR CHILD'S TEETH.

The first or temporary teeth are formed long before birth. Every baby is born with a mouthful of teeth, though they are under the gums and cannot be seen. Somewhere about the seventh month—the exact age varies much even in healthy babies—the first tooth appears, usually a lower middle incisor (or front tooth). Within the next two months all the incisor teeth may be cut. About the beginning of the second year the first milk molars (or back teeth) appear. At about eighteen months the canine or eye teeth emerge between these and the incisors; about the end of the second year the second milk molars. This completes the first set of teeth, twenty in all.

Teething is not a disease. It is a perfectly healthy process which often gives rise to no trouble at all. At the worst there may be a little fretfulness and dribbling, when the gums are swollen, in a healthy baby. When a baby is sick from any cause the uncut teeth appear to ache, and the mother is apt to mistake this aching for the cause of the illness. As all babies are "teething" from six months to two years of age, this is a very convenient excuse for all the troubles caused by want of knowledge and care.

At birth the crowns of the first permanent molars are already beginning to form; those of all the other permanent teeth are formed inside the gums during the first three years of life, though they do not appear until much later. The first permanent molars appear at about six years behind the milk molars. They are often mistaken for temporary teeth, and allowed to decay early—a very serious error, for they are intended to last a lifetime. Within the next two years the roots of the temporary incisors are absorbed and they fall out, to be replaced by permanent teeth. Within another two years the same happens to the milk molars, later still to the canine or eye teeth, and the second permanent molars appear. The last or wisdom teeth, which complete the permanent set of thirty-two, come much later.

The Formation of Good Teeth.

No care after birth will affect the formation of the first set of teeth. To have good teeth the baby must be born of a healthy mother, one who takes plenty of fresh air and exercise, who chooses her food wisely (including fresh milk, eggs, uncooked fruit, and vegetables), but does not eat overmuch, who takes no alcohol, who is not troubled by indigestion (perhaps caused by her own bad teeth), constipation, or kidney disease, and who can thus supply the good blood out of which good teeth are made.

As the permanent teeth are formed in the first three years of life, their good development depends on the care that is taken of those years. For their perfection and durability the baby should be suckled with human milk, the only substance which contains all the materials for forming good teeth in best proportions. If the baby has, unfortunately, to be bottle-fed he should have good cow's milk by preference and a small quantity of cod-liver oil may be advantageous.

The Dummy Condemned.

He should have no "dummy," which tends to deform the jaws and crowd the teeth so that they cannot develop properly. After weaning he should be carefully fed with right foods.

When the baby is six months old he should have a bare bone to bite. When he is nine months old he should have a tiny crust or finger of bread baked hard and crisp in the oven. Thereafter he should be given baked bread instead of soft bread

and butter. His crusts should be hard and crisp but not tough. Before he is two years of age baby should have learnt to bite other hard foods, including a piece of raw apple, which is a good teeth cleanser. Jaws that do no work and have no exercise will not grow strong teeth. Mothers are destroying teeth by feeding babies entirely on pap and mush.

Any serious illness or prolonged failure of nutrition during the first three years, although it may be completely recovered from in every other respect, may leave the permanent teeth imperfect.

Teeth More Precious than Pearls.

Children's teeth are more precious than pearls; we wish as much care were taken of them. School age in this State commences at six years, and soon after entering school the children's teeth are inspected by the school dentists. Not more than *one in twenty* have a clean mouth. Of their fair white infant teeth many are discoloured and broken, some are septic and offensive, some have caused abscesses. Many of these children have suffered from toothache, many of them have been unable to masticate properly and have acquired the habit of bolting soft food; some have been partly poisoned by swallowing foul secretions. Worse than all, owing to the loss of temporary teeth, the jaws have not grown properly, the permanent teeth are crowded and ill-developed. Often the six-year-old molars begin to decay soon after they have erupted. It is a dismal picture. No wonder that many children grow up undersized, ill-developed and weakly; poorly equipped to meet the strains and stresses of after life.

Knowledge and Care Needed.

Let us try to understand the reasons for this. Some children, as we have already explained, have weakly constructed teeth to begin with, but most of the trouble is due to sheer destruction caused by want of knowledge and proper care. Nature has capped every tooth with one of the hardest substances known, called enamel. It is formed by living cells beneath the gums, but once formed it is a dead tissue, and once destroyed can never be replaced. Nature has therefore made it very hard and resistant, capable of crushing, and grinding, and lasting. It has one weakness—being formed of lime salts, it is dissolved slowly but surely by acids. To guard it from this danger Nature keeps it constantly bathed by an alkaline fluid, the saliva. So cunningly has Nature contrived the mechanism of the salivary glands that they are stimulated to action by all pleasant acid flavour, such as those of fruit juices, which flood the mouth with alkaline saliva. But tasteless, insipid, and alkaline foods do not stimulate the salivary glands, but discourage them. Nature's safeguards were almost perfect until mankind commenced to feed on large quantities of starchy foods and sugar, against which her defensive mechanism was insufficient. These destroy the enamel by forming a paste lodging in the small cavities of the teeth, and the spaces between the teeth, or a glutinous deposit on the teeth. These pastes and sticky substances cannot be penetrated by the saliva, and slowly ferment as they adhere, forming acids. Each atom of acid, as it is formed, unites with an atom of lime from the enamel. As this goes on day after day, month after month, year after year, the enamel becomes penetrated at its weakest spots. Once it is penetrated, the interior of the tooth begins to decay, the living pulp becomes inflamed, and the tooth is lost. In the early stages the dentist can save the tooth by skilful treatment. In the later stages the tooth should be extracted; it is then a source of weakness and poison.

Prevention Better than Cure.

Prevention is better than cure. Preserve your children's teeth by feeding them in such a way as to assist Nature's defensive mechanism, and not frustrate it. Nature has some difficulty in dealing with bread and butter; a little acid jam will assist her. Bread and butter between meals will in time destroy the teeth; sweet cake will do so more quickly; biscuits made of finely-ground flour (so much advertised and so much used) are even worse. Every meal should contain some acid substance, such as stewed fruit, even canned fruit will do, but without too much sugar. Or a little fresh fruit may be given at the end of the meal, and this is best of all. Apples and oranges are the safest and best, but any acid fruit may be given with care. Understand that we do not say that children should be given too much fruit, but a little fruit at the end of the meal.

The Value of Fruit Juices.

You may not always be able to give fruit. Then give acid drinks. Children like them, and they are inexpensive. Lemonade made with weak lemon juice and

water with not too much sugar, or bottled limejuice, or a syrup you can make yourself with citric or tartaric acids are all good. Lemon trees are very hardy, and there are few backyards in the coastal districts in which they will not grow. Tea lessens the secretion of saliva, and for this and other reasons should not be given to children.

Harmful Sweets for Children.

We give our children too much sugar. In excess sugar combines with the mucus of the mouth to form a sticky coating on the teeth impenetrable to the saliva. Sweetmeats and lollies are harmful. None of them are good, but the old-fashioned acid drops and peppermint bulls-eyes were not so bad as chocolates and soft sweets. Children like sweets, but they like fruit better, and fruit in moderation is good for them. Above all, be careful what you give the child in the evenings. The surest way to destroy his teeth quickly is to give him a chocolate or a biscuit when he goes to bed. All night it will be corroding his teeth undisturbed.

Starting a Good Habit.

When your child gets old enough let him see you clean your teeth the last thing before he goes to bed. He will want to imitate. Let him use a small tooth brush. The mouth should be wide open, not shut, and the teeth should be brushed gently inside, outside, and on the top—brushed as you would brush a dress, not scrubbed as you would scrub a floor. Dip the brush in the fruit acid toothwash described below, and teach him to rinse out his mouth with this afterwards. He should not swallow it, but if he swallows a little it will not harm him. The tooth brush should be carefully rinsed and kept dry.

When to Call on the Dentist.

Watch your children's teeth carefully, and if there is anything wrong take them to a dentist. Indeed, it would be a good thing if all children had their teeth examined by a dentist once a year, whether they appear sound or not. All teeth showing the first signs of decay should be stopped at once before they get worse. This will save much trouble and expense afterwards, for if the temporary teeth are neglected the permanent teeth may be ruined. The most important of all the teeth to save are the six-year molars, which come through behind the temporary teeth sometimes without the mothers noticing them. They are mistaken for temporary teeth, allowed to decay, and the whole permanent set is spoilt. Dentists consider them "the key of the arch."

Fruit Acid Tooth Wash.—Cream of tartar, one flat teaspoonful. Dissolve in one pint of water, and add two or three tiny saccharin tablets, procurable from any chemist. This makes a pleasant acid-sweet solution, which costs very little. Unfortunately, it does not keep, and is suitable only for schools. For domestic use, obtain some "fruit acid tooth wash tablets" from your chemist.

BABY CLINICS.

The "Dummy."

There is no surer sign of want of knowledge of the right way to manage a baby than the use of a "dummy." Before many years the mothers of Queensland will learn this so well that they will be ashamed to be seen using it.

Reasons Why You should not use a "Dummy."

1. In the newborn babe to suck is a natural instinct, and is the most powerful agent in establishing the secretion of breast milk. If this instinct is diverted to the sucking of a "dummy," it is often partly exhausted before the baby is put to the breast. He does not suck vigorously, and in consequence the supply of milk becomes deficient. Soon he may prefer his "dummy" and the milk may disappear altogether. This is a common reason for failure to establish breast feeding.

2. The "dummy" is a dirty thing. It drops on the floor and picks up dirt, which the baby swallows. If pinned to the baby's frock it is exposed to dust and flies. Every summer we have a serious epidemic of dysentery spread by flies. Mothers who use "dummies" during this season are exposing their babies to infection with a disease which is always grave and sometimes fatal.

3. Dummy-sucking, like thumb-sucking, interferes with the growth of the jaws and the development of the teeth. It favours the development of a high and narrow-roofed mouth and narrow nasal passages, which become easily obstructed.

4. The use of the "dummy" soon results in the formation of a bad habit, and may lay the foundation of a weak and self-indulgent character.

A baby never cries for a "dummy" until he has been trained to expect it, but there are a number of reasons why he may cry, and these should be known to every mother.

Why do Babies Cry?

The first thing a baby does is to cry. This is how he expands his lungs for breathing. A very young baby cries to strengthen his chest. Let him. In moderation, of course, a good healthy cry will do him no harm.

A baby cries because he is hungry. This also is healthy. If he cries after he is fed it may be because he is not getting enough. The Clinic nurse will probably be able to increase the quantity of your breast milk. If not, she will advise you what to give him after each feed. Never put a breast-fed child on full bottle feeds. If you do this you will soon lose what breast milk you have.

Very often a baby cries because he has colicky pains after feeding. Sit him up after the feed, or put him over your shoulder, so that he may easily get rid of the wind he has swallowed. If that does not soothe him, you may be giving him the wrong food, or too much of the right food. Over-feeding with breast milk is a common way of making crying babies. Perhaps giving the breast soothes him for a short time but makes him worse afterwards.

He may cry because he feels cross and irritable. This is usually due to over-feeding or giving the wrong food. Perhaps he is thirsty in hot weather and wants a drink of water, not milk.

He may cry because he is uncomfortable. Perhaps he has a wet napkin, or a tight binder, or too many clothes on a hot day.

He may cry because he wants his own way. You may have taught him to expect to be rocked to sleep, or to suck a dummy, and he cries because he knows that will bring him what he wants. It is very easy to teach a young baby bad habits; not so easy to break them.

If you want to be a good mother, try to find out why your baby cries. Do not treat him as if he were a bottle, and a dummy were the cork.

THE ROSE GARDEN.

In planning a rose garden it is essential to keep in mind the fact that it is a garden in itself, and does not lend itself with any particular advantage to the remainder of the garden. In other words, it is a specialised garden within the general garden, and as such should receive entirely separate attention. To do this, the first point to be remembered is that it should be screened off, in some way, from the garden as a whole. Evergreen hedges, shrubs, supports carrying climbing roses, rose species or a *Rosa rugosa* hedge are all satisfactory for this purpose.

The next point to remember is that a rose garden is essentially formal in character, and so definite mathematical planning may be successfully carried forward. The beds should be small so that they may be readily cultivated from the surrounding paths; and preferably each bed should be planted with roses of one colour or, if possible, with one variety. The shape of the bed is not of particular importance, as varied interesting effects may be obtained by having them shaped irregularly, while an entirely satisfactory result may be secured, and much more easily too by the beginner, if circular and square or rectangular beds alone are used.

The paths should be straight. Grass paths are preferable to gravel paths, being easy to walk on, restful to the eye, and showing up the rose blooms to greater advantage. The width of the paths is determined largely by the size of the garden, central walks in a large garden being of very good width. In the small garden much labour will be saved by having the grass paths just the width of the lawn mower, so that each path needs to be gone over once only in cutting the grass.

It is usual to have a centre piece in the rose garden—simple or ornate, according to the taste of the owner. A sun-dial or bird bath is very satisfactory, or in larger gardens a fountain may be used.—"The Canadian Horticulturist."

COUNTRY WOMEN AT WORK.

The Country Women's Association is a banding together of women all over Australia in a bond of love and friendship; and every member is expected to render as much service as lies in her power to her fellow women.

A branch is formed primarily with the intention of creating friendliness among women of the district. After meeting, the natural desire is to work together in this new "oneness" for some objective. So come into being hostels, hospitals, seaside homes, and huts, and the many other objectives of the association.

The objects of the association, as stated in the constitution and rules, are being carried out to a wonderful extent. In order to show in what way these objectives are being carried out it might be well to mention first the objective and then the ways in which it is being met.

1. "To improve the welfare and conditions of life of women, girls, and children in the country."

Most of the branches have rest rooms, which members and country women and children can visit and have a cup of tea, rest between trains or leave children if they are shopping.

Rest tents on show grounds during show weeks are arranged by the majority of the 300 branches. Emergency funds are established, the funds to be expended upon necessitous cases. Most branches keep a supply of clothing on hand to send to those in need of it. Travellers aid committees make much easier the journeys of country women. Families who are unable to afford a needed holiday at the seaside are often sent by the branch to which they belong.

Branch Activities.

2. "To draw together all women, girls, and children in the country." Each month members meet together, and in most cases the afternoon is a social one. Lectures and demonstrations are given on such subjects as leather and raffia work, pastry making, poultry raising, and other domestic arts. Special afternoons are arranged for children.

3. "To provide opportunities for recreation and enjoyment, bringing them within reach of all members." Every branch at Christmas time provides Christmas trees or some special pleasure for children in their districts, and gifts are given to patients in hospitals.

Libraries have been opened in places where there are no schools of arts. In quite a number of cases recreation grounds have been provided for children.

4. "To encourage women to take an active part in country development by working on committees, such as schools, hospital, ambulances, &c., and to promote a wise and kindly spirit in the community."

Branches of the association have representation on local committees, such as schools of arts, &c., and in one or two cases on hospital boards. Ambulances have the wholehearted support of the association everywhere. Any local interests have the support of branches in raising funds for the welfare of the towns and districts.

5. "To improve educational facilities in the country."

The establishment of educational hostels at Warwick (for girls) and Bundaberg (for boys) is a forward step in the association's desire to assist with the education of country children.

First-aid classes are arranged by many branches with the co-operation of the ambulance brigade.

6. "To secure better provision for the safeguarding of public health, especially of women and children, and to secure medical and hospital facilities for country districts."

The need of accommodation for waiting mothers has long been felt. To meet this need hostels for waiting mothers have been established at Goondiwindi, Warwick, and Stanthorpe.

In towns where there are no hospitals, and sometimes no resident doctors, emergency hospitals and homes have been established.

Branches have provided X-ray plants for local hospitals, and have been instrumental in having maternity wards added to country hospitals.

Members help in providing linen, crockery, &c., for hospitals; nearly every branch in whose district there is a hospital has its visiting committee.

KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for it to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes $3\frac{1}{2}$ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

FIVE REASONS IN FAVOUR OF THE HOME VEGETABLE GARDEN.

(1) Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

(2) The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

(3) Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

(4) It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and not unusually generous reward are to be gained from this work.

(5) The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

BEAUTY IN ENVIRONMENT.

"I come straight from two cities where the common folk find an environment which fits in with their sense of beauty—one is ancient Athens, the other is Venice," said the Archbishop of Canterbury at the recent Royal Academy banquet. "In such cities it was possible for the citizens to understand, encourage, and rejoice in great art. But what of our England? We have, indeed, noble buildings, both old and new, but more and more they are set in acres of surrounding vulgarity. Drab and dreary suburbs are crawling everywhere into the countryside. The eye which yearns for beauty and form is affronted at every turn by hideous petrol pumps and tawdry bungalows 'with every modern convenience.' It may be true that the cult of ugliness is diminishing, but the power of ugliness is day by day increasing. How can the civic sense of beauty survive the progress of a civilisation which, if I may borrow the rhetoric of George Wyndham, is 'making a desert of the past and a dustheap of the future'? In a community which suffers these things the general sense of beauty must, sooner or later, perish, and with it all capacity to understand any form of noble art."

Farm Notes for September.

With the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghums, melons, pumpkins, cowpeas, broom millets, and crops of a like nature provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

Orchard Notes for September.

THE COASTAL DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, 2 to 3 eyes are left spaced around the butt, any surplus ones being removed. The top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash—2 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared—viz., brought into a state of perfect tilth to a depth of at least 1 ft., more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate, bonedust or Naru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to

encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphid should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

MANURE FOR CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil, and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.							Phases of the Moon, Occultations, &c.	
AT WARWICK.								
Date.	August, 1929.		September, 1929.		Aug. 1929.	Sept. 1929.		
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.		
1	6.37	5.19	6.9	5.35	a.m.	a.m.	5 Aug. ● New Moon	1 40 p.m.
2	6.37	5.19	6.9	5.36	2.22	4.25	12 " ☾ First Quarter	4 0 p.m.
3	6.36	5.20	6.8	5.36	3.28	5.15	20 " ○ Full Moon	7 42 p.m.
4	6.35	5.21	6.7	5.37	4.37	6.36	28 " ☽ Last Quarter	6 0 a.m.
5	6.34	5.22	6.6	5.37	5.41	7.9	Perigee, 4th August, at 7.12 a.m.	
6	6.34	5.23	6.5	5.38	6.38	7.44	Apogee, 16th August, at 1.0 p.m.	
7	6.33	5.23	6.5	5.39	7.26	8.15	The ringed planet Saturn will be at its highest point in the sky, nearly overhead in Queensland, about 9 p.m., at the beginning of the month. Towards the end it will be about one third of its way downward to the west, followed by the fine constellation Sagittarius. Saturn's rings are nearly at their best.	
8	6.32	5.24	6.4	5.40	8.6	8.46	On the 15th at 3 p.m. the Moon will be passing 4 degrees to the southward of Saturn. This should afford another interesting daylight spectacle for keen eyes, though binoculars or telescope will aid in seeing Saturn. The Moon will pass nearly directly overhead at Brisbane at an early hour after sunset on this and the following night.	
9	6.31	5.24	6.3	5.40	8.42	9.13	The occultation of Phi Sagittarii, magnitude 3.3, will take place on the night of the 16th, about half-past 8 at Brisbane, Toowoomba, and Warwick, but somewhat earlier at Townsville.	
10	6.30	5.25	6.2	5.40	9.13	9.22	When the Moon rises on the night of the 28th it will be interesting to notice the proximity of the planet Jupiter which will be to the northward. Its brightness will exceed that of Sirius, the finest fixed star, which will rise in the south-east about half-an-hour later.	
11	6.29	5.25	6.0	5.41	9.46	10.1	During this month the Southern Cross will be on its downward path towards the west during the evening hours. It will reach its extreme western point about 10 p.m. on the 1st, and about 8 p.m. on the 31st, and being horizontal it will be at a height above the horizon equal to the latitude of the place where the observer is situated.	
12	6.28	5.26	5.59	5.41	10.13	10.43		
13	6.27	5.26	5.58	5.41	10.51	11.32		
14	6.26	5.27	5.56	5.42	11.26	12.23		
15	6.25	5.27	5.54	5.42	p.m.	12.5	3 Sept. ● New Moon 9 47 p.m.	
16	6.24	5.28	5.52	5.42	12.49	2.10	11 " ☾ First Quarter 8 47 a.m.	
17	6.24	5.28	5.51	5.43	1.39	3.8	19 " ○ Full Moon 9 16 a.m.	
18	6.23	5.29	5.50	5.43	2.31	4.6	26 " ☽ Last Quarter 12 7 a.m.	
19	6.22	5.29	5.49	5.44	3.14	5.3	Apogee, 13th Sept., at 5-18 a.m.	
20	6.21	5.29	5.48	5.44	4.19	6.1	Perigee, 28th Sept., at 10.42 a.m.	
21	6.20	5.30	5.47	5.45	5.20	6.57	The conjunction of the two planets Mercury and Mars will form an interesting spectacle on the evening of the 10th when they will be visible well over the western horizon after the Sun has set, wherever no clouds intervene. Mercury will be 3 degrees (one half the length of the Southern Cross) southward or to the left of Mars.	
22	6.19	5.30	5.46	5.45	6.15	7.56	The nearness of the Moon and Saturn on the evening of the 11th will be an interesting observation. As they approach the western horizon at a late hour the apparent nearness will increase until the distance between them will be only eight times the diameter of the Moon. The Moon will pass on the south side of the planet and next evening at eight o'clock will be 12 degrees, or twice the length of the Southern Cross, to the eastward of Saturn.	
23	6.18	5.31	5.45	5.46	7.11	8.59	On the 23rd the Sun will enter the Sign Libra but not that constellation; it will remain, apparently, in the constellation Virgo.	
24	6.17	5.31	5.43	5.46	8.8	10.3		
25	6.16	5.31	5.42	5.47	9.5	11.9		
26	6.15	5.32	5.40	5.47	10.3	...		
27	6.14	5.32	5.39	5.48	11.4	a.m.		
28	6.13	5.33	5.38	5.48	...	1.18		
29	6.12	5.33	5.37	5.49	a.m.	12.10		
30	6.11	5.34	5.35	5.49	1.16	2.17		
31	6.10	5.34			1.16	3.10		
					2.22	3.54		
					3.26			

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

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

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

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