ANNUAL RATES OF SUBSCRIPTION.

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

VOL. XL. 1 AUGUST, 1933. PART 2.

Event and Comment.

A Great Agricultural Show.

RIGHTLY regarded as the most important event in Queensland's agricultural year, Brisbane's great August festival promises to surpass all previous Exhibitions of the Royal National Association. In a message of goodwill, in the course of which he pays a very fine tribute to this State, the Governor-General, Sir Isaac A. Isaacs, says:—

> Queenslanders have in their more intimate charge a section of this continent that has its own special advantages and inherent responsibilities. With scientific experiment and advance, business methods, and reasonable distributive facilities there is every reason to hope that in the near future Queensland will prove one of the most important gateways of mutually advantageous inter-Imperial commerce. Side by side with this great object Queenslanders are constantly offering to the world, if it will pay atttention, unanswerable proof that there is nothing in the climate or other natural conditions of their State that the stamina and courage of Australians cannot meet and conquer. For all this, past Shows have given, and I am confidently expecting the coming Show will again give the most satisfactory confirmation.

The Premier, Mr. W. Forgan Smith, too, pays a high tribute to the primary producers of the State, who through hard work and enterprise have made the annual Show in Brisbane such a great feature of our national life, and adds:—

> The Exhibition affords the opportunity to all sections of the people of fully appreciating the value of the great natural resources of the State. We can thus realise the part that Queensland is contributing towards the development of this young Commonwealth, and be justly proud of the accomplishments of the citizens of the State.

Country and City United.

"A WEEK of fresh inspiration, of splendid realisation—a week of praise and thanksgiving to a generous Providence. The city and the country join hands, and each is enriched by the union." In expressing those thoughts in his pre-Show message, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, epitomises

popular sentiment. The Show was made possible, he said, by those people who have realised that the industry and enterprise of a great State are worthy of a noble setting. "The Exhibition is agricultural history in the making, and citizens will read with pride a great record of sustained achievement."

Departmental Display.

CHIEF of the pavilion displays this year is the Court of the Department of Agriculture and Stock. While the whole Show may be described as a working model of the State, the Departmental Court may be said to be a working model of the Show. It is a well-organised and artistic display, educational in aim and designed to represent the work of the scientific, technical and field staffs, and to demonstrate, by the meticulous care taken in the technique and arrangement of the exhibits, that a high standard of departmental efficiency in dealing with the many and varied problems of primary production has been attained. A country's progress in agriculture and stock raising is dependent now more than ever on the linking of science with practice. Proof of the soundness of that assertion may be observed throughout every section of the Court of Agriculture. These sections embrace a varietal display of sugar-cane; a wheat-breeding and grain exhibit; maize breeding and seed selection; root crop cultivation; broom millet, sorghums, and other fodder plants; separate wool and cotton displays; native grasses and edible herbs; weeds and suspected poisonous plants; illustrations of the work of the Pure Seeds Branch; pig and poultry raising exhibits; and the "Queensland Agricultural Journal" information bureau.

In the pig industry section is another example of the intensive instructional campaign which the Department is conducting throughout the State for the assistance of primary industry generally.

The dairying section is housed this year in the new Dairy Hall, near the Meat Industry Hall, where an excellent display covers every phase of dairy science and practice.

The merits of the different varieties of cotton in cultivation under Queensland conditions, as discovered in careful departmental tests and by observation over a long period, are disclosed in the cotton division. Much valuable technical information is graphically set out, and there is an attractive arrangement of the various stages of production—the plants, the cotton bolls, the seed cotton, ginned lint, cotton, baled cotton, and the by-products of the seed, oil and meal.

In pursuance of Government policy to aid in every possible way those engaged in tobacco growing, and also in so interesting the man in the street that he will smoke Queensland leaf, there are settings devoted to the culture, the curing, the grading, and other treatment of the leaf and its manufacture.

Peanut production and the demonstration of the ramifications and potentialities of that side of agricultural effort is a new feature.

Notable wheat-breeding and other cereal experiments have been carried out by the Department for many years, and much of the result of this work is available for public scrutiny at the Show. In the cereal section, as in many of the other departmental sections, a great preponderance of the exhibits are the products of State experiment farms and associated areas, and the highly scientific methods of culture and other treatment there applied are reflected in the high quality and attractiveness of the exhibits arranged. Every possible form of rural production is represented.

The effective work of the Entomological and Plant Pathological branches in evolving and applying the means of combating insect, fungoid, and other pests are placed before visitors in a striking way, showing what tremendous losses in agricultural, vegetable, and fruit production are constantly being averted by the work of the scientist. What will be very largely a new presentation is that of the State Animal Health Station. The methods of study, the prevention, the treatment and cure of diseases in animals, which are illustrated, should be of great value to every stockowner, and enlightening also to the public.

Science and the Farmer—Work of the Department Appreciated.

SCIENCE as applied to agriculture is rapidly transforming the great agricultural industries of Australia, resulting in a high standard of farming efficiency, with consequent improvement in the quality of our primary products. On this subject the "Brisbane Courier" comments interestingly as follows:—

> Australia may at some future date adopt large-scale farming, but there is little to indicate, in the present-day trend of development, a radical departure

from the one-man farm. But whether farming be on a large or small scale, improved technique, due to the application of science to agriculture, calls for a higher standard of efficiency among farmers.

Just as the manufacturer with an obsolete plant cannot hope to compete with a factory possessing modern equipment, so is it impossible for the haphazard-farming methods of a few decades ago to win a reasonable livelihood for the man on the land. Scientific progress in agriculture, therefore, has brought about a transformation in the farmer himself. His calling is more exacting, and demands from him a degree of skill which his forefathers did not possess.

In our own State of Queensland the Department of Agriculture and Stock is the hand that guides the farmer to a better knowledge of his requirements. The research work of that department is directed towards educating him in all that appertains to his work. Over thirty graduates of the Queensland University are engaged in the Department's scientific services, and its field officers are, in the main, the product of the agricultural colleges of the Commonwealth. Given a farming community with a low cultural level, and the work of these officers would be of little avail; hence the degree of advancement in scientific knowledge requires a correspondingly high standard of intelligence among those for whom the research is undertaken.

There is, therefore, no place in the primary industries to-day for the illiterate and superstitious peasant of tradition. He must be able to equip himself with the knowledge available—and necessary to keep him in step with progress.

A realisation of the community of interests of those engaged in land pursuits also exercises a strong influence for progress. The farmer is naturally an individualist, and is usually conservative to a degree. His condition of life makes him so. But the pressure of competition in the markets wherein he disposes of his product has driven him to the acceptance of co-operation, of pooling, of organised marketing, of association with his fellows, in tackling the manifold problems which confront him from day to day. This coming together is sure to lead to greater efficiency. Planned production and distribution are better than the old anarchic method by which each produced according to his whim, and took his chance on the available market. We have evidence of this drive for planning in the case of three of Australia's greatest products—wheat, wool, and butter. Once that idea takes firm hold its extension over the whole field of primary production is brought within the bounds of probability.

This emergence from the state of individualism is by no means the least of the changes which modern developments have brought into the life of the farmer. Its great importance lies in the fact that it makes for organisation and regulation, two factors that are destined to play a predominant part in the economics of all countries.

Co-operation of Farmers with the Department.

BENEFITS to be derived from co-operation between producers and the Department were emphasised by the Minister for Agriculture and Stock (Mr. F. W. Bulcock) when addressing a representative party of dairy farmers recently.

He said that the problems confronting the dairying industry to-day were, perhaps, more serious than at any time in the history of the industry. So long as everything was done to maintain high standards of production Queensland had nothing to fear. For some considerable time the Paterson scheme had been in force, but there was no present prospect of that scheme surviving very much longer. Australia was not responsible for market fluctuations in London, for the industrial conditions in Australia did not change so rapidly as the conditions governing the English market. The Department was busy on the substitution of another scheme, and the Queensland Government was prepared to assist as far as possible in any sound project for the stabilisation of the Australian price.

It had been suggested that the leaders of the dairying industry should be brought together from time to time to discuss the position of the industry. There were two forms of contribution, one the financial and the other the intellectual, and what was wanted was intellectual contribution. The members of the dairy science school now assembled in Brisbane would be able to see what the Department was doing, how men were being trained to assist the farmers, and how establishments were being maintained for that purpose.

Bureau of Sugar Experiment Stations.

CANE PESTS COMBAT AND CONTROL.

ENTOMOLOGICAL NOTES FOR AUGUST.

By EDMUND JARVIS.

It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.—EDITOR.

OCCURRENCE OF BOTH GRUBS AND PUPAE IN SUBTERRANEAN CELLS.

AUGUST marks the commencement of a decided lull in the activity of this cane insect, which for the time being has lapsed into a condition of torpidity and disappeared from view. Its grubs, after forming their pupal cells, can now be found either lying in them with shrunken straightened body, or awaiting in the form of pupæ that call to a wider sphere of action than that experienced by the grub or its mummy-like pupa.

At this time of the year growers should make a careful inspection of affected areas, to determine if possible the reason for such invasion of this cane beetle. In the event of a belt or clump of timber containing food plants of the beetle chancing

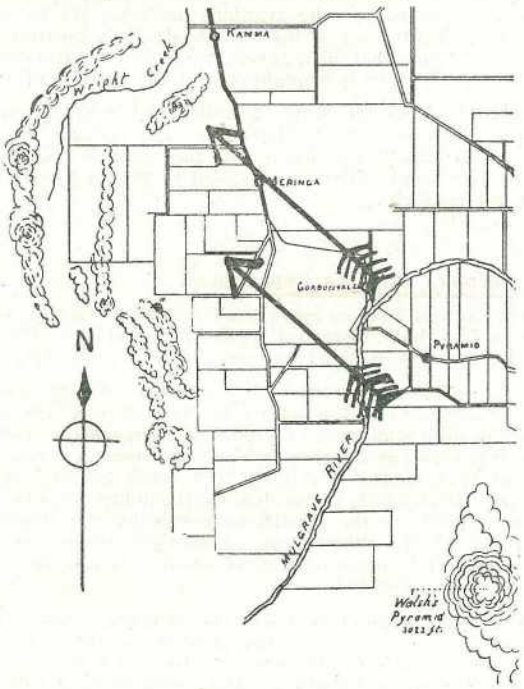

PLATE 15.—A small pocket of cane land near Meringa partially encircled by mountainous country. The arrows show direction of trade wind, and of migrating greyback cockchafers chancing to travel with same.

to occur in the midst of a plantation or to separate two adjacent fields and to lie in a south-westerly situation, within a mile from the southern headland, such trees should be cut down.

Similarly, when either of the opposite sides of an area of cane land happens to run in a north-easterly direction and to be closely bounded by forest country, it often becomes advisable to cut out all feeding trees growing near such headlands to a distance of at least half a mile from the nearest rows of cane. On the other hand, when the southern edge of a canefield is bounded closely by forest land extending far to the southward, it is *not* advisable to clear a belt of timber back from such headlands, or to cut down the feeding trees.

Should grubs occur over an area of caneland chancing to be more or less surrounded on all quarters except the south by timbered mountain ranges, destruction of the food plants of this beetle would, if practicable, not only entail considerable

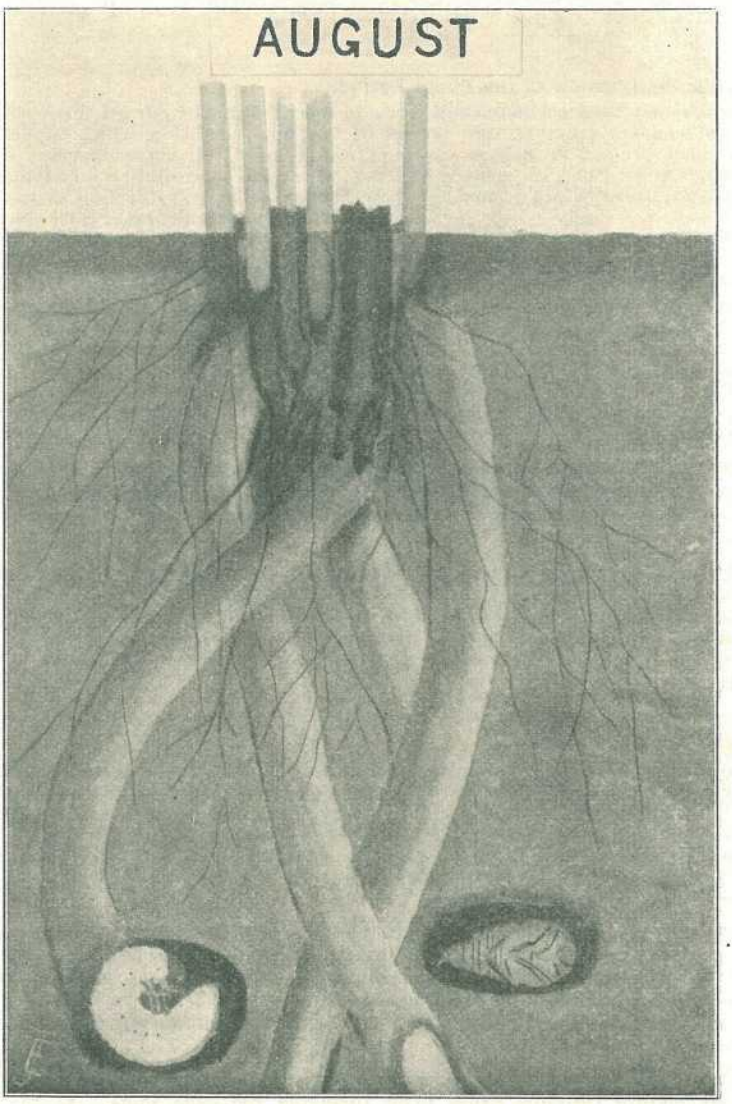

Plate 16.—Showing pupation of grubs of the greyback cane-beetle; and a pupa of same in its resting or pupal chamber.

labour and expense, but be likely in many cases to prove ineffectual as a control measure. Such cul-de-sacs or large pockets usually become grub-infested in the first place as a result of the arrival of greybacks migrating from the south-east which are forced to come to rest finally upon timber fringing the basal portions of these ranges. Finding the situation favourable for breeding purposes, and that further progression towards the north, east, and west is obstructed by mountainous country, they generally become established in such localities and regularly damage the cane each season.

In the case of permanent infestations of this kind, the best plan of procedure would be to try to prevent excessive multiplication of these beetles by collecting them during each flighting period either from native food plants or from trap-trees grown for such purpose, and by picking up the grubs during the course of cultural operations. By exercising common-sense methods of this kind on such cane areas it should be possible to reduce the grub pest to harmless proportions, seeing that the fields are practically closed from invasion from all quarters but the south.

Economic Significance of the Pupal Period.

Apparently the most important phase in the life-cycle of our greyback cockchafer from an economic point of view is that of its pupal condition, which happens to be passed underground at depths varying from 6 to 15 or more inches. Although occupying a position so well calculated to exclude possibility of attack from predaceous insects or other enemies, these beetles, after transforming to the winged state about six weeks later, unfortunately find themselves practically imprisoned in their subterranean cells, from which escape is often impossible until the surrounding hard dry soil becomes sufficiently softened by heavy rain to enable them to reach the surface. Now, it is all important that, just before and for some time after pupation of these grubs in June or July, the rainfall should continue to be normal throughout a period of five months (June to October) in order that such transformation may take place at the proper depth, and the soil remain moist until commencement of the flighting season. In the event of abnormally dry conditions prevailing during these months, coupled with a precipitation far below the average throughout the preceding period of January to May, a check to the activities of this species must assuredly follow.

Should such adverse climatic conditions, however, be continued through November and December, the check sustained is likely to be very severe, causing enormous numbers of these cockchafers to perish hopelessly in their underground pupal chambers.

It appears, therefore, from available data obtained during a period of about thirty years that heavy annual rainfalls are not, as some growers imagine, invariably followed by serious grub infestation; such outbreaks of this pest being usually determined, as pointed out above, by the quantity of rain chancing to fall during what should be known as the *critical period*, occupied by its pupal and early beetle conditions.

Change from Grub to Beetle.

An examination of pupal cells below grub-infested stools growing on high land canefields in August, 1925, revealed pupæ and newly-emerged greybacks in about equal proportions; the soft condition of the latter indicating that transformation to the adult beetle had occurred in these cells about a fortnight earlier. In this instance pupation (change from grub to pupæ) had taken place late in June at an average depth of 14 inches, thus indicating that the soil at the time contained less moisture than is usual for that month.

During the subterranean life of this insect profound physiological changes occur. While the outer body-case of the future beetle is gradually hardening, the entire interior anatomy of the pupa, including muscular, nervous, and other systems, are becoming liquefied; this fluid matter giving rise later on to totally different structure, designed to meet conditions to be encountered during the course of its winged or perfect state.

The diagrammatic sketch for August indicates the downward trend of tunnels made by mature fully-fed grubs after forsaking the cane roots. At the bottom of plate a pupa and a grub nearing transformation are lying in cells; while the anal segment of one of the latter, seeking lower depths, is just disappearing.

In Memoriam.

CHARLES QUEALE.

WITH deep regret we record the passing of Mr. Charles Queale, an efficient and highly respected officer of the Department of Agriculture and Stock, who died at his residence, Moolabin, Villa street, Annerley, on Sunday, 11th June. He was born in 1868 at Woodlands, on the Brisbane River, and consequently was in his sixty-fifth year of age.

His father was the late Mr. Charles Queale, who arrived in Queensland by the ship "Vernon" from Ireland in May, 1864, and took up land on the Brisbane River, where he carried on farming for many years.

Mr. Queale was the youngest of a family of seven, an elder brother being the late Mr. Robert Queale, well known in business circles in Brisbane and the Darling Downs for over fifty years.

On leaving school Mr. Queale assisted his father on the farm for some years, and later, in 1907, joined the Department of Agriculture and Stock as a Dairy Inspector, and was first stationed at Boonah, and since that time has been engaged as a Dairy Inspector and Stock Inspector in various parts of Queensland, in all of which places he gained the high esteem of all who came in contact with him, and was always recognised as a most zealous and capable official.

He was a man of high culture and had a wide knowledge and a wide appreciation of the best in literature. He wielded a ready pen both in prose and in verse.

The late Mr. Queale had democratic views in political thought, and in the early days before the advent of the Labour Party as it is known to-day, did great work for the cause he believed in as a member of the Old Democratic Vanguard, and with such able pioneers in the movement as Mr. John Huxham, Mr. T. L. Jones, and Mr. Max Ramsay, helped to lay the foundations of the Queensland branch of the Australian Labour Party. He also took an active interest in union matters, and for some years was a member of the Council of the Queensland Government Professional Officers' Association, representing the Department of Agriculture and Stock on that body.

In his younger days he was noted for his very fine physique and an excellent record in the field of athletics, particularly as a high jumper and long-distance runner. The possessor of a most likeable personality and an idealism that remained undimmed throughout his life, he had a large circle of friends among all classes of the community, who cherish dearly the memory of a happy nature and a man of the highest integrity and honour. He was an ardent student of nature, and found never-ending pleasure in the contemplation of her beauties.

The late Mr. Queale is survived by a widow, one son, and three daughters. His son, Mr. Alan Queale, is on the staff of the Queensland Mines Department at Mount Isa. Two daughters are nurses in the Brisbane General Hospital, and the other is an art student at the Central Technical College.

The late Mr. Queale was laid to rest on 12th June in St. Matthew's, Church of England, Cemetery at Sherwood in the presence of a large gathering, including many of his old colleagues. The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, was represented by Mr. E. Graham (Under Secretary and Director of Marketing); and among others present were Messrs. R. Wilson (Assistant Under Secretary), R. P. M. Short (Chief Clerk), Major A. H. Cory (Chief Inspector of Stock), and Mr. H. Iliff (Deputy Registrar of Brands).

Our sincere sympathy is extended to his sorrowing family.

JOHANNES CHRISTIAN BRUNNICH.

IT is with great regret that we also have to record the death at his home at Taringa on 3rd July of Mr J. C. Brünnich, F.C.S., F.I.C., F.A.C.I., who was one of the most distinguished agricultural chemists in the Southern Hemisphere, and who, up to the time of his retirement in September, 1931, had performed

invaluable service to the State. The late Mr. Brünnich, who was seventy-two years of age, suffered from a stroke a few days previously, from which he never rallied. Before his retirement he was Agricultural Chemist to the Department

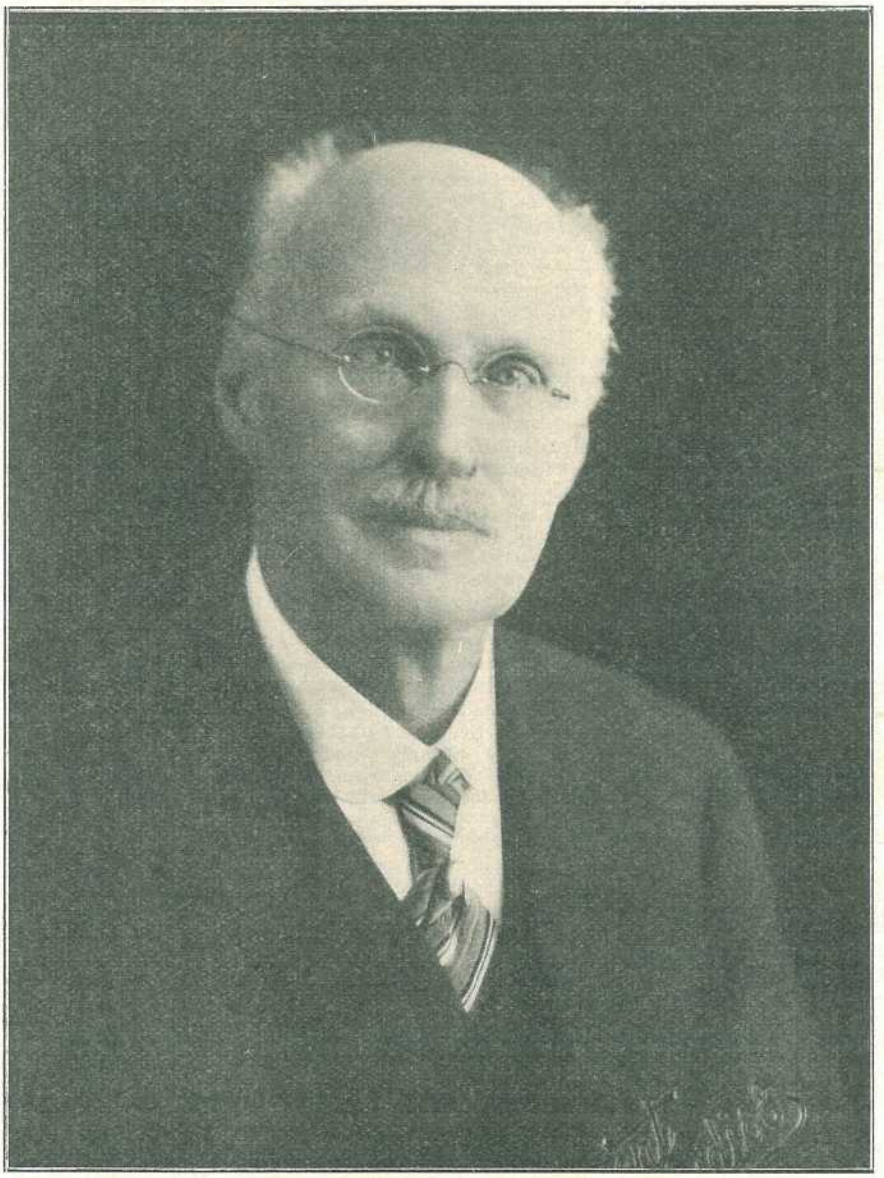

PLATE 17.—THE LATE J. C. BRÜNNICH, F.I.C., F.C.S., F.A.C.I.

of Agriculture and Stock, and served with the Department for thirty-five years. He had a notable record of valuable scientific achievement, both in Queensland and abroad, and his work in the interests of men on the land was of immense value.

He was born on 11th September, 1861, at Gorizia, in Austria, at which place his father was stationed as Lutheran minister. His early youth was spent in Bohemia, and then he was educated in Switzerland at a scholastic institution at which his father was lecturer in mathematics. He qualified by examination for admission to the Federal Polytechnic School at Zurich, where he studied chemistry under distinguished masters. On the completion of his studies in Zurich he travelled in Russia, and then for a period in Tiflis served with a firm of wholesale druggists, later to return to Bohemia to be a chemist in a sugar mill. During 1884 he did his turn of military service in Switzerland as a lieutenant of artillery, and it was while in the Swiss Army that he made the acquaintance of Dr. Muller, who, with his family, had just returned from Queensland, where he was one of the pioneers of the Gayndah district. Dr. Muller's information about this State induced Mr. Brünnich to seek his fortune here early in 1885, and soon after arrival he was appointed manager and sugar boiler at the malt refinery then in operation at Bulimba. In the following year he married Miss Kate Terry, a daughter of pioneers of early Brisbane. For ten years from 1897 Mr. Brünnich was the chief chemist and mill manager of the Colonial Sugar Refining Company's mill at Homebush, Mackay, where he did much special scientific investigation in both mill and field work. This carried him further into prominence, and in 1896 the late Mr. Peter McLean (first Under Secretary) and Professor Shelton, at the instruction of the late Mr. J. V. Chataway (Minister for Agriculture) visited Homebush and offered him the position of Agricultural Chemist. The Agricultural College at Gatton being established about that time, Mr. Brünnich, at his own suggestion, in the interests of economy, was appointed lecturer in chemistry at the college, in addition to Government Agricultural Chemist, which position he had previously accepted.

The late Mr. Brünnich was responsible for the plan on which sugar experiment stations were established, though in a somewhat modified form, and later did much valuable work in connection with inspection and reporting in the operations of central sugar mills, and in 1899 was a prominent participant in the Agricultural Conference held in Mackay, and later at other conferences elsewhere. He had been examiner in chemistry at the Pharmacy College; he had conducted inquiries into many matters bearing on tobacco soil and the culture of tobacco; he had investigated means for the destroying of prickly-pear; he had studied and investigated various natural grasses and pastures; and experimented with dipping fluids. He assisted in the drafting of many Bills bearing on fertilizers, margarine, stock foods, pure seeds, and the destruction of pests, and was a prolific contributor to the "Queensland Agricultural Journal." From time to time he was entrusted with the work of drafting plans for chemical laboratories, including the extensive one at the Department of Agriculture and Stock in Brisbane. He was technical adviser to the chairman of the first Royal Commission on the sugar industry in 1912; took a prominent part in fixing the analysis of payment for sugar-cane, and in 1914 prepared for Parliament a paper on the various methods of payment by analysis. His work in connection with malnutrition in animals is regarded as a notable achievement, as was that in respect of the introduction of suitable phosphatic licks. Comparatively early in his career in Queensland he became naturalised, and was appointed a Justice of the Peace. He joined the Queensland Mounted Infantry, and was in command of the Gatton squadron for a period, and in 1905 was elected a Fellow of the Institute of Chemistry of Great Britain and Ireland.

He is survived by his widow, two sons—Dr. K. F. C. Brünnich (Brisbane) and Mr. H. Brünnich (Agricultural Department)—three daughters—Mesdames S. E. Taylor (Goomeri), H. W. Horne (Brisbane), and Miss Pauline Brünnich (Brisbane)—also six grandchildren. At his interment at Toowong Cemetery on 4th July there was a large gathering of citizens representative of the Government Departments, the Queensland University, and professional, commercial, and industrial circles of the State. The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, was represented by Mr. E. Graham (Under Secretary and Director of Marketing), and with him were many of Mr. Brünnich's former colleagues, including Mr. E. H. Gurney (Agricultural Chemist) and members of his staff.

Our sincere sympathy is extended to his bereaved relatives.

The History of Economic Entomology in Australia.

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

ECONOMIC entomology now plays an important part in the activities of practically every Government agricultural service, hence it seems appropriate to give a brief account of the early steps taken to incorporate economic entomological research in the activities of the various State and Federal Departments in Australia. In addition to indicating where, how, and when official economic entomology had its beginnings in this country, the following paragraphs contain an account of the present organisation in the Queensland Department of Agriculture and Stock, and they also indicate some of the major results achieved.

First Published Reference to Economic Entomology.

In going through the old files the writer found that the first definite reference to economic entomology in this country occurs in "The Proceedings of the Royal Society of Van Diemen's Land." The reference in question is a five-page article by Captain Berthan, entitled "On the Potato Grub of Tasmania." This article, which doubtless refers to the pest now commonly known as the potato tuber moth, was read before the society on the 14th March, 1855, and it is rather interesting to note that it contains three of the control measures generally incorporated in any advisory leaflet published on this pest in the year of grace 1933.

Although articles dealing with destructive insects and their control thus appear to have been published spasmodically at an early date in Australia's national history, many years were to elapse before official recognition was given to the necessity for economic entomological work. There was, however, a very distinct awakening in the late 'eighties and early 'nineties of last century.

First Official Appointment.

To the State of Victoria must be given the credit for the appointment of the first official economic entomologist in this country, Mr. Charles French, senior, being appointed to that position in 1889. He held the appointment for many years, and will long be remembered by the publication of a profusely illustrated five volume work entitled "A Handbook of the Destructive Insects of Victoria," the first volume of which appeared in 1891, the final volume being printed in 1911.

Other Early Official Appointments.

The mother State of New South Wales did not lag long behind Victoria, and in 1890 Mr. Olliff received a similar appointment in Sydney. One notable feature of his tenure of office was the fact that the Government of the day realised that entomological research in a large State was really more than a one-man job. Hence Mr. Olliff was given two assistants during his brief tenure of office, which was terminated by his untimely death in 1895. He was succeeded by Mr. W. W. Froggatt,

whose name will always be associated with the early investigation of the blowfly problem, and with the publication of the very fine text-book, "Australian Insects."

The first official entomological work in Tasmania commenced in 1891, when a Church of England clergyman, the Rev. E. H. Thompson, was appointed Entomologist and Pathologist to the Council of Agriculture.

In South Australia Mr. J. G. O. Tepper was appointed Consulting Entomologist to the Department of Agriculture in 1888, but this appointment was not on quite the same footing as those already mentioned. A few years later, in 1896, Mr. Claude Fuller was appointed to the staff of the Department of Agriculture in Western Australia. In the case of the Northern Territory, Mr. Gerald F. Hill held the position of Government Entomologist from 1912-1917.

The Queensland records show that Mr. Henry Tryon was appointed to the Department of Agriculture and Stock in 1893 with the official title of Entomologist.

Before discussing what has been achieved in Queensland, brief mention must be made of Federal activities in economic entomology. As far back as 1909 a Bill was introduced to the Federal House of Representatives, aiming at the establishment of an Australian Bureau of Agriculture. This Bill, however, never became an Act, and nothing further was done until the old Institute of Science and Industry was established. This Institute was subsequently expanded into the much more ambitious Council for Scientific and Industrial Research, which established an entomological division in 1927 under the control of Dr. R. J. Tillyard, to deal primarily with such national problems as blowfly, buffalo fly, and weed pest control.

Early Developments in Queensland.

The remaining paragraphs of this article will be restricted to a discussion of the development of the work in Queensland. Referring once more to the records, the reader's attention is directed to the fact that in 1875 a board was appointed to inquire into diseases in live stock and plants. A sum of £2,500 was voted to the board during the years 1875 to 1877, and it issued four reports. No reason can be found for the disbanding of the board, but it is rather significant that the introductory paragraphs of the fourth, and, evidently, final report give a summary of the reasons for the continued existence of the board. This almost suggests propaganda in favour of a further grant of funds to replenish an exhausted treasury. If that was the case the propaganda was evidently unsuccessful, for no more is heard of the board after 1878.

In the second of the reports just mentioned there is a discussion of a serious sugar-cane pest occurring in the plantations on the Albert River on the South Coast. This article is from the pen of Dr. Joseph Bancroft, and to him must therefore be given the credit for having published one of the earliest articles on economic entomology in Queensland. Dr. Bancroft's name is, of course, one of the most honoured in scientific annals in this State, more particularly in medical science.

The immediately succeeding years are rather barren so far as further economic entomological work is concerned, but on reaching 1889 the appearance of a very comprehensive handbook may be noted. The

title of this publication is, "Report on Insect and Fungus Pests No. 1," and its 238 pages constitute a mine of information on economic entomology. This publication arose out of a visit of several months duration made by Mr. Henry Tryon to the Darling Downs, and it contains an exhaustive review of the information obtained by him during these months.

When an entomologist was added to the staff of the Department of Agriculture and Stock in 1893 Mr. Tryon was the obvious choice for the position, and he remained in charge of the general entomological work of the State until he was succeeded by the writer in 1925.

A very important aspect of Mr. Tryon's official career was his association with the bold experiment represented by the biological control of prickly-pear. He suggested such a possibility in 1899, and as a result of his interest in the subject he was chosen as one of the two members of the Prickly-pear Travelling Commission, which was appointed by the Queensland Government to visit the more important pear-infested countries during the years 1912 to 1914. As a result of their overseas investigations the members of the Commission, Mr. Tryon and Professor Harvey Johnston, recommended the introduction of various insect enemies of prickly-pear, including the now well-known species of Cactoblastis, colonies of which they actually brought back to Australia. These, however, did not produce a new generation of moths, and it was left to the subsequently constituted Commonwealth Prickly-pear Board to introduce and establish this most useful insect at a later date.

Like most departmental entomologists, Mr. Tryon worked single-handed for many years, but in 1908 an assistant was appointed and the staff of entomologists has since steadily expanded. There is now a headquarters staff and four field stations handling general entomology, in addition to three field stations under the control of the Bureau of Sugar Experiment Stations.

Present Departmental Organisation.

The expansion of the staff has enabled the Department to devote an increasingly large amount of time to research work, and a wide range of problems is now being investigated.

The two main research projects at present handled by the headquarters staff are, firstly the field investigation of vegetable pests and their control, and secondly field experiments for the control of the dreaded thrips pest of bananas. Furthermore a large proportion of the time of the headquarters staff is devoted to the furtherance of field station research projects. The headquarters offices contain comprehensive reference collections, a large reference library, and various departmental records which are extensively drawn on for the better conduct of the investigations allocated to the various field stations. The publication of the necessary bulletins, pamphlets, and leaflets, and the illustration thereof, is also handled by the Brisbane staff.

The first field station was established at Stanthorpe in 1922, and during the intervening years many important and interesting problems have been investigated at that centre. Among the results achieved at Stanthorpe, mention might be made of the marked success which has followed the introduction of the Aphelinus parasite of the woolly apple aphis, the control of which pest is now a comparatively simple problem.

An excellent and very inexpensive lure has been evolved for the control of fruit fly, and this furnishes a further illustration of the benefits arising out of the establishment of the field station in question.

The second field station was established in North Queensland in 1928. The first centre of the work was at Cairns, but recently the staff was transferred to Atherton. At that centre the main investigations deal with the control of pests of tobacco, grasslands, maize, and timber. Among the successes to the credit of this field station, mention may be made of the evolution of satisfactory measures for the control of certain tobacco pests. Important practical results were also obtained in an investigation of a very serious borer problem associated with walnut bean logs exported for furniture veneers.

The third field station was established at Nambour in 1930. The main problems handled at that centre are citrus pests, but attention is also devoted to entomological problems associated with pineapples, strawberries, and other crops. During the few years that this station has been established, success has been achieved in evolving thoroughly satisfactory measures for the control of the two most serious pests of citrus—namely, the bronze orange bug and the larger horned citrus bug.

The fourth centre of entomological investigations is at Biloela, in the Callide Valley, where an officer has in recent years been stationed for the duration of the cotton season. The main work at that centre is the evolution of satisfactory measures for the control of the corn ear worm, which is such a destructive pest of cotton, tomatoes, maize, and lucerne.

The work of the Department is not confined to plant entomology, for in 1930 an entomologist was appointed to deal exclusively with stock pests. Following the recent reorganisation of the Animal Health Station at Yeerongpilly, that officer was transferred from Brisbane to the Yeerongpilly staff.

Only very general references have been made to the entomological activities in Queensland, but it is hoped that this brief survey has indicated to readers the manner in which the work began in Australia, and the lines along which it is at present being conducted in this State.

Squirter Disease of Bananas.

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

SQUIRTER is the name adopted by the trade in the southern Australian States for a certain type of banana fruit rot which makes its appearance on the Sydney and Melbourne markets during the winter and spring months of the year. It was not until 1932 that the trouble was reported as occurring in Queensland, and then only as a rare appearance in cased fruit. Owing to the restriction of the disease to the Southern markets, the writer had had no opportunity of examining samples of affected fruit until 1932, when the manager of the Committee of Direction of Fruit Marketing, on request, kindly arranged for typical specimens to be returned from the Melbourne markets. It was then readily demonstrated, by the usual microscopic and cultural methods, that a distinct fungus was associated with the rot. This fungus when isolated and inoculated into sound bananas produced typical squirter symptoms. It was subsequently learnt that Dr. D. A. Herbert had obtained similar results a year earlier from material submitted to him at the Queensland University, and had placed the organism concerned in the genus *Nigrospora*. Since then a certain amount of work has been done regarding the source of infection, as well as attempting to explain the reason for the restricted seasonal occurrence. Although much remains to be accounted for, it is thought that the publication of the results obtained to date may help towards finding a solution of the trouble during the present winter season.

Symptoms of the Disease.

The typical squirter banana is one in which the flesh of the fruit has decomposed to a dark, semi-fluid state, so that a squeeze of the hand will expel it in a stream from the stalk end or the side. On cutting a fruit before it has reached this stage there is seen a dark, watery rot extending out from the central placental region, and running varying distances longitudinally. The affected region is most commonly situated towards the stalk end, directly connected with a rotting of this region. (Plate 18.) In other cases there is apparently no connection with the stalk except for a few discoloured vascular strands. Again, the early stages of the rot may be situated well towards the flower end of the fruit.

It is characteristic of this rot that there may be no obvious external symptoms, and the fruit, if not felt, may be deemed quite sound. There is sometimes, however, a bluish black discolouration of the skin over the worst affected region which closely resembles in colour a bruise on the human flesh. This may be distinguished from the blackening of the over-ripe banana. The soft, black, decayed condition of the stalk, typical of fruit stalk rot, commonly accompanies the squirter condition, although it is not necessarily present. It is more than likely that the squirter organism should be included with the several other fungi responsible for this type of rot.

Examination of affected fruit indicates that, in the majority of cases at least, infection takes place by means of the broken fruit stalk. There is evidence that the fungus may travel some distance in advance of the obvious rot in association with the vascular elements of the centre

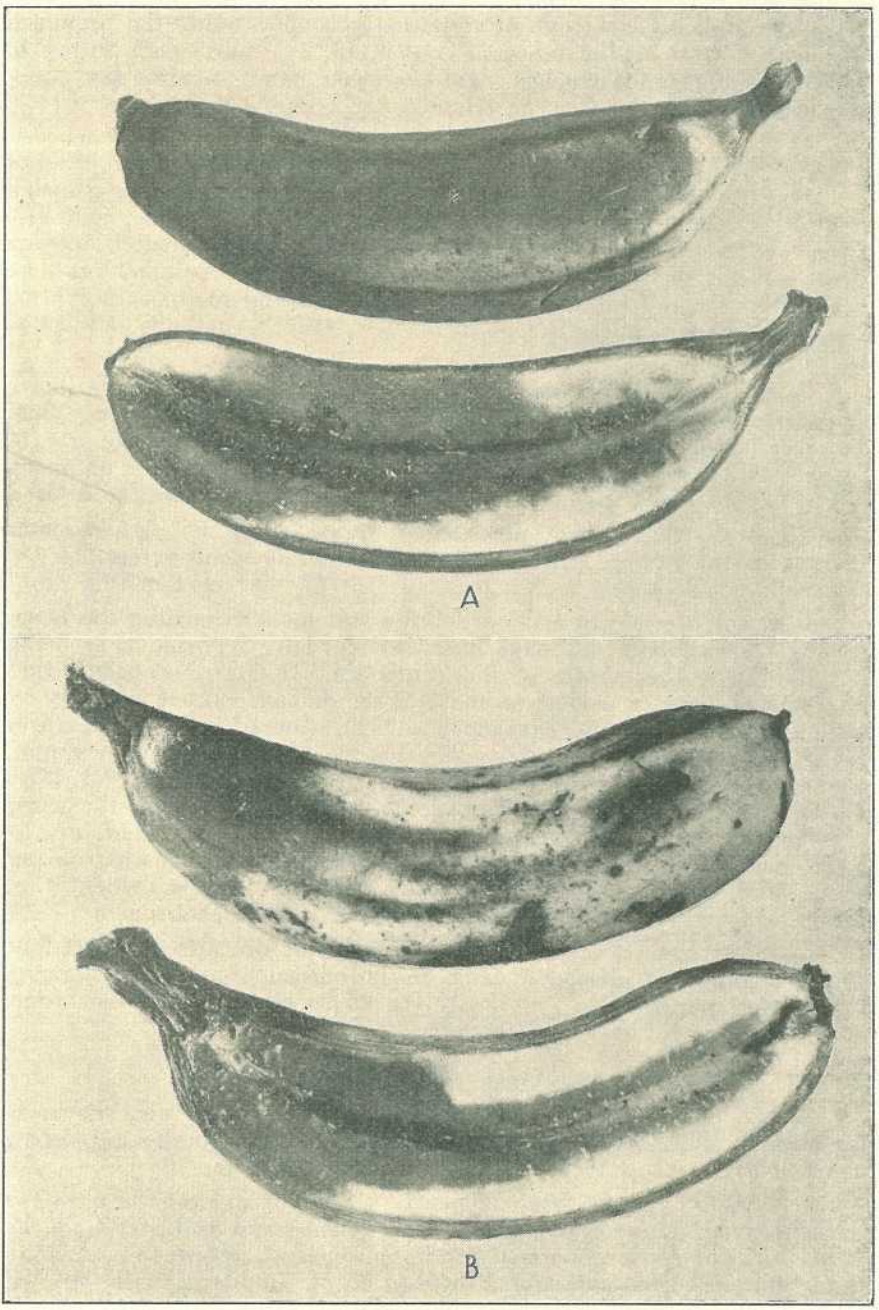

Plate 18.

Natural squirter infections. A.—Fruit exhibiting sound external appearance and internal rot restricted to flower end. B.—Fruit showing a visible stalk rot with the internal decay extending from this end.

of the fruit. This may explain those cases where the lesion is separated from the stalk by a bridge of apparently sound tissue, the organism restricting itself to the placental region until a part more suited to rapid development is reached. On the other hand, in some few cases, infection through the apex or wounds may occur.

Distribution and Economic Importance.

Squirter has been reported from all the main banana-growing districts of Southern Queensland, as far north as Gympie, and also from the Tweed districts of New South Wales. No one region appears to be subject to outstanding loss, though it may be pointed out here that King[1] stresses the fact that plantations, owing to their individual location from a temperature point of view, may be specially subject to the disease.

One consignment of bananas from Sarina were said to have shown squirter symptoms when ripened in Brisbane last year. There has, however, been some doubt expressed regarding the identity of the trouble with true squirter. Until confirmation of this report is obtained, North Queensland fruit may be regarded as being free from the disease.

Those districts which place their fruit mostly on the Brisbane market in the bunch form do not suffer to the same extent, as the disease is not definitely known to occur in fruit marketed in this way.

It is not possible to make a definite statement regarding the losses arising from squirter, although other writers have reported it as being serious during the months of its occurrence. Goddard[2] considers that £50,000 represents a modest estimate of the damage caused annually by squirter during the four years prior to 1929. One of the worst features is the depression of the market when this trouble makes its appearance. Figures collected by the Committee of Direction show that for 1928, apparently a typical year so far as squirter was concerned, the losses reported on the Melbourne market amounted to 1·7 per cent. of the total consignment, while in Sydney the corresponding loss was ·35 per cent. Judging from reports for other years also, it is evident that the loss in Sydney is insignificant compared with Melbourne.

Goddard records that all standards of fruit are affected, and that the percentage of damaged fruit in individual consignments varies from a few per cent. to practically the whole consignment, the latter, however, being by no means common.

Previous Investigations.

A trouble to which the name squirter was applied was known as far back as 1920. Whether the same disease occurred under a different name prior to this date would be difficult to ascertain.

In 1925 the disease was sufficiently serious to suggest the need for investigation. The former Institute of Science and Industry and the Department of Agriculture and Stock, Queensland, agreed to contribute funds towards this end, and Professor E. J. Goddard, with Mr. H. Collard for Assistant, undertook the work.

Although a considerable amount was accomplished, no published record of this is available other than a short preliminary report by Goddard[2] in 1929. In this article the symptoms of the disease are described and the observation made that it is impossible to detect any signs of "squirter" potentialities in green bananas before their entry

to the ripening rooms. Special attention is called to the restriction of the disease to South Queensland, and the occurrence of the disease only during the winter months. The field experiments designed to ascertain conditions which might contribute to the development of the trouble are briefly outlined. He summarises his conclusions as follows:—"In the present state of our knowledge it would appear that fruit grown in certain parts—namely, in South Queensland—suffers during the winter period under a physiological disability which responds to unsuitable temperature or other conditions during transport in the development of the condition known as squirter."

Little further was attempted until Young, Bagster, Hicks, and Huelin undertook research into the ripening and transport of the Cavendish banana. In their report,[3] published in 1932, they include notes on several diseases encountered during ripening and transport—namely, black end, stem end rot, anthracnose, and squirter. They cite Goddard's opinion that squirter is a physiological condition developed in the plantation, and that the development of squirter in susceptible fruit is favoured by cold conditions after cutting. Bearing on this Bagster carried out an interesting experiment in which small cases of green bananas were stored for seven days at the temperatures: 65°, 59°, 53°, 48° F. and then ripened at 68° F., when the percentage of squirter developed was respectively nil, 15, 33, 37. This temperature effect was also brought out in another experiment, where fruit stored for four days at 50° F. before ripening developed more than three times the number of squirter bananas as did comparable fruit stored at 50° to 70° F. for the same period. The same authors note that squirter is apparently restricted to fruit from certain plantations. They also showed by experimental consignment that there is less tendency for squirter to develop in fruit packed in hands or part hands than when packed in "singles." They conclude by suggesting that squirter is due in part to some predisposing condition developed on the plantation, which may be accentuated by exposure to low temperatures after cutting, an opinion reminiscent of that expressed by Goddard.

About the same time as the above work appeared, King[1] published the results of a soil survey with reference to squirter occurrence, which he had undertaken at the suggestion of Professor Bagster. In this article King briefly reviews the position as it stood up to that time, mentioning the difficulty encountered in squirter control owing to the lack of knowledge regarding the primary cause of the disease. He refers to the non-occurrence of squirter in North Queensland bananas, even though they are railed in the same trucks as the southern fruit, and cites this as an argument against the cause lying either in (*a*) temperature conditions during transport, (*b*) packing methods, (*c*) ripening control.

King was unable to find any evidence to suggest that soil constituents, drainage, or the nature of the vegetation had any bearing on the incidence of squirter. His conclusions may be summarised in the following quotation:—

"The analytical data show definitely that squirter occurs on all types of soil from the poorest forest soil, which has grown bananas for twelve years without fertilization, to rich new scrub land in its first year of bunching. But one factor remains constant on all plantations—where a gully or hollow encroaches sufficiently far up the slope of the hill as to reach into the banana area, squirter is found to occur on that

plantation." He, therefore, concludes that "the fruit is primarily subjected to a cold spell on the plantation during the maturing period of the bunch, bringing about a cessation of certain physiological processes in the ripening of the fruit and rendering it subject to complete physiological breakdown in the event of further conditions such as obtain during transport." He further suggests that variations in temperature during transport, or contamination at this stage by an organism may accentuate the breakdown process, the ultimate condition being aided possibly by the ripening methods in the Southern capitals. Recent work has shown that his reference to a possible pathogen was justified.

The point in which all investigators appear agreed is that the development of squirter is definitely associated with cold, either on the plantation or during transport. As will be shown later, reference to the seasonal development of the disease also supports this conclusion.

Evidence for the Parasitic Origin of Squirter.

A microscopic examination of the rotting tissue from a fruit showing squirter symptoms reveals the presence of a delicate thin-walled mycelium, densely packed with globules, measuring up to 6 μ in breadth. In the older lesions this mycelium is present in great abundance.

If an affected fruit is broken and allowed to incubate, there is developed upon the surface of the rotting tissue a dense, greyish mould growth associated with which the rounded jet black spores of the organism may be found.

Isolations from typical material to potato dextrose agar by the usual tissue-planting methods may be made very readily. These consistently yield the same organism, which is moreover commonly obtained from the lesion in pure culture. Inoculations of this organism into healthy fruit under suitable conditions will produce typical squirter symptoms, and from these lesions the fungus is easily reisolated. For this phase of the work the inoculations were made by means of a cut to either the stalk end or the side of the fruit. (Plate 21.)

As will be described later, spores morphologically identical with those belonging to the above organism have been found in association with banana material in the plantation and packing shed and also elsewhere. Isolations have been made from such material by both poured plate and single spore isolation methods. The resulting pure cultures may differ somewhat in character, but isolations identical with those obtained from squirter-affected fruit have been obtained. Certain of these cultures have been used to produce again the squirter type of rot on inoculation. (Plate 19.)

A scrape of naturally occurring spores from the plantation, when inserted by means of a cut into sound fruit, has also produced a typical rot, though of smaller dimensions. The squirter organism has been reisolated from these lesions and typical squirter symptoms obtained by reinoculation. Appropriate controls have been included in these experiments. (Plate 22.)

It, therefore, appears established that squirter of bananas is due to infection by a fungus having its origin in the plantation or its environs. Certain temperature or other meteorological factors are possibly associated with the full development of the rot to explain the influence of cold conditions so stressed by previous workers.

The Causal Organism.

The fungus concerned in producing the squirter fruit rot is rapid in its growth and produces on potato dextrose agar a white cottony mycelium, which, as the culture ages, becomes darker in the substratal region from the centre outwards. When a plate culture is placed media-side up mycelial wefts will grow down in a columnal structure to reach the lid. In some strains spore formation takes place readily, whereas in others it occurs rarely if at all. The spores and their method of formation are very characteristic, and place the organism in the genus *Nigrospora*. Mason[4] refers to the genus as follows:—"This is held to be sufficiently characterised by its jet black, shiny, depressed-globose aleuriospores and its characteristic ampulliform aleuriophores."

Species of this genus have been recorded from the banana on more than one occasion from other parts of the world. Mason[5] records the isolation of *N. sphærica* from the fruit and petioles of West Indian banana plants, and the occurrence of *N. oryzæ* on banana leaves from Jamaica. Tomkins[6] lists *N. oryzæ* as one of the fungi commonly occurring in association with a fruit stalk rot in West Indian bananas during shipment to England.

Mason,[5] when reviewing the genus in 1927, recognised three distinct species based on spore size alone. In his later note[4] he states that the problem of determination is still in an unsatisfactory position as no further morphological characters distinguishing the species have been noted. In Table I., Mason's measurements from various hosts for these three species are given after being summarised and reduced to a percentage basis. Measurements of *Nigrospora* spores obtained from various sources in Queensland are also shown. Mason has been followed in recording only the long diameter of the spores and in the method of presentation.

It will be seen that, of those examined, the majority of isolations from naturally infected bananas yield an organism which as regards spore dimensions falls clearly in the *N. sphærica* group. Two other isolations from different fruit of the same consignments have a somewhat lower range, but since their cultural characters are identical with the rest, their affinities evidently lie with the same species.

To confirm this diagnosis cultures were submitted to the Imperial Mycological Institute, Kew. Mr. S. F. Ashby identified the fungus as *Nigrospora sphærica* (Sacc.) Mason.

Some Sources of Nigrospora.

Nigrospora sphærica has been recorded according to Mason on maize, rice, sugar-cane, coconut, and *Arundo conspicua,* and his records are from three continents. It, therefore, appears to be a very cosmopolitan organism, a conclusion which is borne out by experience in Queensland.

The characteristic nature of the *Nigrospora* spore has made possible a survey of a number of plantations and their environs by microscopic methods with a view to ascertaining the source from which infection might arise.

The packing-shed was made the starting-off point, and the examination made on material collected in November, 1932, showed a *Nigrospora* with typical spore dimensions to be present in four out of five plantations visited, associated with bunch stalks and other banana refuse lying near the sheds. Later work indicated that the organism

Table I.—Spore Measurements of Nigrospora spp. from various sources including an adaptation of Mason's Series.

Host Association.	Origin of Spore Material.	No. of Spores Examined.	10μ	11μ	12μ	13μ	14μ	15μ	16μ	17μ	18μ	19μ	20μ	21μ	22μ	23μ	24μ	25μ
Banana—																		
Natural squirter infections ..	6 isolations on P.D.A. ..	120	..	..	..	..	1	14	35	19	36	6	5	1	..	..	..	..
Ditto	2 further isolations	40	..	..	3	5	9	9	8	3	3	..	..	..	..	..	..	..
White leaf lesions	4 collections from plantation..	80	..	..	..	..	..	7	8	10	29	12	8	1	2	..	..	..
Ditto	1 further collection	40	..	..	..	5	7	18	7	2	1	..	..	..	..	..	..	..
Bunch Stalks	3 collections packing dumps ..	60	..	..	..	..	..	..	4	8	25	17	5	1	..	..	..	..
Bunch spathe	1 collection	50	..	..	..	2	1	4	6	3	6	8	14	4	2	..	..	..
Petiole	3 collections plantation trash	70	..	..	..	..	..	..	..	2	11	2	7	17	12	8	9	2
Petiole and white leaf lesions..	3 single spore cultures on P.D.A.	90	..	..	3	18	19	35	5	5	4	1	..	..	..	..	..	..
Couch (*Digitaria didactyla*).. ..	Culture on P.D.A.	50	..	..	1	..	1	1	6	..	16	11	6	5	2	1	..	..
Kikuyu (*Pennisetum clandestinum*)	Field material	50	..	..	..	..	2	..	3	6	13	11	6	8	..	1	..	..
Rhodes grass (*Chloris gayana*) ..	ditto	50	..	..	..	..	2	5	13	10	10	1	4	3	1	1	..	..
Sorghum (*Sorghum vulgare*) .. Johnson grass (*Sorghum halepense*)	ditto	60	..	..	..	1	1	2	23	15	16	2	..	..	..	..	..	..
Paspalum (*Paspalum dilatatum*) ..	Field material (2 collections) ..	50	..	..	..	..	5	17	17	6	9	3	1	1	1	..	..	..
Natal grass (*Rhynchelytrum roseum*)	ditto	50	..	..	1	8	7	20	10	9	5	1	..	..	..	..	..	..
Blady grass (*Imperator cylindrica* var. *koenigii*)	Field material	50	..	..	2	4	5	20	5	2	2	7	2	..	..	..	..	1
Various (Mason: Trans. Brit. Mycol. Soc., XII., 2-3, pp. 152-165)	Mason's measurements for *N. Sphærica* reduced to a percentage basis	425	..	..	·2	·7	3·5	5	21	23	34	8	4	·2	·2	..	..	..
Ditto	The same for *N. oryzae*	487	·2	1	6	24	43	19	6	..	·2	..	..	..	..	..	..	..
Sugar cane (Mason: Ibid.) ..	Type material of *N. sacchari* after Mason	50	..	..	..	..	..	..	1	..	4	9	13	11	6	3	3	..

was commonly present in this situation, and even more prevalent in the plantation itself, where it occurs on the dead trash lying on the ground or hanging round the pseudostem and elsewhere. One point of occurrence is on the petiole of the dead leaf near its junction with the pseudostem and another on the main subtending spathe of the bunch which remains hanging in the dead state over the latter. The organism is also found fairly consistently on a type of leaf lesion which appears to have its origin for the most part in a form of sun scald. These consist of large light-grey papery areas, up to several inches in diameter, sharply delimited from the green leaf by a narrow brown border.

Spore measurements of some of the material examined are given in Table I. Those from three collections of bunch stalks and the same number of white leaf lesions are of the typical *N. sphærica* type. One series from a leaf lesion resembles the smaller spored form of the original isolations.

Strangely, three collections from leaf bases provided spores of considerably larger dimensions and agreeing more closely with those of *N. sacchari* (Speg.) Mason. An isolation from this material was typical of the squirter organism.

The collection from a bunch spathe, while coming within the *N. sacchari* group so far as its mean is concerned, has a somewhat intermediate position between that of the petiole collection and the typical *N. sphærica.* From the spathe material no difficulty was experienced in isolating the typical squirter strain of *Nigrospora.* This suggests the possible necessity of extending the *N. sphærica* group to include that of *N. sacchari* also.

It will thus be seen that the plantation affords an important source of squirter infection. An interesting experimental confirmation of this was obtained on a plantation which had had recent losses from the disease. Examination of the fruit in the packing-shed showed that *Nigrospora* spores were present on the surface of the skin in a number of instances. A few fruit retained from this shed later developed a somewhat atypical squirter decay from which the typical organism was isolated. The same condition with respect to spore contamination held in the plantation itself, where fruit were taken at random from the upper part of various bunches. Spores were found to a certain extent on leaf bases, bunch bracts, and white leaf lesions in the same plantation.

In one case in particular a white leaf lesion on which was developed an abundance of *Nigrospora* spores directly overhung a fairly mature bunch. When examined, the fruit of this bunch was found to be plentifully scattered with the same spores. The number present on the fruit may be judged from the fact that from a piece of skin approximately 2 x 1 cm. no difficulty was obtained in securing twelve spores for single spore isolation. Of a total of twenty-three spores successfully transferred from the fruit picked in the plantation to banana infusion agar plates, thirteen germinated in the typical manner, and from these, cultures were obtained indistinguishable from those of original squirter fruit isolations. The mycelium of single spore cultures obtained from these fruit and white leaf lesions and also spores scraped direct from the latter were used to inoculate healthy fruit, and a rot of the squirter type resulted. The organism could be reisolated from these lesions.

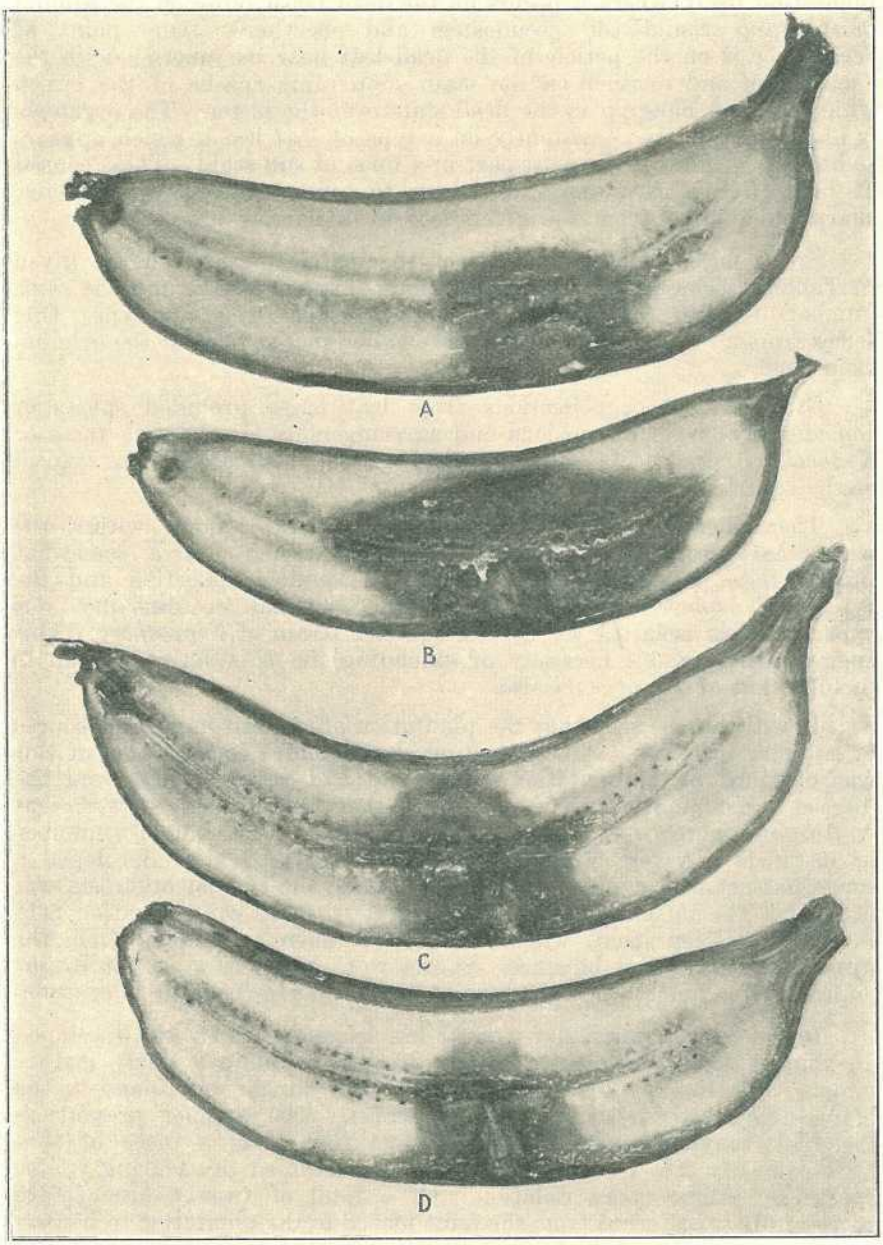

PLATE 19.

Results of inoculation with *N. sphærica* cultures obtained from the following sources:—A and B.—Isolations from fruit inoculated with spores obtained from Natal grass and sorghum respectively. C and D.—Single spore isolations from Johnson and Natal grass respectively. A and D.—Compact type of mycelium. B and C.—Straggly.

Similar results were obtained with fruit from another plantation, except that in this case the source of supply of spores was found to be the dry bunch bract hanging over the fruit. Spore isolations from both this bract and the surface of the green fruit yielded the typical squirter organism.

Besides the banana a number of other plants are capable of forming a suitable substratum for the development of *Nigrospora*. Spores may be formed on the dead portions of blue couch (*Digitaria didactyla*), Kikuyu (*Pennisetum clandestinum*), Rhodes grass (*Chloris gayana*), sorghum (*Sorghum vulgare*), Johnson grass (*Sorghum halepense*), paspalum (*Paspalum dilatatum*), Natal (*Rhynchelytrum roseum*), and blady grass (*Imperata cylindrica* var. *koenigii*). According to spore measurements the fungus as it occurs on the first five of these hosts belongs to the *N. sphærica* group. Those from the last three show spore dimensions somewhat smaller, and in this they resemble the two strains from original squirter isolations listed at the beginning of the table. Fruit inoculated with cultures and spores obtained from some of these plants have developed a typical rot from which the *Nigrospora* may be isolated. (Plate 19.)

At the present stage of the work the writer is not prepared to state how many species of *Nigrospora* occur in Queensland. Mason himself seems to doubt whether the division on morphological grounds alone is justifiable. Although some of the Queensland material exhibits a lower mean than his, it is probably referable to the *N. sphærica* group rather than to *N. oryzæ* (B. and Br.) Petch. A group of single spore isolations included in Table I. show morphological relationships with the latter species. Since these are decidedly atypical in cultural characters, and as the characters of a *Nigrospora* are said by Mason to vary towards the smaller species in some instances under cultural conditions, no great attention has been paid to the occurrence. Reference has already been made to the question of whether the group included in *N. sacchari* (Speg.) Mason, represents a distinct species.

It is generally considered inadvisable to create a complexity of species unless the grounds for so doing are clearly justified. It may therefore be best, for the present at least, to regard all the forms of *Nigrospora* so far found in association with Monocotyledons in Queensland as belonging to the group included within the species represented by *N. sphærica* (Sacc.) Mason. From the discussion on cultural characters which follows it is evident, however, that there exists a distinct strain, marked by certain cultural features and its greater pathogenicity towards the banana fruit, which is probably responsible for most of the squirter trouble occurring in Queensland.

The important point to consider is where the main source of infection originates. Observations on plantation conditions such as those just described suggest that in most cases the fruit is contaminated with spores before the bunch is cut. Subsequent infection is made possible by means of the tears and bruises occurring during packing operations. This probably constitutes the main source of trouble. A subsidiary source of infection lies in spores present in the packing shed and on banana refuse in the vicinity. It is doubtful whether the organism as present on various grasses and cereals, even when of the proved pathogenic strain described below, plays any significant part in squirter development, unless this material is used as bedding for the fruit either in the plantation or packing shed.

Cultural Characters.

Over eighty strains of *Nigrospora* isolated by single spore, poured plate or tissue planting methods from the banana and six other hosts have been compared with respect to their cultural characters on potato dextrose agar. The situation has been found too complex to make any final statement at this stage, owing to the variation exhibited even by cultures obtained from the same field material. For practicable purposes it has been found possible to establish two groups based on the characters exhibited during the first forty-eight hours after subbing to a potato dextrose agar plate.

The first and probably the most important group is characterised by a rapid, open type of growth restricted to the surface of the agar and developing little or no aerial growth for the first forty-eight hours at least, although any deficiency in this respect may be made up by the rapid growth of a white, cottony mycelium later. The edge of the colony is made characteristic by the presence of stout hyphæ, which are clearly defined from the finer laterals and extend out in an irregular, straggly, and usually curved manner from the main body. This group includes all the isolations made from typical squirter bananas, as well as isolations from banana leaf, bunch spathe, petiole, and fruit surface, sorghum, Johnson and Kikuyu grasses.

Group 2 includes strains with a less open type of growth usually producing a fine but distinct aerial mycelium even in the early stages. The margin of the colony is more even, the hyphæ being finer and of a more regular radiating type, with the coarser straggling hyphæ characteristic of Group 1 inconspicuous or absent. However, in some border line cases it is difficult to determine to which group a particular strain should belong. The growth of members of this group is usually less rapid, and individuals may display considerable differences in the final appearance of the aerial mycelium, and in substratal colouration. Strains falling within this group have been obtained from banana leaf, petiole, and fruit surface as in the case of Group 1, and also from couch, paspalum, and Natal grass.

In addition to these there are a few forms distinct from those already described, differing considerably amongst themselves as regards rate of growth, which is usually slow, density, abundance of aerial mycelium, &c. Except for the fact that their development has been observed from a single spore, they would scarcely be considered to belong to a *Nigrospora*. Little attention has been paid to these forms.

It has been noted that all isolations from naturally occurring squirter infections are of the straggly type described in Group 1. Although definite lesions have been obtained when cultures of the non-straggly appearance are inoculated into green fruit, evidence has been obtained which suggests that it is the strains of the former type which are most actively pathogenic and are instrumental in causing the squirter disease. For example, three fruits were inoculated with a culture of the straggly type obtained from spores on a banana petiole. Three similar fruit were inoculated under identical conditions with a culture of the non-straggly type obtained from the same source. After eleven days the average extent of rot in the two cases was as follows (Plate 22) :—

Fruit inoculated with straggly type	9·0 cm.
Fruit inoculated with non-straggly type	3·3 cm.

Somewhat similar results have been obtained when inoculations have been made with the two types but from different sources. The more

rapid growth of the straggly form may contribute to its success as a pathogen. At optimum temperatures the rate of lateral growth may be double that of the more compact strains.

It is of some interest to note that the straggly type appeared in considerably greater proportions in material collected subsequently to a recent spell of exceptionally cold weather. Whether the reason for this lies in the location of the collection or in a temperature factor is yet to be determined.

Spore germination is characteristic, and might be mentioned here. Normally there are two germ tubes produced from opposite poles. These branch sparingly and at first the hyphæ grow with somewhat aimless meanderings distinct from the more usual radiating type. The mycelium is also somewhat characteristically waved rather than straight. The tendency to depart from the radial path is maintained even later, and a definite clockwise rotation is often discernible.

The Relationship of Temperature to Squirter Development.

The work of previous investigators has emphasised the fact that low temperature, either on the plantation or during transport, has a definite bearing on the development of squirter. An attempt has been made to find an explanation for this, but up to the present one based on definite evidence has not been forthcoming.

The Committee of Direction of Fruit Marketing has kindly made available the reports of their agents in Sydney and Melbourne on the amount of squirter developing at different periods throughout the years 1928 to 1933. The incidence of squirter for selected years has been compared graphically with the maximum and minimum temperatures Brisbane (for South-Eastern Queensland), relative humidity Brisbane, and average temperature Melbourne. Arising out of this are two points which may be of some significance.

Firstly, the earliest record in the year and also some of the more serious subsequent outbreaks frequently follow closely on a sudden drop in minimum field temperature to between 40° and 45° F. In 1928 and 1930 heavy loss followed a period of about a fortnight, during which the temperature frequently fell to within this range.

Secondly, the average temperature in Melbourne during the period of the year in which squirter occurs is for the most part well below 60° F.

The earliest date on which squirter has been reported is from fruit leaving Queensland on 28th April, and the latest 24th November of the same year, 1928. Both of these records are of Melbourne occurrence. Usually the disease does not appear in a severe form until towards the end of June, the middle of winter, though it may continue well into the warmer spring months. It will be remembered that losses in Sydney are less than in the cooler Southern capital.

If a fungus is responsible for squirter, one might expect on the above evidence to find that this organism had a specially low temperature range. Judging from the results so far obtained this is not so. The temperature reactions for a number of strains are incorporated in Plate 20. A multiple temperature incubator providing temperature ranges differing by approximately 2° C. was available for this work.

The growth-temperature curve averaged for seven strains all from original squirter isolations is shown in A. The curve for the strain with the lowest optimum out of this series is given by B, and that with the highest optimum by C.

It will be seen that the optimum ranges from 22° C. (72° F.) to 25° C. (77° F.). Seventy-five per cent. of the maximum, which may be taken as a normal rate of growth, is possible between 18° C. (64° F.) and 26·5° C. (80° F.). Little development takes place below 10° C. (50° F.) on the lower side, and growth ceases altogether at about 33° C. (91° F.) on the upper.

The temperature of spore germination is important from the point of view of infection. The germination of spores from field material, and to a less extent those in culture, is somewhat erratic. The reason for this has not been investigated. The most satisfactory medium so far used consists of tap water in which pieces of shredded banana leaf have stood for a short time. When conditions have been suitable satisfactory germination has been obtained over the whole temperature range at which active mycelial development is possible. For example, one actively sporing strain from an original squirter isolation gave a germination of 90 per cent. and over between 14·5° and 27° C.

Temperatures favouring spore production were noted with respect to four strains on potato dextrose agar plates incubated at thirteen different temperatures from 7° to 34° C. Spores were formed between 15° and 26° C. (59° and 79° F.) in all cases, the exact optimum varying for the strain concerned. Outside these limits production diminishes more or less rapidly and ceases altogether for some strains.

An attempt was made to ascertain whether rotting of the fruit followed the same temperature relationships as did the vegetative growth

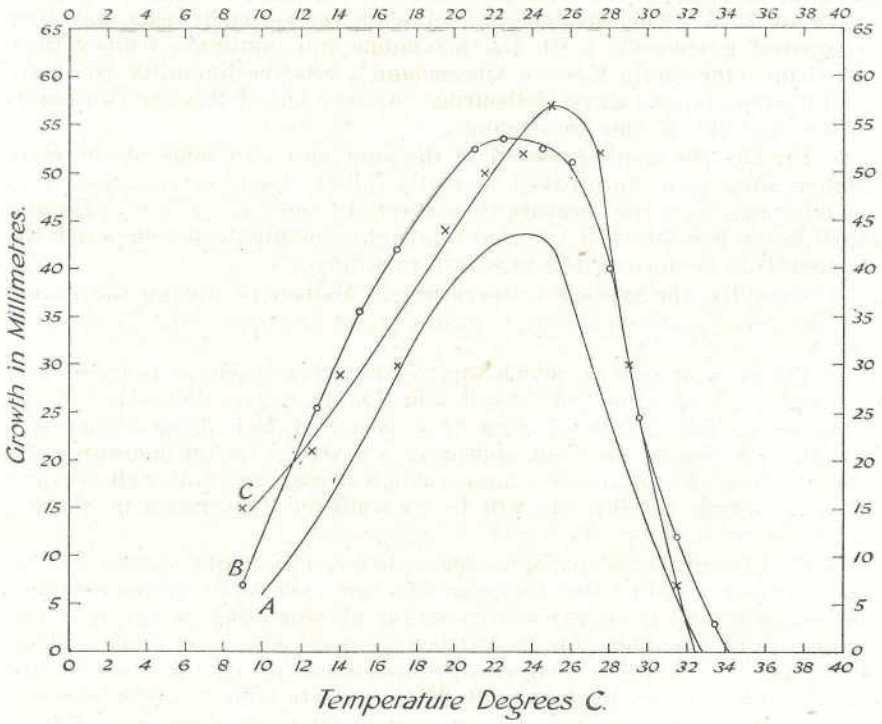

PLATE 20.

Growth-temperature curves for *N. sphærica* strains isolated from original squirter infections. A.—Average of 7 strains. B and C.—The curve for the strain having the lowest and the highest optimum respectively. All on potato dextrose agar; 26 hours' growth in the case of B and 23 in the case of C.

of the fungus. Only preliminary results are available in this connection, but it appears that the maximum amount of rotting takes place at a temperature a few degrees lower than the optimum for fungus growth. Apparently the reason for this is that at the higher temperature the pulp softens too rapidly for it to provide a suitable medium for growth of the organism. The typical squirter rot is not produced in the hard green or soft ripe fruits, but in the intermediate stages.

When consideration is given to the various temperature relationships discussed above, it is difficult to accept the view that the cold conditions so often associated with squirter development act directly as a stimulus to either spore germination or vegetative growth of the organism concerned. For example 50° F. (10° C.), at which point Bagster obtained such marked infection figures, is well below the optimum for the vegetative processes of any of the strains so far studied. A general seasonal influence is, of course, to be expected, since the temperatures during the summer months in Queensland are such as would be expected to check the growth of an organism with requirements such as the one under consideration.

One is therefore forced to the conclusion that if a temperature factor is present it must act in regard to the fruit itself. Two suggestions are tentatively put forward for the operation of this factor. Young[3], Bagster, Hicks, and Huelin point out that there is some fundamental physiological difference in banana fruit in the winter and summer seasons. Also, ripening at temperatures below 66° F. is slower, and the product usually varies from the normal as regards flavour and texture. It is possible that chilling may provide a fruit of a composition more suited to the rapid development of the fungus within its tissue. So far it has not been possible to obtain confirmation of this experimentally.

Another effect of cold conditions is the delayed ripening period. Winter fruit may take from two to four days longer to ripen than in summer, depending on the amount of chilling to which they have been subject. This may prolong the stage in the ripening of the fruit at which rotting makes most rapid progress, with the result that squirter appears to a greater extent. Fruit is also held for longer periods before retailing in the winter months. Wardlaw and McGuire[7] record the greater development of main stalk rot in West Indian bananas owing to a delayed ripening after chilling.

That the method of ripening definitely affects squirter development is shown by the following experiment: —

Eighteen fruits from the same bunch were inoculated in the hard green (unsprung) stage with a pathogenic strain of *Nigrospora* having an optimum growth in culture at 75° F. Two days later half were placed in the Committee of Direction rooms and ripened under standard conditions at 66° to 69° F. The other half were allowed to ripen without gas in a laboratory temperature of 61° to 70° F., the first six days being at the lower temperatures. It is understood that the Committee's method would accelerate the early stages and retard the later stages of ripening. After eleven days both samples were approximately of equal ripeness and were examined. The Committee of Direction ripened fruit averaged 2·6 cm. of rot, while those ripened in the laboratory averaged 6·4 cm. Plate 21 illustrates this result.

The typical squirter does not develop to any extent while the fruit is in the hard green (unsprung) or the soft ripe condition, but in the intermediate stages. After inoculating green fruit with mycelium,

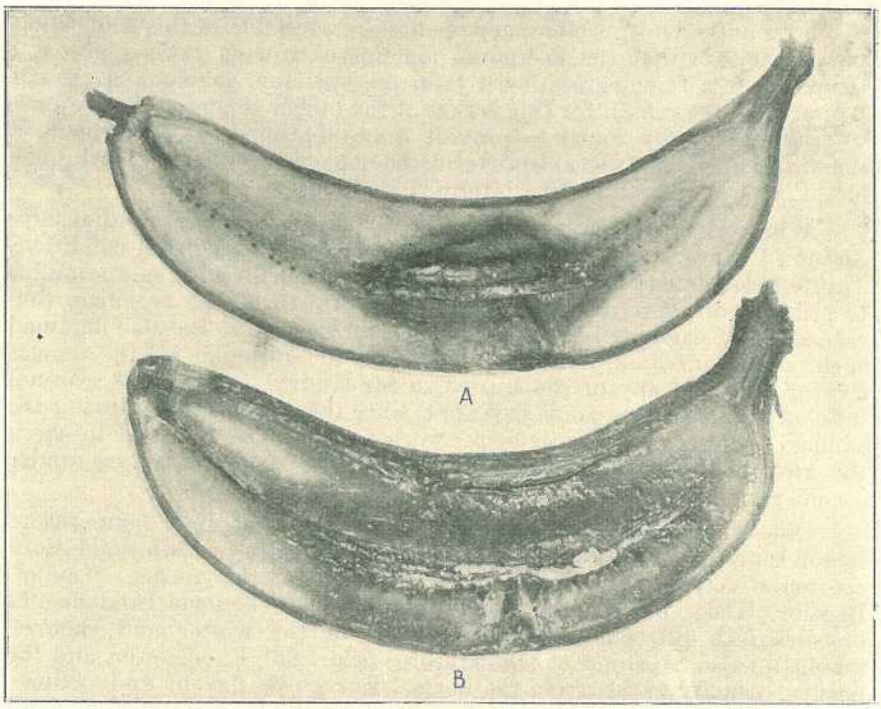

Plate 21.

The influence of ripening on squirter development. A.—Ripened in regulated rooms. B.—Ripened in laboratory without gas. The greatest development in each series represented. Inoculated with culture from an original squirter infection

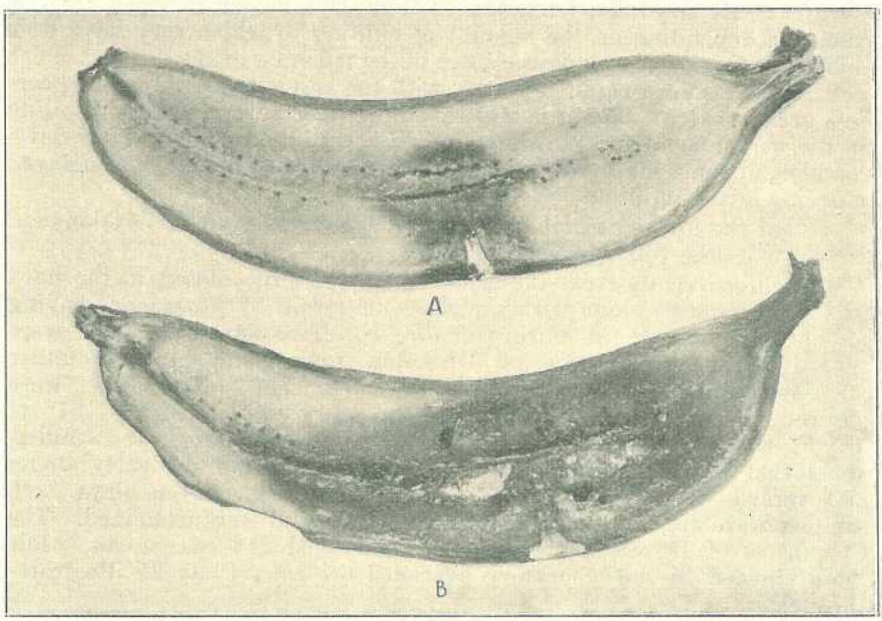

Plate 22.

Influence of cultural characters on squirter development. A.—Inoculated with a culture of the straggly type. B.—Inoculated with the compact type. Both cultures originally isolated from the same banana petiole. The average fruit from a series of three in each case.

several days may elapse before any appreciable lesion is observed, and for extensive rotting to take place ten to twelve days or more may be necessary.

In an attempt to ascertain what main constituent of the fruit fungal growth depended on, four strains of *Nigrospora* were grown on three synthetic media of which the carbohydrate constituent was composed respectively of 10 per cent. starch, 10 per cent. glucose, and 10 per cent. starch plus 2 per cent. glucose. Mycelial growth was most abundant on the glucose media, with the glucose plus starch only slightly less.

When discussing cultural characteristics it was mentioned that the strongly pathogenic straggly form of the *Nigrospora* was obtained from field material much more consistently after the marked cool spell occurring during the latter part of last June. This opens up the possibility of a temperature factor operating in the production of a more pathogenic strain of the organism. It is hoped to obtain more definite evidence on this point.

Control.

The finding of an organism responsible for squirter has resulted in bringing a different point of view to bear on the question of the control of the disease. It may be, however, that the physiological side will still need to receive attention.

Three aspects of squirter control come up for consideration:—Sanitation measures to reduce the source of contamination, treatment of the fruit to prevent infection, and the adjustment of the physiological processes of the banana so as to render it less subject to invasion. These aspects will be dealt with in the order mentioned. It is realised that some of the precautions advocated will entail extra work which will be justified only when losses from squirter are considerable.

Sanitation.

Since a *Nigrospora* capable of producing a rot of the banana fruit is known to occur in so many situations, an attempt to exclude all sources of inoculum becomes fraught with difficulties. It is not at present known whether all strains of *Nigrospora* possessing morphological characteristics identical with *N. sphærica* are capable of producing the typical squirter disease. It may be that as a result of further work the situation will become clearer. As has been mentioned earlier, for all practical purposes the plantation and, to a lesser extent, the packing shed, may be regarded as the main danger points in so far as they probably provide the source of most of the infection.

(1) In the plantation dead leaves should be removed by cutting them well back to the pseudostem. The narrow spathe which remains attached to the top of the bunch stalk should be cut off before it dries. The removal of leaves showing the early stages of the white leaf spot might be possible in some cases.

(2) The packing shed and its environs should be kept free of all banana refuse. If possible a wooden floor and packing bench should be provided to make sanitation easier. The shed should be sprayed out periodically with a formalin solution of 5 per cent. strength. Waste fruit and bunch stalks should be collected systematically and buried or burnt.

(3) Neither grass nor banana trash should be used for standing fruit upon. Rank grass should be burnt off in the immediate vicinity of the packing shed and plantation.

PROTECTION OF THE FRUIT FROM INFECTION.

As has been pointed out, the fruit in many cases enters the packing shed with spores of the fungus already upon it. The precautions suggested above can be expected to reduce the amount of spore material available for infection but not to eliminate it entirely. In this respect squirter differs from another transport disease—soft rot of pineapples (*Thielaviopsis paradoxa*)—since, in the case of the latter disease, packing-house sanitation is all important and field infection usually negligible.

The procedure adopted by many growers of stacking all their fruit from any one cut on the floor of the shed or the bench prior to packing makes some form of fungicidal treatment at this stage practicable. Two methods of treatment might prove useful in this connection. The fruit as it is received from the plantation could be either sprayed with a suitable wet spray, such as a weak solution of formalin, or be fumigated under a tarpaulin with gaseous formaldehyde liberated by the potassium permanganate method. Experiments directed towards finding the most suitable method for treating fruit at this stage are now in progress, and it is hoped that definite information will be available at an early date.

When describing the symptoms of squirter it was pointed out that infection appeared to take place in the great majority of cases through the broken stalk end. Bagster[3] is responsible for an experiment having an important bearing on this point. Comparable cases of fruit were packed in "hands," "fours," and "singles," and each subjected to three methods of ripening. It was found that the amount of squirter developing in the "hand" pack was insignificant as compared with the "single," while the "four" pack was somewhat intermediate between the two. This result is as would be expected on the above assumption of fruit stalk infection, since the collar left on the hand when it is removed from the bunch would form an effective barrier to fungus invasion. Moreover, the bruising and tearing of the fruit stalks, which occurs when hands are divided into "singles," is entirely obviated.

It is recognised that there is some opposition in the trade towards fruit packed in this way on account of the smaller count of fruit to the case. However, if concerted action is brought to bear, a system of equitable payment should be forthcoming, especially when dealing through the growers' own organisation.

(4) Growers whose fruit is subject to squirter, black end, or other affection of the fruit stalk should pack in "hands" or "part hands" rather than "singles." This is probably the most practical and important point with respect to squirter control.

(5) Care must be exercised during all stages of handling the fruit to avoid bruises and wounds. Bending the fruit on its stalk will not cause any appreciable damage at the time, but a black bruised area is almost certain to develop later where the tissues have been crushed, and this is a common point of entry of fungal organisms.

REDUCING THE EFFECT OF COLD.

To protect the fruit from the cold while still in the plantation, a system of bagging or cloaking the fruit may prove to be of considerable help. In the winter time the loss of leaf caused by the combined effects of cold weather and the presence of leaf spot and speckle disease results

in the exposure of the fruit to the sun during the day and cold at night. It has been found that by covering the bunch with a hessian bag the fruit is enabled to mature normally and fill out more satisfactorily. A number of growers are making this a routine practice during the winter months. Two methods are available. The bunch may be entirely enclosed in a sack of suitable size and texture. In its ultimate effect this practice is most commendable, but two objections arise in that the operation takes time, and observation of the correct cutting maturity is made more difficult. For these reasons the method of cloaking has some advantage. In this case half a sack is used. This may be rapidly thrown over the exposed side of the bunch, and secured behind by a nail to act as a pin. Covering should take place when the fruit are commencing to fill out, the correct time being largely a matter of experience.

(6) When taking up land for banana growing an effort should be made to secure a site in a warm locality and with a suitable aspect in order to avoid chilling during the winter.

(7) Bunches should be covered by bagging during the winter months. Fruit should not be left in exposed situations during cold weather. It should be picked when warm and despatched with as little delay as possible. The cases should be well lined with paper as recommended for winter conditions.

(8) Fruit subject to squirter should be ripened as quickly as possible by modern methods, and should not be held in the green or partly ripened condition.

Improvements have been made of late years in rail transport conditions, with the result that chilling is not likely to occur at this stage.

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HARVESTING AND PACKING OF PINEAPPLES.

By C. G. WILLIAMS, Acting Instructor in Fruit Packing.

IN the marketing of pineapples for both factory and the fresh fruit trade, it is essential that correct methods be applied in selecting mature fruit. Growers are required to accept guidance in this matter by observing the maturity standards as prescribed in the regulations under "*The Fruit and Vegetables Act of* 1927," which read:—

> "In the case of pineapples, fully developed fruit which during the months November to March show a distinct tinge of yellow colour at the base, and during the months April to October is quarter yellow coloured at the base."

It may be found that sugar content is sometimes in advance of colour, or the reverse may apply. However, if the conditions mentioned in the maturity regulations are followed, sugar contents will usually be found sufficient.

A further guide in determining maturity will be found in the leaflets at the base of the eyes on the fruit. When these leaflets are quite dry and the pips full, the pineapple is mature.

Harvesting.

Breaking the fruit from the stem is bad practice on account of the greater opportunity presented in the roughened surface for the entry of decay at the stem end. The fruit should be cut from the plant with a sharp knife, leaving not more than one-quarter of an inch of stem at the butt of the pine. Careful handling of the fruit is most important, as it is very easily bruised. Before packing see that all fruit is thoroughly dry, particularly at the stem end.

As a control against water blister it is recommended by Mr. J. H. Simmonds, M.Sc., of the Pathological Branch, that during the wetter months a preventive treatment of the fruit with benzoic acid may be advisable. Prior to packing the cut end of the fruit, stalks should be rubbed either in pure benzoic acid powder or in a mixture of benzoic acid and kaolin. The quantity of kaolin should not exceed four times the weight of the benzoic acid and should be mixed with it very thoroughly.

Grading.

As with all fruits, good packing is dependent on good grading. Pineapple grading is determined by selecting the particular pines of uniform size required to give certain counts. For instance, a twenty-four count represents twenty-four pineapples of even size to the case.

When the fruit is being unloaded at the packing shed it will be found expeditious to grade it into the various counts and to stack it tops down. Stacking in this way will permit better drying and easier handling.

Type of Case.

The tropical fruit case 24¾ inches long, 12 inches deep, by 12 inches wide is the case used for both market and factory purposes. Case makers should exercise care when building cases. End boards must comply with correct measurements, 12 inches by 12 inches. When nailing sides and bottoms, overlap must be avoided, otherwise the cubic capacity of the case will be altered and standard packing rendered difficult.

Branding of Case.

Markings on the case should show at one end the variety (such as "Smoothleaf") and the number of fruit in the case: 18; also the packer's name and address: "J. Smith, Woombye."

Packing.

The packing of pineapples is, comparatively speaking, a simple matter. Varying shapes will occur in any particular variety, but, provided proper grading methods are used, no difficulty should be experienced in packing irregular shapes.

For general purposes the following methods of packing the various counts will be found satisfactory:—

Count No. of Fruit to Case.	Diameter of Fruit.	No. of Layers in Case.	No. of Fruit in each Layer.
11	Large 5 in.	3	4 x 3 x 4
12	Small 5 in.	3	4 x 4 x 4
14	Large 4¾ in.	3	5 x 4 x 5
15	Small 4¾ in.	3	5 x 5 x 5
18	Large 4½ in.	3	6 x 6 x 6
21	Large 4 in.	3	7 x 7 x 7
24	Small 4 in.	3	8 x 8 x 8

In explanation of "large" and "small" shown above, as the same diameter—a large fruit may be taken as one which will sit on a ring having a diameter of, say, 5 inches, but which will barely pass through a 5¼ ring. A small 5-inch pine would fit tightly at its centre in a 5-inch ring.

By reference to the illustrations the method of placing the fruit can be easily understood. It will be noted that with large and medium sized pineapples—viz., 11 and 14 counts—the layers are placed in one line only with the butts of the fruit touching the side of the case. This method of packing also applies to counts 12 and 15.

The smaller pineapples, such as counts 18, 21, and 24, are packed two rows to each layer and placed so that each fruit has its butt end alternately at opposite sides of the case.

Pineapples smaller than 4 inches in diameter should be disposed of at local markets. It may be more convenient to market such fruit loose, but where distance renders casing necessary, the method of placing the fruit in the case should be the same as shown in the 21 and 24 counts.

It is essential for the prevention of bruising that wood-wool, or other suitable material such as thoroughly dry blady grass, be used at the bottom, top, and sides of the case and between each fruit.

For factory requirements, pineapples less than 5 inches in length and less than 4 inches in diameter (measured from the centre of the fruit) should not be forwarded for canning purposes.

Acknowledgment.

Thanks are accorded Messrs. H. Willmott and Sons, of Victoria Point, for their assistance and the provision of material for the purpose of this paper.

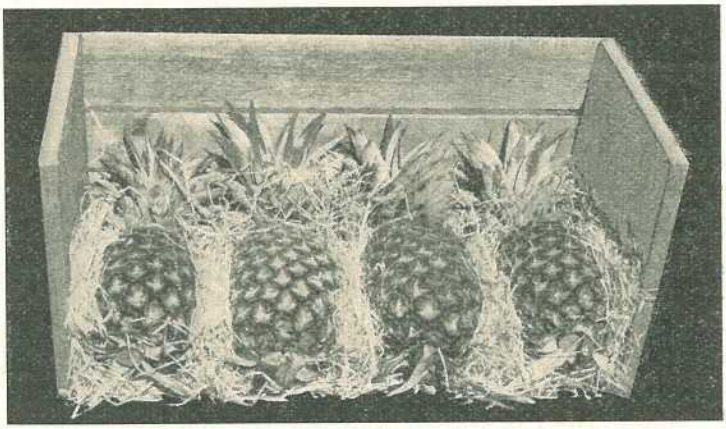

PLATE 23.
11 Pack, bottom row.

PLATE 24.
11 Pack, first and second layers 4 × 3.

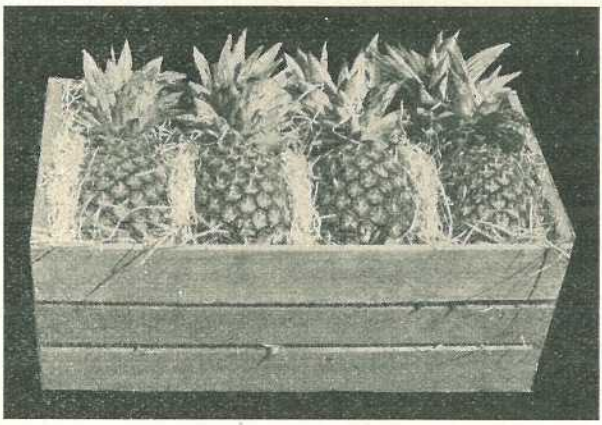

PLATE 25.
11 Pack, top view of finished case. Three rows, 4 × 3 × 4.
Pines 5 inches in diameter.

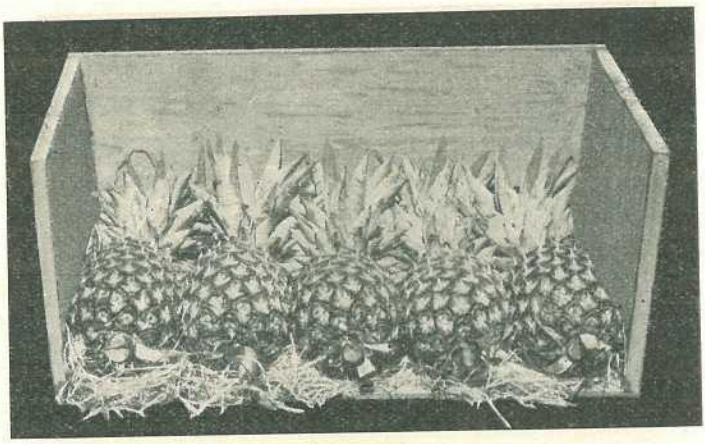

Plate 26.
14 Pack, showing bottom layer.

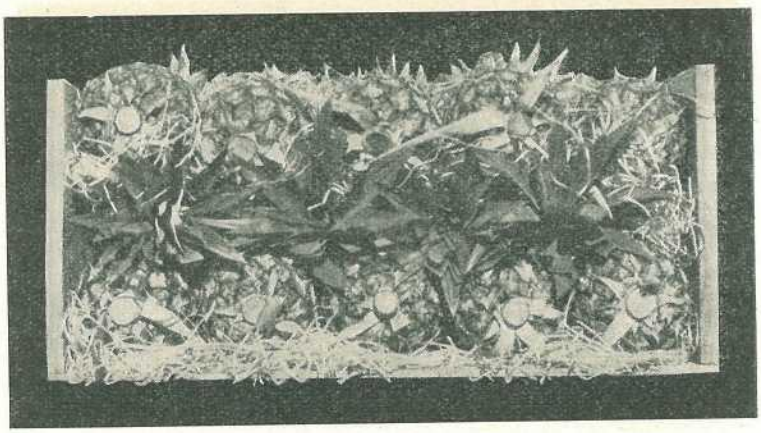

Plate 27.
14 Pack, showing position of layers. Three rows, 5 × 4 × 5.
Diameter of pines (large), 4¾ inches.

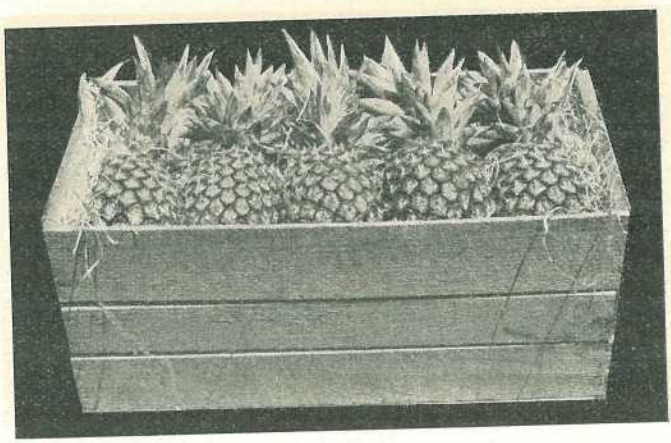

Plate 28.
14 Pack, top view of finished case.

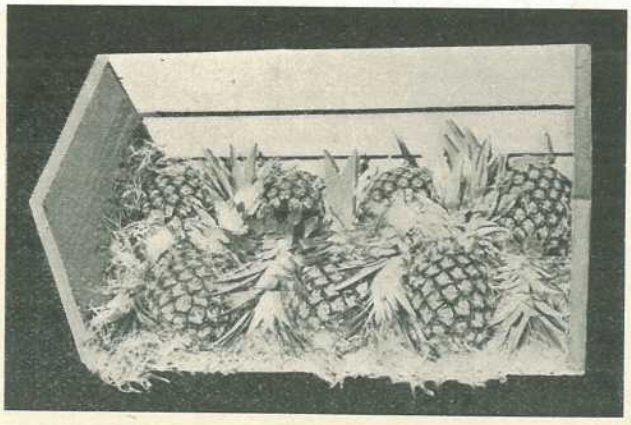

PLATE 29.
21 Pack, bottom layer.

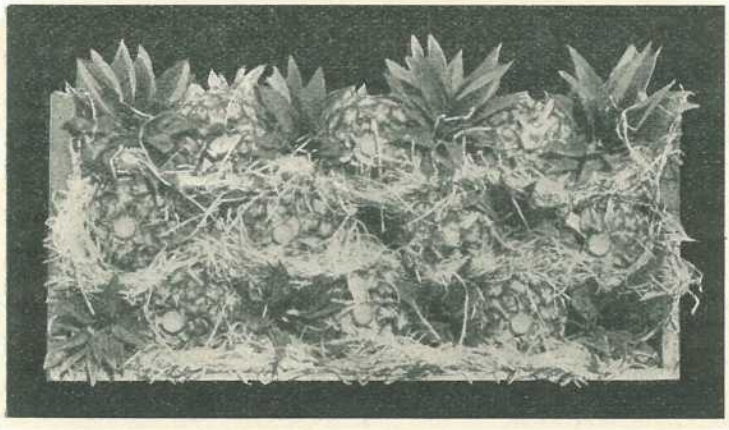

PLATE 30.
21 Pack, showing position of layers. Three rows, 7 × 7 ×7.
Diameter of pine (large), 4 inches.

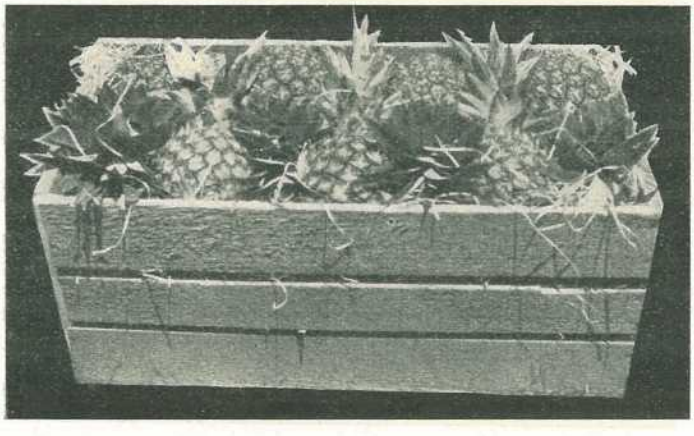

PLATE 31.
21 Pack, top view of finished case.

TUNG OIL FRUIT. (*Aleurites Fordii.*)

E. H. GURNEY and G. R. PATTEN.

THESE tung oil trees were planted by the Queensland Forestry Department at their Imbil Nursery in April, 1929, from seeds.

Analysis No. 1230. Australian strain on scrub land, Casey's Gully, R. 135. This seed received from Mr. A. R. Penfold, Curator, Technological Museum, Sydney, who stated these seeds were Australian-grown.

Analysis No. 1232. American strain on scrub land, Casey's Gully, R. 135.

Analysis No. 1231. American strain on forest land. The American seeds were received from Otto Katzenstein, seedsman, Atlanto, Georgia, U.S.A.

The young trees were planted approximately 25 feet x 25 feet, which is equivalent to seventy trees per acre. The Forestry Department state the only cultural treatment these trees received was two deep chippings during first year. The fruit analysed was harvested in April, 1932.

ANALYSIS OF DRIED FRUIT.

		Analysis No.		
		1230.	1232.	1231.
*Shell	per cent.	38·1	34·0	34·5
Kernel	per cent.	61·9	66·0	65·5
Average weight of a nut	.. grams	3·57	3·01	3·29
Average weight of a kernel	.. grams	2·2	2·0	2·2
Moisture in kernels	per cent.	3·7	3·6	3·3
Oil in kernels as received	per cent.	57·8	57·4	58·3
Oil expressed on moisture-free kernels	per cent.	60·0	59·6	60·3

* Shell is Seed Coat or Testa, not outer Hull or Husk.

ANALYSIS OF OIL.

The oil as extracted from the kernels with light petroleum was a yellow liquid.

	Analysis No.		
	1230.	1232.	1231.
Specific gravity at 20°C.	0·9354	0·9391	0·9394
Acid value	0·68	0·92	0·74
Saponification value	191·1	189·5	193·6
Iodine value (Wij's 3 hours)	170·5	169·6	174·9
Unsaponifiable matter per cent.	0·24	0·42	0·42
Refractive index at 28° C.	1·5119	1·5140	1·5149

The analyses of fruit from trees grown at Imbil compare favourably with analysis of fruit of tung oil trees (*Aleurites Fordii*) grown in other countries. The oil content of kernels is quite up to the average percentage. The colour and physical constants of the oil are practically in agreement with specification set down by the Australian Commonwealth Engineering Standards Association.

The following analyses of by-products were made to ascertain if they might be of any commercial value:—

	Australian Fruit (Scrub) Analysis No. 1230.			American Fruit (Scrub) Analysis No. 1232.			American Fruit (Forest) Analysis No. 1231.		
	Meal.	Testa.	Husks.	Meal.	Testa.	Husks.	Meal.	Testa.	Husks.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture	7·21	9·05	9·78	7·29	7·99	9·68	6·04	8·51	9·28
Crude protein (N x 6·25)	42·85	3·76	2·97	44·13	5·97	3·28	41·74	3·98	2·97
Oil	7·0	2·58	0·40	7·0	8·62	0·37	7·0	6·64	1·61
Carbohydrates (by diff.)	29·73	15·17	9·12	28·50	17·14	9·79	32·72	14·41	5·84
Crude fibre	6·07	65·80	67·95	6·14	56·85	67·32	6·25	64·35	71·02
Crude ash	7·14	3·64	9·78	6·94	3·43	9·62	6·25	2·11	9·28
Lime	0·47	0·62	0·28	0·62	0·75	0·71	0·62	0·69	0·50
Potash	2·27	1·07	0·93	1·56	0·84	1·16	1·74	0·35	0·48
Phosphoric acid	2·37	0·24	0·07	2·25	0·31	0·11	1·71	0·15	0·11

These trees were again harvested in April, 1933; the following results were obtained:—

	1230 Australian Stock Scrub Land.	1232 American Stock Scrub Land.	1231 American Stock Forest Land.
Number of trees in experimental plot	39	72	105
Green fruit harvested from experimental plot	1 cwt. 16 lb.	1 cwt. 4 lb.	1 cwt. 9 lb.
Green fruit per acre (equal 70 trees)	2 cwt. 6 lb.	1 cwt. 1 lb.	81 lb.
Analysis of dried fruit—			
Husk per cent.	48·7	51·7	49·8
Testa per cent.	23·0	20·0	21·4
Kernel per cent.	28·3	28·3	28·8
	Grams Oz.	Grams Oz.	Grams. Oz.
Average weight of fruit	33·6 = 1·185	32·6 = 1·138	33·2 = 1·171
Average number of kernels in fruit	4·6	4·46	4·76
Average weight of kernel grams	2·07	2·05	2·01

BUNCHY TOP AND BEETLE BORER.

A Proclamation has been issued under the Diseases in Plants Acts, declaring that Fruit Districts Nos. 1 to 6, which were proclaimed in February, 1930, and comprise the South Coast, North Coast, Wide Bay and Burnett, Central, Bowen, and Northern districts, shall be quarantine areas for the purposes of the Acts, and determining the nature of the quarantine to be imposed in such areas in regard to Bunchy Top and Beetle Borer infestation of bananas.

The proclamation provides that the occupier or owner of any land within the quarantine area shall keep his property free from banana plants infected with bunchy top and beetle borer by following the procedure described below. In the case of plants affected with bunchy top, half a pint of kerosene must be poured down the central foliage of each infected plant, afterwards destroying the plant by completely removing it from the soil and cutting the butt into pieces of not more than two inches in diameter. Regarding beetle borer, the spent stem of the plant must be cut off at not more than six inches above ground level, and the severed stem split longitudinally along its whole length and cut transversely into not less than four pieces. The remaining portion of each spent stem must be cut off at ground level and, together with the cut surface of the corm, thoroughly dusted with a mixture containing one part by weight of paris green and six parts by weight of flour. The portion of the spent stem thus treated is to be replaced in its original position on the corm. It will now be necessary for banana-growers to keep their banana plantations free from bunchy top and beetle borer, irrespective of whether they are ordered to do so by an Inspector or otherwise.

THE BOY EMPLOYMENT PROBLEM.

ST. LUCIA FARM SCHOOL.

J. F. F. REID.*

FROM the pages of history we learn that every year during the early development of the Roman Empire it was decreed that with the coming of the spring the virile youth of the community, being superfluous for its economic needs, must seek a life in some other part of the country. Year after year, and decade after decade, this spring-time migration went on, with the result that in successive generations vigorous young colonies were established throughout Italy, and consequently formed a basis for the extension of the Roman State.

To-day, I submit, from that slab of history we can learn a very fine lesson. What we should do with our boys is, I also submit, a cry that should not be heard in this under-populated and comparatively undeveloped continent. "There are still unredeemed empires in the West," and, it should be added, in North Australia. It is not proposed, of course, to discuss the causes of the present economic situation, but we certainly have to deal with its effects, especially in respect of the problem of unemployment. The problem is not a new one, yet its existence in its present magnitude is a direct challenge to the statemanship and citizenship of this Commonwealth.

Looking around this country, we see extraordinarily valuable latent national assets calling loudly for development—illimitable coal measures, rivers calling for locking for water conservation, soils calling for scientific study of their potential productivity, and so on to the end of an impressive and very lengthy list. All this work that is calling to be done could absorb the labour of generations—and yet one of the greatest, most pressing, and distressing problems of the day is that of unemployment, and especially that of the unemployment of our growing youth.

We talked a lot about man-power during the war. Then we suddenly realised that, after all, the greatness and strength of a nation is made up of the men and women who compose the nation; and that the real capital of a country is the character of its people. The parents who were able to send six stalwart sons to the trenches and gun pits were regarded as national benefactors. Badges were presented to mothers of young men who had enlisted to bear witness of patriotic sacrifice. Such is the topsy-turveydom of our social system that to-day the possession of a family of growing sons is a source of grave anxiety to any parent as to the chances of their obtaining suitable, useful, and profitable employment in their own native land. We lost one generation during the war, and there is very serious danger of our losing another generation, socially speaking, during the peace.

Fortunately, we are able to realise that those who really count in a nation and those who govern its destinies for good or ill are those who are born and live and work in it. Also, it is believed that we are becoming more appreciative of the fact that no society is properly organised until every youngster born into it shall have a real opportunity in life. We are learning that crude and rather callous parsimony may be mistaken for genuine economy; and that we cannot solve the problems of an age of glut by cutting down consumption.

Fortunately, too, we are making an effort, particularly in respect of the boy employment difficulty, to tackle the problem with sympathy, intelligence, and resource. To refer to only one important line of effort, some of the best brains, some of the most thoughtful men and women of the community are searching for practical means of giving the boy a chance and a place among the nation's workers. The land, they perceive, is one way out, though it is recognised that the mere placing of people on the land will not settle our economic problem. It is certainly placing them in a position of at least producing their own food, but, of course, something more than that is required. Oxygen must be pumped into all our struggling industries, and other heroic measures taken to cure the general economic disorder.

To-morrow's Manhood.

In the blood of every capable and enterprising Australian youngster is a spirit of progress that should not be thwarted by any mistake in national policy. As a natural sequence of any back-to-the-land movement must be a comprehensive land settlement policy providing not merely for living areas, but for areas sufficient for the branch of primary industry engaged in and for the needs, in the case of the individual, of a growing family whom it is desired will remain on the land. A

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* In a radio address from 4QG.

PLATE 32.—THE STAFF OF ST. LUCIA FARM SCHOOL.

Seated, left to right—Messrs. F. O. Bosworth, B.A. (Principal), and S. D. Hartley (Farm Foreman).

Standing, left to right—Messrs. A. Crees (in charge of dairy), D. Mullins (cook), J. A. Kerr (Instructor in Agriculture).

PLATE 33.—ST. LUCIA FARM SCHOOL—GROUP OF TRAINEES.
Most of these young men have completed their six-months course and are now engaged in regular rural employment in the agricultural districts of the State.

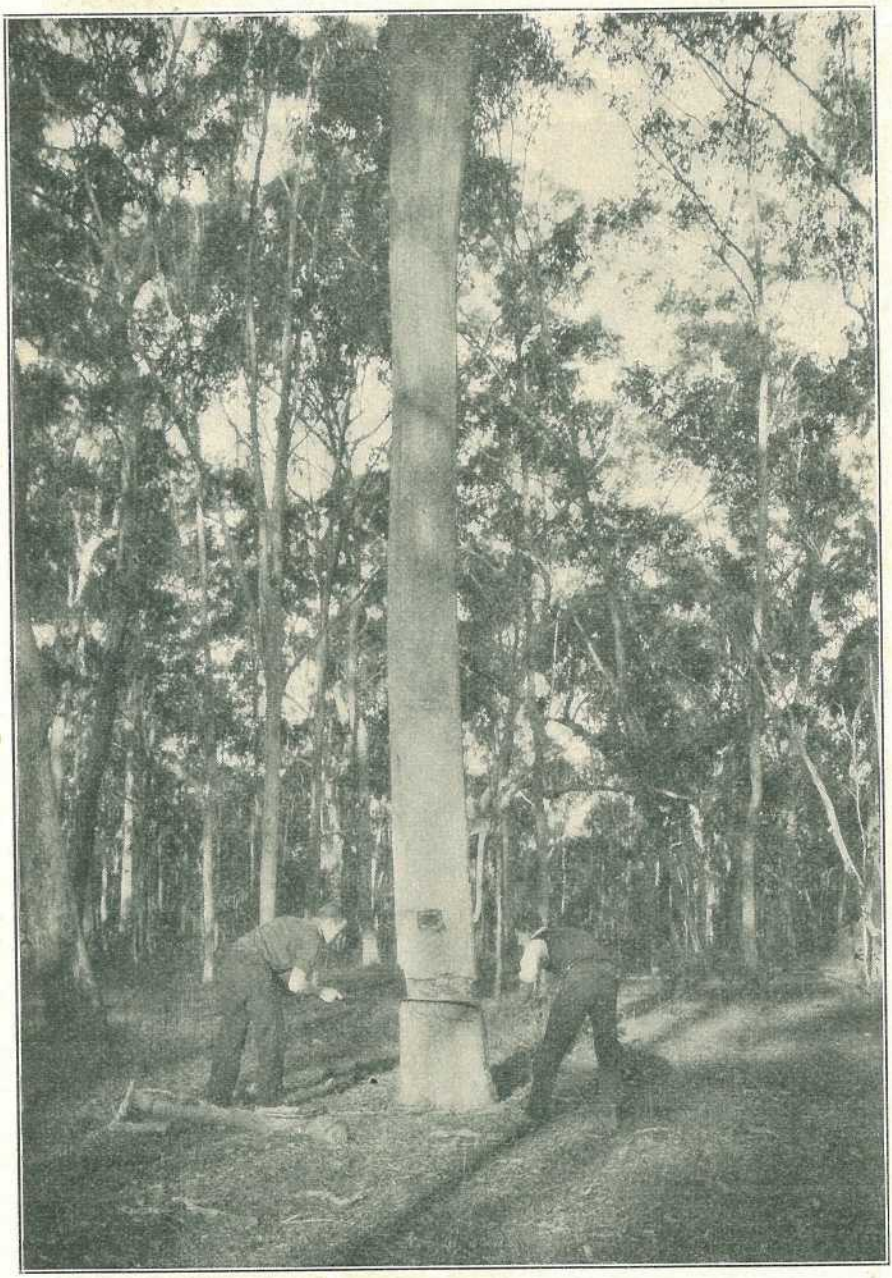

PLATE 34.—SAWING THE BACK CUT.

St. Lucia Trainees are taught various branches of bushcraft in the Queensland University forest lands at Moggill.

PLATE 35.—STAND CLEAR FOR THE CRASH!
The falling tree was belly-scarfed and sawn by St. Lucia Farm Trainees in 7¼ minutes.

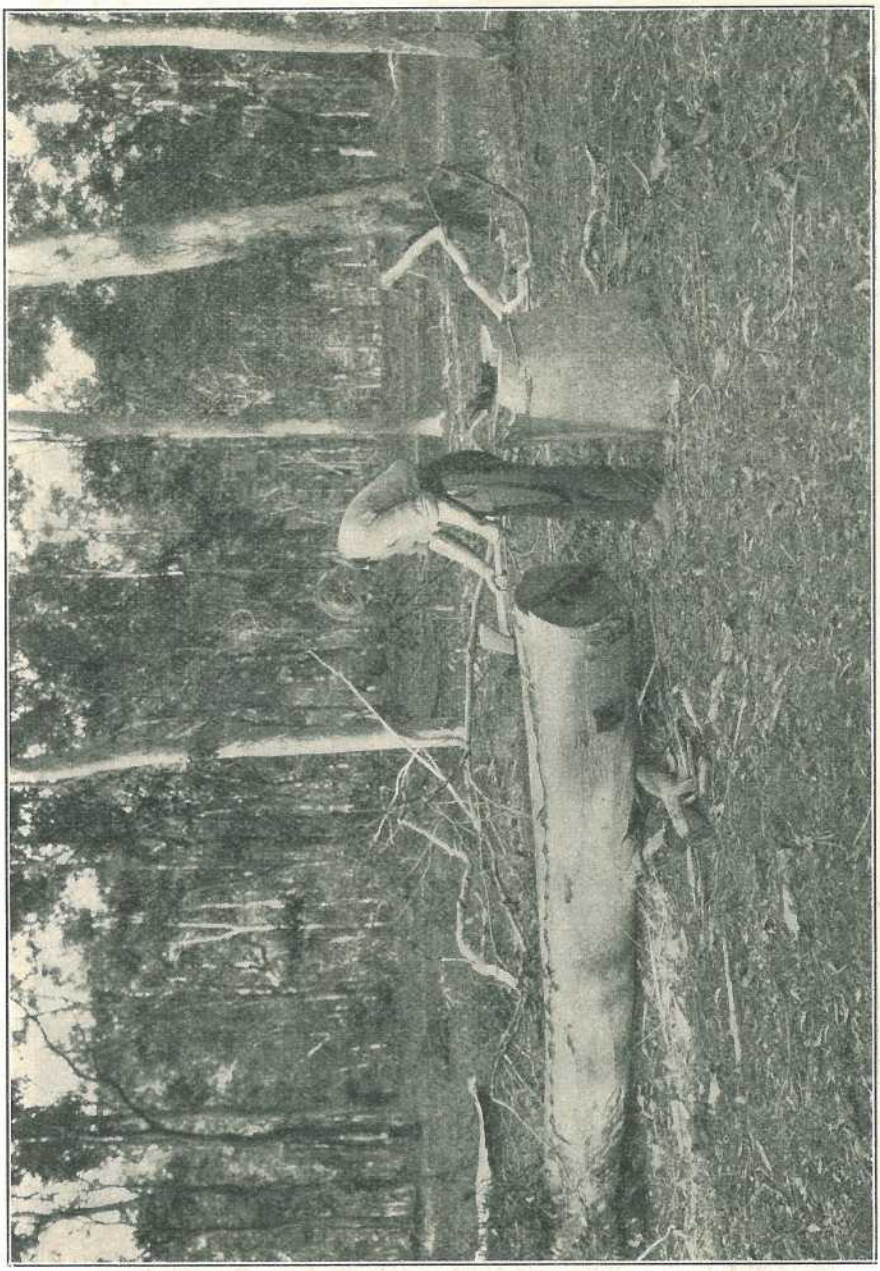

PLATE 36.—BARKING THE FALLEN LOG.
Preparatory to sawing it into fence-post lengths.

PLATE 37.—ENTERING A WEDGE.
St. Lucia Trainees engaged in splitting fencing timber.

prosperous yeomanry rather than a struggling peasantry should be our aim in this country. A realisation of those facts is behind the St. Lucia Farm School, the Boy Employment Scheme of the Department of Labour and Industry, the schemes fostered and capably directed by all the churches, the New Settlers' League, the Rotary Club, and the Legacy Club—an association of Diggers who regard their work not as a charity but as a duty voluntarily assumed; and in this spirit they carry on, overcoming difficulties as they arise, shunning personal publicity, and proving quietly but splendidly that the spirit of the A.I.F. has survived and is still an effective force in Australian national life. It is not possible, of course, to deal with the activities of all these public bodies in a short talk, but what may be said of the St. Lucia Scheme is typical, at least in spirit, of them all.

St. Lucia Farm School.

St. Lucia Farm School was opened by the Hon. Frank W. Bulcock, Minister for Agriculture and Stock, on 31st January with fifty boys, ranging in age from seventeen to twenty years, all coming from the Brisbane city area. Half the boys are boarders and half are day boys, and shifts are changed periodically, the day boys becoming boarders for a term, and the boarders becoming day boys. Mr. Bosworth, of the Queensland Agricultural High School and College, is in charge. The 170 odd acres of the St. Lucia Farm comprise the land that has been generously given as a university site by Dr. and Miss Mayne. Fifty or sixty years ago this land was growing sugar-cane and other crops, and a considerable area of it consists of fertile river flats. As the University is not likely to occupy the area for some years to come, it could not be put to a better immediate use than that of a training ground for potential primary producers.

PLATE 38.—SIGHTING A LINE OF FENCING.
Example of practical instruction at St. Lucia Farm School.

Since the school has been opened the boys have been given instruction in tree-felling, splitting, fencing, ploughing, harrowing, sowing, and butter-making, general dairy practice, and pig raising. Officers of the Department of Agriculture and Stock visit the farm regularly to lecture on pig raising, dairying, fruit and vegetable growing, animal hygiene, botany, poultry raising, chemistry of the soil, insect pests, and general farming topics. Besides the farm at St. Lucia there is a tent camp in forest country at Moggill, also belonging to the University, where the boys are instructed in bushcraft and pioneering work, supplying fencing and round building timber for headquarters; groups of boys are also sent out to the Beerburrum settlement for instruction in tobacco raising and the curing and grading of tobacco leaf. Accompanied by an instructor, the boys also visit on occasion the Roma Street Markets, the Kingston Butter Factory, and a stud pig farm at Kingston.

Piggeries—portable and permanent—have been built by the trainees on the farm; five brood sows of the Tamworth, Large White and Berkshire breeds are housed there, and litters of pedigree and crossbred pigs are being raised mainly for purposes of instruction in piggery management.

The dairy herd consist of twenty grade Jersey cows, which supply milk and butter for the establishment. Practical instruction in herd testing is given, and occasionally groups of boys visit the Department of Agriculture and Stock for further instruction in that important branch of animal husbandry.

Disc and swing ploughs are at work on the farm, and already about 2½ acres of lucerne and an acre each of rye and barley have been planted. An additional 15 acres have been ploughed for summer crops.

Poultry pens have been erected by the boys. Elementary blacksmithing, use and care of farm implements and machinery, and the running of an internal combustion engine are included in the general training. A fine football field and a tennis court have also been cleared and laid out by the boys.

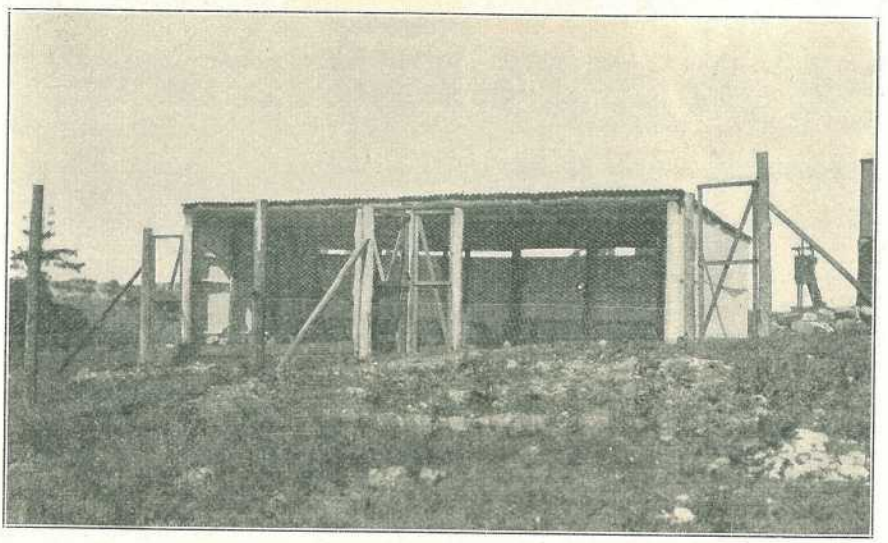

Plate 39.—Poultry House and Pens at St. Lucia.
All buildings and dividing fences were erected with material from the Moggill forest by trainees as part of their general course of instruction.

At the end of July the first group of twenty-five boys from the St. Lucia Training Farm completed their course of training in the rudiments of rural industry and were absorbed in farm employment; at the end of October another twenty-five will be available for farm employment, and thereafter similar groups will be available every three months. As each group goes, a similar number will be enrolled to keep the strength up to fifty—the prescribed number. The boys pay no fees and receive free board. At the end of the term of six months two boys from each group of fifty will be granted scholarships to Gatton College.

Parents who desire that their boys should enter the school should get in touch with Mr. McGillivray, of the Central Technical College, Brisbane, and farmers who desire the services of the boys who are about to finish their term should communicate immediately with the Lads' Employment Bureau, Box 1448T, General Post Office, Brisbane. The boys represent a very fine stamp of Australian youth, keenly intelligent, country conscious, active, and imbued with a very fine spirit.

This, in brief, is the outline of a scheme of farm training prompted by a general desire to counter an effect of the present economic situation and a realisation of the wisdom of directing the youth-power of the land—to-morrow's manhood—into fields of primary production. One of the ideas behind the scheme is that workless city boys should be given an opportunity of cultivating an inclination towards country life.

It is suggested, in conclusion, and as apposite to my opening remarks, that a practical effort must be continued to readjust our lop-sided distribution of population. The transference of town lads to the country where they will gain practical experience and a "land sense" is regarded as a preliminary only to their becoming either share farmers or farmers on their own account. It is also suggested that the direction of the mind of our youth to rural occupations cannot be regarded merely as a temporary expedient, but as the first step in a movement back to the land, of which adequate settlement and development is essential to the fulfilment of our national destiny.

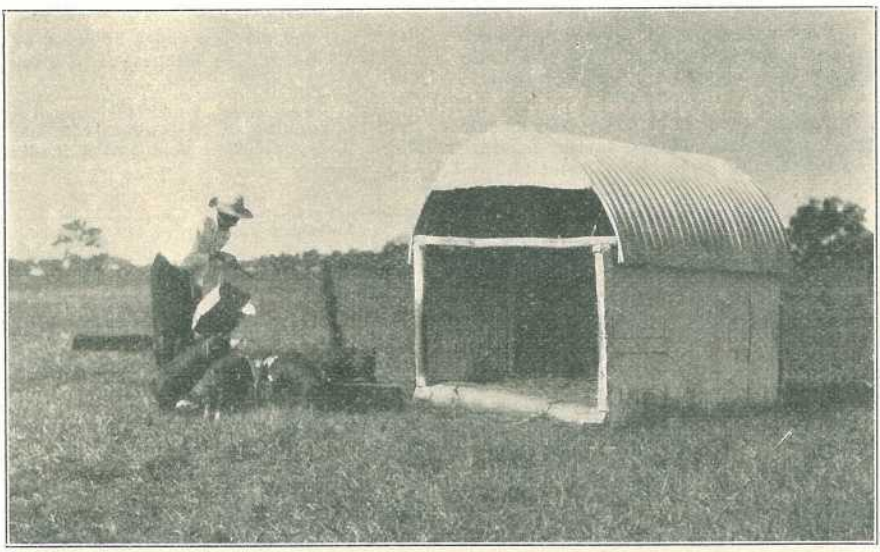

PLATE 40.—FEEDING THE MORNING MILK TO A HUNGRY LITTER.
Piggery management is part of the curriculum at St. Lucia Farm School. The portable shelter was constructed by the boys from scrapped material found on the farm.

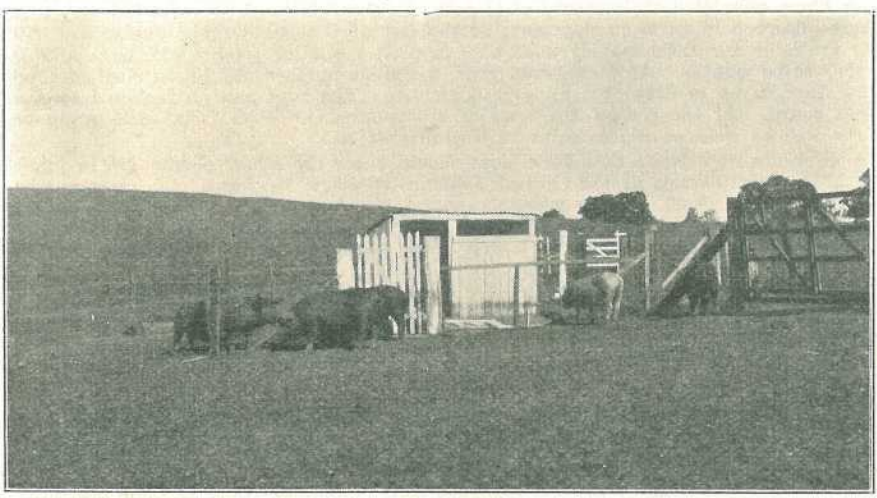

PLATE 41.—A CORNER OF A PIGGERY, ST. LUCIA FARM SCHOOL.

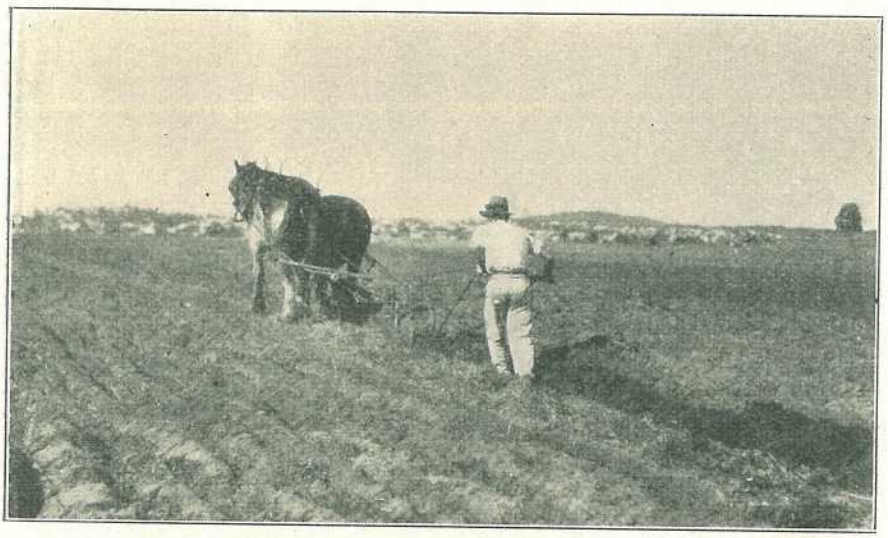

PLATE 42.—YOUTH AT THE PLOUGH.
Learning to open a straight furrow at St. Lucia Farm School.

PLATE 43.—GIVING THE HORSES A "BLOW."
A scene on St. Lucia. The lad was receiving his first lesson in ploughing and the handling of a team. Mount Coot-tha and D'Aguilar Range in the distance.

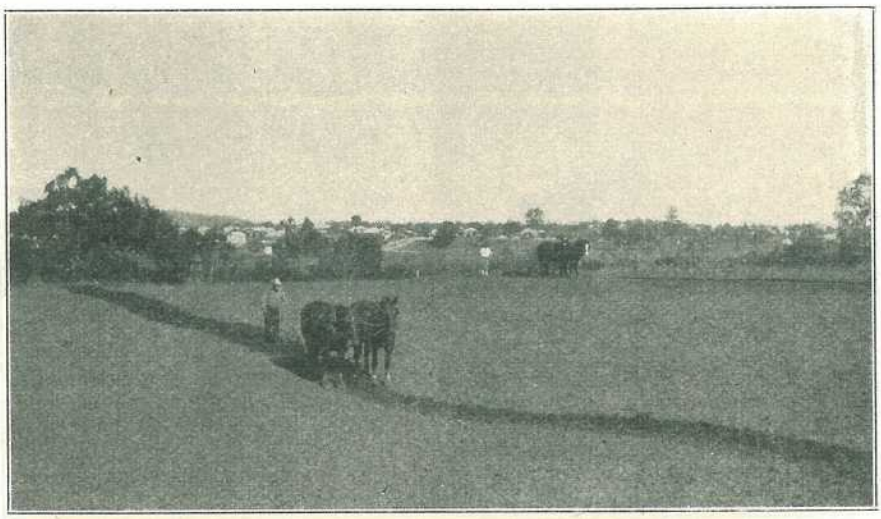

PLATE 44.—PREPARING LAND FOR LUCERNE.
Plough teams in charge of trainees at St. Lucia.

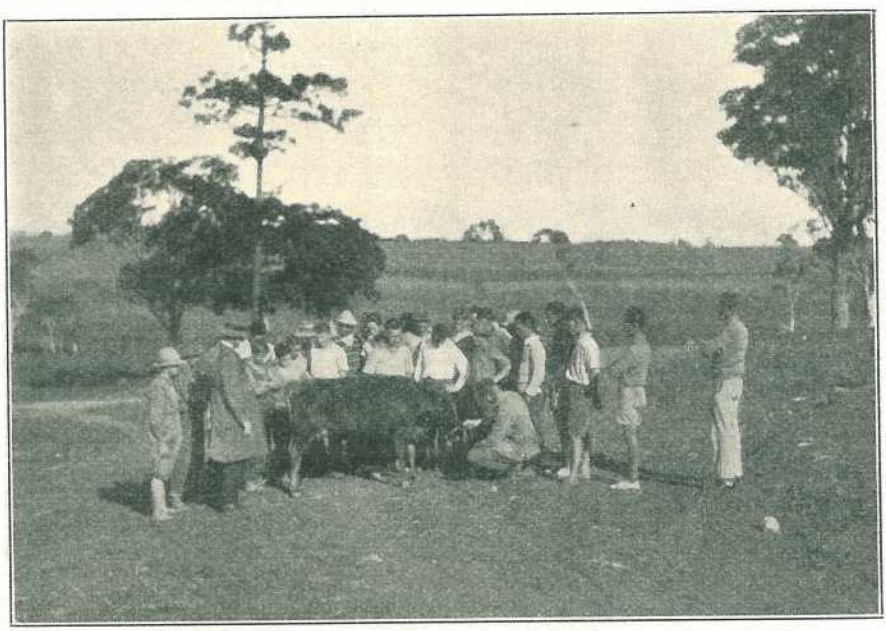

PLATE 45.—POINTS OF A GOOD "PODDY."
A Dairy Instructor demonstrating at St. Lucia Farm School.

BEERBURRUM TOBACCO SETTLEMENT.

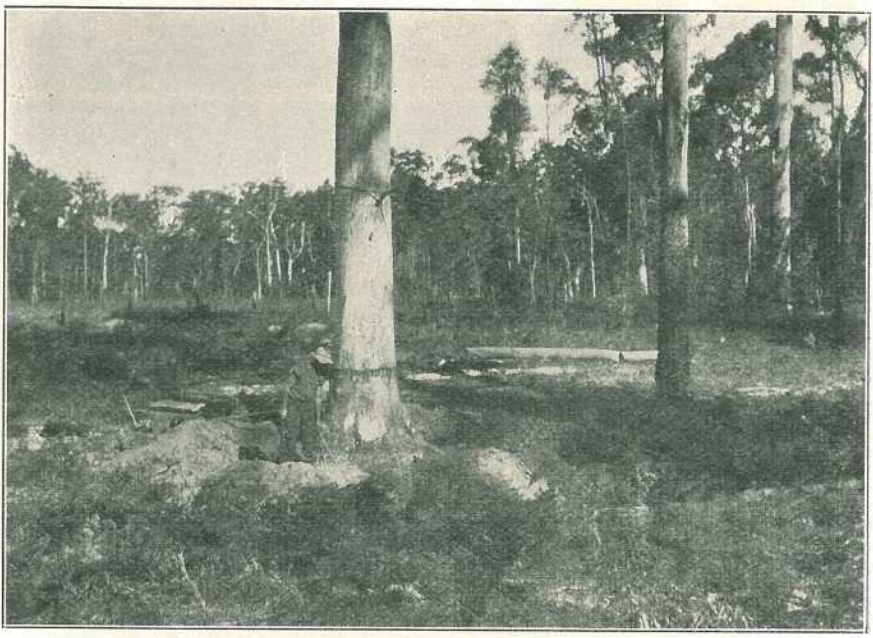

Plate 46.—Grubbing a Forest Giant.
Clearing land for tobacco at Beerburrum.

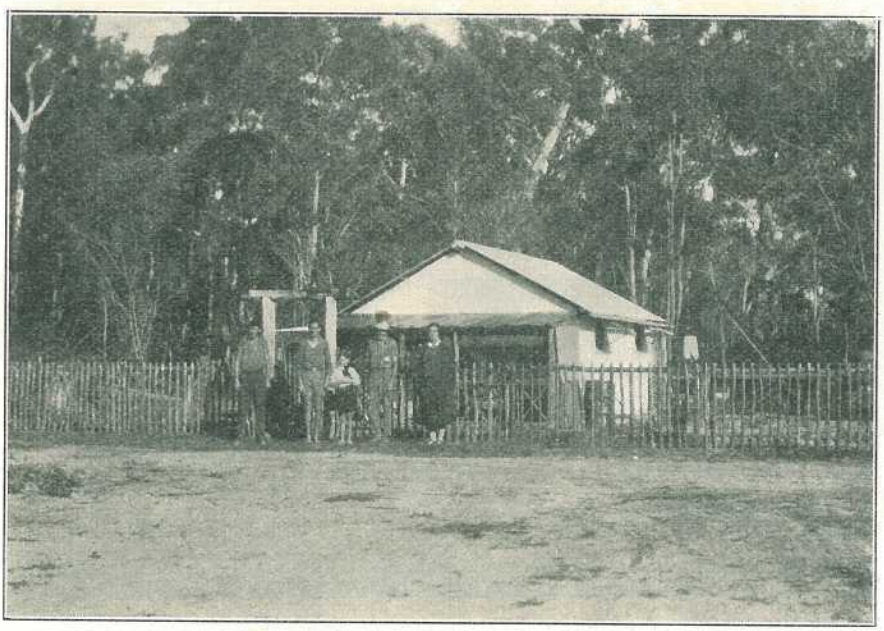

Plate 47.—Beerburrum Settlement.
A tobacco-grower's temporary home.

PLATE 48.—ANOTHER TEMPORARY DWELLING ON THE BEERBURRUM SETTLEMENT.

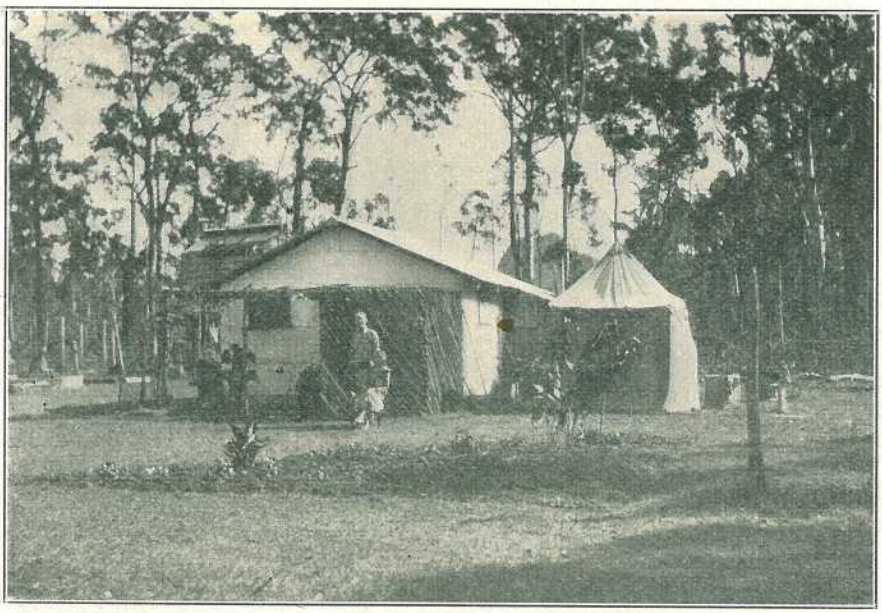

PLATE 49.—A BUSH HOME AT BEERBURRUM.
The new settlement of tobacco-growers at Beerburrum has shown good progress in its first year.

PLATE 50.—"AS THE TWIG IS BENT . . ."
Little Queenslanders on a Beerburrum Tobacco Farm.

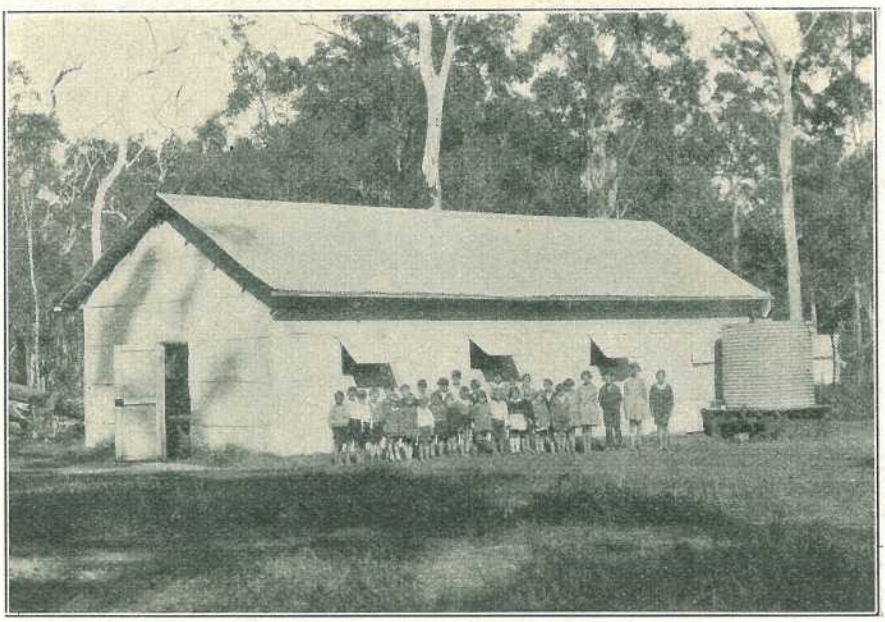

PLATE 51.—CITY CHILDREN BECOMING COUNTRY-CONSCIOUS.
Scholars and a temporary school house on the Beerburrum Tobacco Settlement.

PLATE 52.—A SETTLER'S FIRST TOBACCO CROP AT BEERBURRUM.

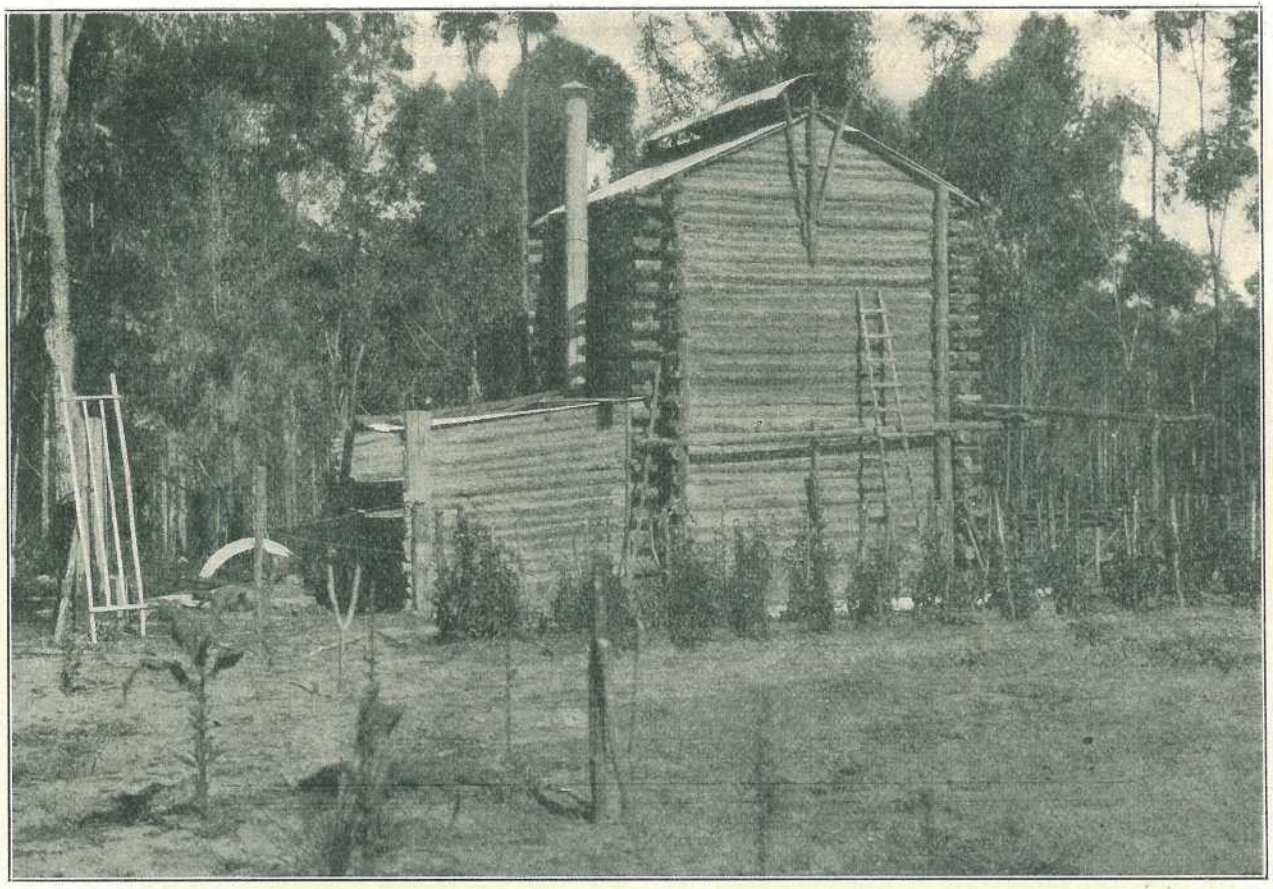

PLATE 53.—A LOG TOBACCO-CURING BARN, BEERBURRUM SETTLEMENT.
Barns of this type built from material on the spot have been erected by the settlers on most of the farms.

PLATE 54.—BEERBURRUM SETTLEMENT, TOBACCO GRADERS AT WORK.
The girls are the daughters of settlers, and they are proving very skilful in their new job under the supervision of officers of the Department of Agriculture and Stock.

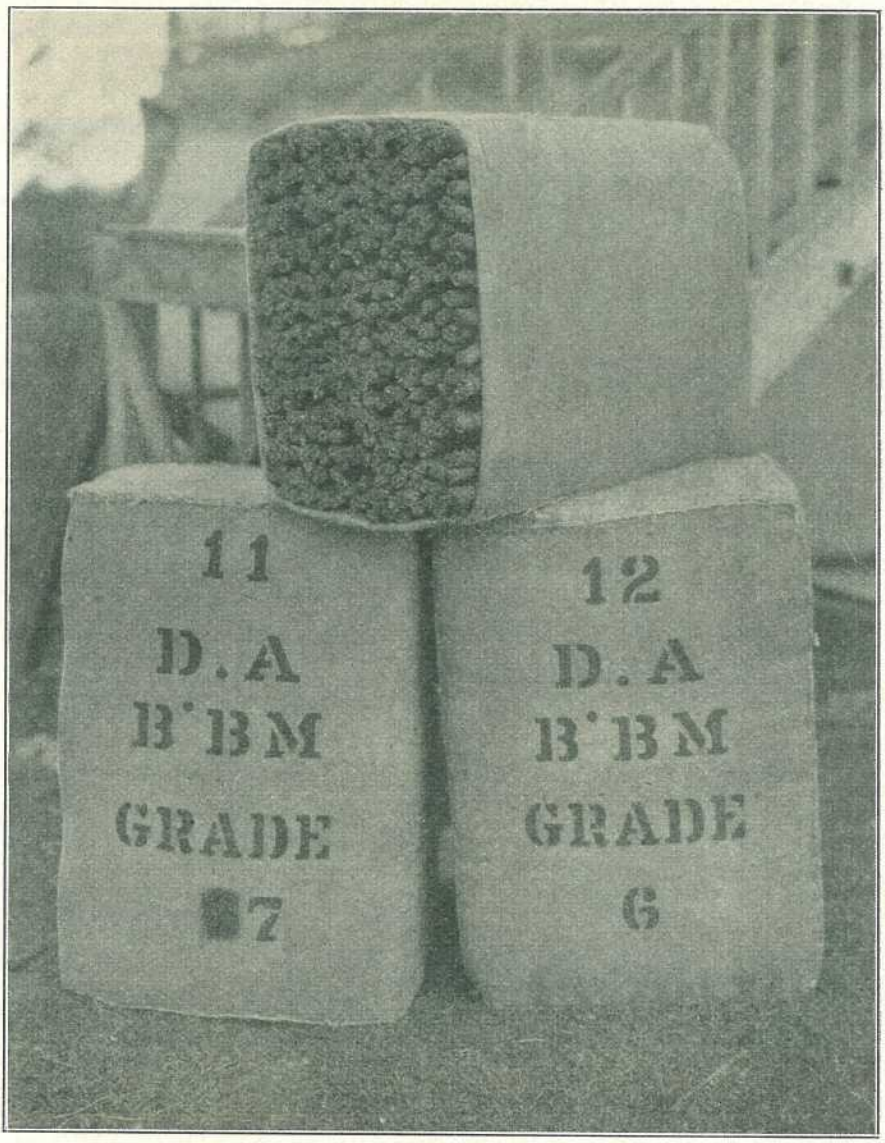

PLATE 55.—FIRST FRUITS OF INDUSTRY.
Tobacco on a Beerburrum farm baled for sale.

Plate 56.—Beerburrum Tobacco Ready for Railing to the Brisbane Market.

A PLANT POISONOUS TO LIVE STOCK (*Cestrum Parqui*).

By J. A. RUDD, L.V.Sc. (Melb.), Director, Animal Health Station, Yeerongpilly, and C. T. WHITE, F.L.S., Government Botanist.

Description.—A shrub 4 to 5 feet high, suckering very freely from the base. Leaves with a rather offensive odour when crushed, lanceolate in shape, dark, rather dull green above, paler beneath, 2 to 4 inches long, ½ to 1 inch wide, on a leaf-stalk or petiole of about ¼ inch. Flowers in bunches (panicles) terminating the branches, the flowering branches usually somewhat curved or pendant; individual flowers yellowish green, often somewhat brownish, narrow-tubular, ¾ to 1 inch long, the upper part or limb divided into five small acute lobes. Fruit black, shining, elongately egg-shaped. Seeds angular, embedded in a juicy dark-purple pulp.

PLATE 57.—A SHRUB POISONOUS TO LIVE STOCK (*Cestrum Parqui*).

Distribution.—A native of Chili and the Argentine, South America, now a common naturalised alien in South-Eastern Queensland, especially in vacant allotments around towns.

Common Name.—We have not heard a common name given to it in Australia, but the botanical one is short enough for general use. In the Argentine, according to an article by Dr. L. F. Ruiz in the "Bulletin of the Ministry of Agriculture" of the Argentine Republic (Vol. 29, pp. 52-55), it is variously known in that country as "Duranzillo," "Duranzillo Negro," and "Palque." A French name for the plant is "La Parquina."

Poisonous Properties.—According to Dr. Ruiz, in the article just referred to, some notes on the chemistry of the plant were published by J. Mercier and J. Chevalier in the "Bulletin des Sciences Pharmacologiques" for October, 1913, where it is stated that the poisonous principle is due to an alkaloid.

Effects on Stock.—We have never known horses to touch it although feed in the paddocks was decidedly short, even up to starvation point. Cattle and sheep however, will eat it if fresh feed is scarce, even if they are fed on chaff and in first-class condition, particularly in the late winter and during frosty weather. It brings on paralysis of involuntary muscles soon after being eaten; loss of cud in ruminants follows constipation at first with blood-stained fæces; dry muzzle; temperature up to 105 deg. Fahr. This is rapidly followed by a general paralysis and death in great pain. The rapidity of onset of these symptoms is dependent upon the quantity consumed and the peculiar resistance of the animal, which refuses all food long before death, but may, however, drink a very little water before death. Post-mortem examination reveals visible mucous membranes, cyanotic, enteritis, with marked blood extravasation along the whole alimentary tract, with hæmorrhage in parts into the tissues of the bowel.

Eradication.—At the present time the plant is nowhere so abundant but that hand eradication will be found the most effective means of control. After the parent plants have been cut off below the soil level, or pulled out, numerous suckers will come up from the old roots. These must be chipped or hand pulled regularly until the old roots have become exhausted. If preferred they can be poisoned, but the young shoots will have to be sprayed several times until the old roots fail to send up any more suckers. This may have to be persisted in for as many as five seasons before the plant is finally destroyed.

Botanical Reference.—Cestrum Parqui L'Her. Stirp. Nov. 73.

CHEAP RUGS FOR DAIRY COWS.

Where proper shelter is not provided for stock, not only is their resistance to disease reduced, but much food material is wasted in "warming the wind," or, in other words, meeting the increased demands of an exposed body. This fact has an important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the last mentioned, especially in colder districts and situations, the rugging of the animals during, at any rate, a portion of the winter is well worth while.

Many farmers would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity, points out a departmental leaflet. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together, and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted; it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be water-proof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical manner.

FRUITGROWING IN NORTH QUEENSLAND.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) has received the following report from Mr. H. J. Freeman, Senior Instructor in Fruit Culture, Cairns, upon fruit matters generally in North Queensland for the second quarter of the year.

Citrus Fruits.

CAIRNS produced the heaviest crop of both mandarins and oranges for any individual district between Cooktown and Townsville, though the other districts have produced crops of slightly greater proportion than that of last year.

As a consequence, prices have not been very satisfactory. Whereas it is usually an accepted fact that good quality mandarins demand a better price than equally good oranges, there are many instances this year where such has not been the case. This is entirely due to two causes, the first being the proportionately bigger crop of mandarins as compared to the orange crop, and the unseasonable weather conditions existing, whereby it was impossible to get the fruit to hold. The fruit ripened so quickly during the exceptionally humid June weather that many orchardists were sorely troubled by having to destroy such large quantities of windfalls which had reached such a state of ripeness that they simply dropped from the tree. Having no cold weather has been instrumental in allowing the fly to inflict damage in districts south of Innisfail, in which, during ordinary seasons, fruit is not injured to any serious extent by this pest.

Local lemons of excellent quality can be purchased for a few shillings a case. It has always been surprising that more growers do not resort to storing; holding the lemons until an appreciable rise in temperature would naturally help to improve the price of lemons considerably, as well as to create a very keen demand as compared with any autumn or winter sales.

Other Fruits.

Locally, pineapples are still scarce.

A crop of granadillas commenced ripening during the first week in June and for the balance of the month there was no shortage in this line. At the correct time, a trial consignment of this fruit to the Brisbane or Sydney markets would bring forth results that should be quite pleasing.

Passion fruit is very scarce and, in many instances, a fungus attacking the vine just above the ground surface level has been destructive. Along the northern coastal area, it is essential to plant out a number of new vines each year.

For a short period during May, there was a general shortage of papaws throughout the northern coastal areas. This was somewhat of an unusual happening, as the North is capable of producing a never-ending supply of this beautiful fruit. However, this period passed and papaws of excellent size and quality are again to be seen in practically every centre where fruit is offered for sale.

Our output of bananas during the past three months has been remarkably small and I have noticed, unfortunately, even though we are producing only sufficient to satisfactorily supply local requirements, that it is a very difficult matter to find any fruit of good quality being offered for sale. This means that even for local sales we must look to newly planted areas for our supply of good quality fruit during the coming summer. Leaf Spot is very much in evidence, as also is Root Rot, and the humidity of the autumn season has, this year, allowed the fly menace to continue almost uninterruptedly.

From reports to hand, the Herberton-Ravenshoe vineyards have been cleaned, and pruning will be commenced in the very near future. Some extra planting is expected to take place, and varieties that will yield better quality berries have been recommended. A decidedly temperate district, such as the Herberton-Ravenshoe area lying adjacent to a distinctly tropical zone, naturally possesses a fine asset, inasmuch as a ready sale for all temperate products can be made in the towns on the tropical coast below the Dividing Range.

Because of the geographical position of this hinterland and the nature of its soil conditions, and also because of the vastness of the tropical belt of country extending from Townsville to Cooktown, I consider the possibilities of this higher country have never been developed to the extent they should—nor have the possibilities resulting from such development ever been realised, except by very few.

Inquiries were received during June concerning the possibility of securing land in the North for the growing of tea, coffee, and cocoa.

PIG IMPROVEMENT SCHEME.

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

REALISING that the interests of stock men generally and particularly those of pig raisers are best served when development on sound economic lines goes hand in hand with extension of marketing facilities, the Minister for Agriculture and Stock (Hon. F. W. Bulcock) in this State has, with the co-operation of various interests associated with the industry, been devoting a considerable amount of time recently to organising and making due preparation for extension of activities which must necessarily follow the opening up of overseas market outlets for Queensland's pig products. A résumé of activities of the Queensland Pig Industry Council also indicates progress and assures pig raisers that their interests are being carefully guarded in the advance that is being made.

The formation of the Queensland Pig Industry Council in April last was an earnest of the desire to bring all parties together around a common table to discuss the pros and cons of the business, and to lay plans for future development of this, one of Queensland's most progressive live-stock industries.

The plan adopted on inauguration of the Pig Council was to arrange for various sub-committees to take control of sectional activities and to devote special attention to these prior to a calling together again of the parent body.

In his numerous references to the pig industry in this State, the Minister has drawn attention to the fact that although it is one of the oldest industries in the world, dating back to scriptural days, the pig industry has been a very neglected one and has received the least attention of all, and more particularly from the economic point of view.

A stage has now been reached owing to altered demands of consumers the world over when, in order to make the carcases of pork and bacon pigs acceptable to the trade, certain characteristics have to be developed without which it will be impossible to have permanent access to the world's markets. Formerly a short fat pig was regarded as the breeders' ideal; to-day the long, lean, quick-growing and early-maturing pig is to the fore, and for the export trade white-skinned pigs are in particular demand.

Without doubt, as Mr. Bulcock points out, the time is opportune—even more so than a few years ago—for, with the inauguration of the Queensland Meat Industry Board and Brisbane Abattoirs, and with the hearty co-operation of the board's officials, together with the reorganisation of the Animal Health Station at Yeerongpilly, an excellent opportunity is provided for engaging in considerable experiment work in problems relating to nutrition, preventive measures in disease control, research into mortality in young pigs, and for carrying out efficiently organised feeding tests with Queensland products like meat and protein meal and the by-products of the cotton and other industries.

The Minister has emphasised on more than one occasion that the fundamental necessity is to secure a fair and equitable return for the labour the farmer puts into his work and on his capital invested in land and stock.

With a view to assisting approved farmers to improve their pig herds, and thus assist in developing the industry, the Better Boar scheme has been introduced and is being pushed on with.

Under this method of pig improvement, selected boars of a breed recognised the world over as being suitable will be made available to approved farmers on a subsidy basis—that is to say, the department will bear half the total purchase price of the boars purchased under the scheme provided application is made on forms to be provided and that the farmer agrees to the department's proposals.

Another important move by the Minister has been the provision at the Animal Health Station of a Pig Experiment and Research Section, especially for experiment work.

AGRICULTURAL NOTES.

By H. S. HUNTER, Department of Agriculture and Stock.

GENEROUS and unexpected rains in July revived the demand for live stock, and caused a decline in farm fodder prices. It is too early to look for a spring in pastures, but a profusion of clovers and winter herbage is reported from many districts.

Improved seasonal conditions have greatly eased the situation, especially in the dairying country where dry weather in conjunction with low butter-fat prices were creating considerable anxiety. A wonderful response has been obtained from winter-growing fodder crops, which were practically at a standstill and could not be grazed without being pulled up by the roots. In a short space of time these will provide good grazing or material for cutting and feeding to stock.

The subsoil, which had become depleted of moisture owing to a long absence of good soaking rains, has now received a thorough saturation, and the spring season can be looked forward to with every confidence. It is a matter for gratification that the State's principal cotton belt has participated, and so has been assured of favourable conditions for planting at the period of the year most suitable for the purpose, an important factor governing successful cotton production. It now remains for the growers to adopt approved methods of cultivation until the planting time arrives.

The preparation of land is being pursued with vigour to conserve moisture and to get the soil into readiness for planting with maize, cotton, potatoes, pumpkins, dairy fodders, and other summer-growing crops, as soon as the danger of frost has passed.

Early plantings of potatoes have already been made and should be assured of a good start. For the spring planting seed has to be obtained from southern States, as tubers harvested from autumn-planted crops are not sufficiently advanced for the purpose. Seed potatoes should be selected, when possible, from localities which are free from disease. When there is any possibility of infection by fungoid growths it is advisable to immerse the potatoes for one hour in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water. Before rebagging for conveyance to the field the potatoes should be thoroughly dried and the bags treated in a similar manner.

The Wheat Outlook.

Wheat sowing practically has been completed under conditions, in most districts, fairly satisfactory for a good germination, but the greater part of the main wheat belt will require further rains in the near future before the position can be regarded as entirely satisfactory. The question whether Australia is to restrict the production of wheat may yet be decided by Mother Nature. The dry spell, which until recently afflicted Queensland, has extended also into the wheat areas of the southern States, resulting in a faulty germination. Rains in June provided some relief when many of the crops were in a critical condition, and the July downpour has now assured a fair harvest, subject, of course, to later falls.

One factor which, to some extent, has aggravated the world wheat problem is the unusual run of favourable seasons for the past five years in practically all important wheat-growing countries. This appears to have been broken, judging by the reports of an adverse season in North America, which are responsible partly for the recent appreciable rise in overseas wheat values.

Grading Tobacco Leaf.

Tobacco-curing operations now are completed, and growers for the most part are engaged in grading the leaf prior to offering it for sale. This is really a most important stage in the primary industry of tobacco-leaf production, and whether this operation is carried out by the grower himself or by a commercial grading establishment on his behalf the responsibility is his to see that the job is properly done. Buyers have repeatedly declared that they do not want ungraded or badly-graded leaf, and the point has been emphasised further by their refusal to bid for parcels at the last auction sale, which otherwise were quite saleable, in so far as leaf quality was concerned. A feature of the last sale was the improved quality of some of the offerings, which were grown under irrigation in the Texas and adjoining districts and in the Tamworth and Ashford districts of Northern New South Wales.

Failures of crops in many of the tobacco-growing districts this season have emphasised the dangers to which single-crop regions are exposed. In such regions a crop failure, or a collapse in market values, creates an embarrassing position. This position has been felt keenly of recent years in some of the Southern wheat-growing areas, and, to some extent, in the cotton belt of the Callide and Upper Burnett.

Fortunately the cotton lands were capable of being developed also for dairying and mixed farming, and the Southern wheat areas could be utilised to some extent for other farming activities, but the tobacco lands of Queensland are in a different category, as tobacco is grown on soils unsuited for other forms of agriculture. In fact, they present a problem for the cultivation of green manure crops necessary for restoring humus to the soil.

Farming on Central Coast.

For some years wheat has been grown to a limited extent for grain production in the Central Division, notably in the Dawson Valley. In recent seasons many of the crops originally intended for grain production eventually were fed off to stock, either because of their unsuitability for grain or on account of a fodder shortage. Wheat sowing for the current season practically had been completed prior to the rain, and the young crops will be assured of an excellent start. Throughout the area in question there are many comparatively new settlers, who, making a start on their holdings with cotton, have been endeavouring gradually to build up dairy herds, so that reliance would not have to be placed entirely on one crop. The past unfavourable seasons have hampered their efforts in this direction. The area under cultivation gradually is expanding in the Central Division. In the inter-coastal mixed-farming districts, lucerne, maize, potatoes, pumpkins, onions, broom millet, and dairying and pig fodders are grown, in addition to cotton and wheat. Peanuts are an important crop in the vicinity of Rockhampton, and the coastal lands lying between that city and Mackay have produced some of the best tobacco leaf so far grown in the Commonwealth. In addition, considerable expansion has attended the extension of the dairy industry to the immediate hinterland of Mackay.

Fruit Sales.

The cold weather has had a depressing effect on fruit sales, particularly of oranges and pineapples. In addition, local fruits have had to compete with Southern oranges and with heavy supplies of apples and pears from Tasmania. Strawberries are coming forward freely. A heavy crop is being harvested this season on the Blackall Range, whence consignments are being forwarded to Brisbane and Sydney markets. The fresh fruit market is being relieved by the acceptance of strawberries for factory purposes. Consignments of factory strawberries forwarded to the Committee of Direction must consist of stemmed, clean fruit, and arrive in sound, unfermented condition. Stale fruit should not be included. Potatoes continue to realise good prices, provided they are of satisfactory quality. The demand has improved for other good-quality vegetable lines.

THE WHEAT POOL.

Executive approval has been given under "*The Wheat Pool Acts, 1920 to 1930*," for the issue of the State Wheat Pool Election Regulations, which rescind the existing election Regulations. These provide that the Wheat Board shall consist of four representatives of growers, instead of five as previously, to be appointed from the 1st September, 1933. Also, the members of the Board shall be elected by the wheat-growers voting as one constituency, and shall not be elected from certain districts as was provided in the old Regulations. The representatives on the Board shall be elected by postal ballot by those growers of wheat who furnished returns of wheat for the 1932-33 season, those to whom seed wheat has been supplied by the Wheat Board for this year's planting of not less than 10 acres of land for delivery of the resultant grain to the Wheat Board, and other bona fide growers of not less than a similar area who may make application for a voting paper.

PLATE 58.—SCHOLARSHIP CLASS, NAMBOUR RURAL SCHOOL.

On an instructional visit to the Department of Agriculture and Stock. The young people were keenly interested in the scientific and technical services of the Department. Seated in the centre from left to right are Messrs. H. J. Bonham (Teacher in Charge), W. A. Zerner (Head Teacher, Nambour Rural School), and J. F. F. Reid (Department of Agriculture and Stock).

SHEEP STATION MANAGEMENT.

J. L. HODGE, Instructor, Sheep and Wool.*

IT does not necessarily follow that an expert wool man would make a successful property manager. As a matter of fact the dual position, sheep and wool, is a difficult one to fill. On the other hand, it is not essential that a station manager should be an expert wool man; however, a sound knowledge of wool is to be desired. A thorough knowledge of all stock is also required. The man should be a good man over men, firm but just, and with a capacity for work. A sound knowledge of improvements and their value is of importance. His knowledge of country and its carrying capacity is essential.

Flock Management.

The cost of feeding a bad sheep is just as great as the upkeep of a good one, and it is therefore necessary that the successful manager should keep constantly before him the improvement in his flocks. Apart altogether from type, this is to be achieved in two ways—breeding and culling—firstly, in the use of better rams, and, secondly, in the culling of the ewes. Either operation practised separately is of value, but the full value is not gained unless the operations are carried out together. First fix in the mind's eye the type likely to do best and be most profitable in the particular locality. This is of importance, because a type of merino, suitable for, say, Stanthorpe district, may prove a failure if depastured in the far West and Central districts of Queensland where drought has to be contended with. In this connection, it is as well to remind growers at once that price per pound of wool is not everything. In fact, where the constitution of the animal plays such a big part, price per head is of greater importance. In the matter, then, of the purchase of rams and the culling of ewes, if the manager has sufficient knowledge for this important work, well and good. If not, he would be well advised to employ a recognised authority.

With regard to cull ewes, we in this Department would like to see them sold as fats where that is possible, and not passed on as breeders to other graziers. It is admitted, of course, that in some cases station culls are as good in quality and constitution as the smaller grower can procure locally, but this is the exception and not the general rule.

Having then fixed a type likely to be most profitable under conditions existing, such as locality, average rainfall, prevalence of drought or otherwise, water conditions, and distances to be travelled, it is advisable to stick as closely as possible to that type. Chopping and changing about in the use of rams is not recommended. Under ordinary pastoral conditions rams may be joined up with ewes eighteen months old to lamb then at about 4 tooth.

During pregnancy the ewes should be maintained in good, strong condition, without allowing them to become too fat. After lambing, and with lambs at foot, the feed cannot be too good. Weaning depends to a great extent on local conditions and the growth made by the lambs. If good feed is available, merino lambs may be weaned at about five months old. They should, of course, get the best feed offering.

Improvements.

A thorough knowledge of improvements, their cost, and the necessity for them should be part and parcel of the equipment of the manager of a pastoral holding. Fencing and its value is a necessary part of his knowledge; the conservation of water, where surface water is necessary, should be one of his first cares; the value to the station to be derived from expenditure of money in ringbarking is of first importance. The wise maintenance of improvements calls for economic expenditure. All these items taken together call for qualities of wise judgment on the part of the successful manager. Original improvements, such as the homestead, the shearing shed and its equipment, huts, horse and cow yards, the dip, drafting yards, and fencing call for experienced judgment in the matter of the necessity for them, and the capital value of the property when so improved. It is easy, when the money is available, to over-capitalise a property, and this means a direct loss to the extent of such over-capitalisation.

Lamb Marking.

Lamb marking is an annual operation on the property and calls for organisation. Have everything ready before the ewes and lambs are mustered and yarded, and avoid that state of unpreparedness which sometimes prevails to the detriment of the stock.

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* In a radio address from Station 4QG.

The actual operation calls for efficiency, cleanliness, and despatch, and should be carried out in yards known, as nearly as possible, to be free from germs such as tetanus. Where circumstances permit, we like to see lambs marked in yards erected temporarily for the purpose in the paddocks in which the ewes and lambs are to be let go. The best age at which to mark lambs is from a fortnight to a month old. The utmost cleanliness is necessary in the operation. Knives and other implements used should be dipped freely in a good antiseptic. A recognised preparation, both antiseptic and curative, should be applied to the wounds, and the ewes and lambs removed from the yards to the pastures as soon as practicable. The careful manager sees that these operations are carried out with as little knocking about of the flocks as possible.

Jetting for Blowfly Strike.

A manager is fortunate these times if he goes through the year without having to dress the flocks for fly blow. In this connection we, in this Department, feel that something has yet to be discovered to prove more efficient than jetting, but at the time of speaking this method is the best to hand. A small power plant is recommended, fitted with a suitable nozzle. A pressure of 120 lb. to 160 lb. to the square inch, according to the length of wool carried, is required to get the ingredient used successfully on to the skin of the sheep.

Many proprietary mixtures, some with excellent qualities, are offered to the grazier. We find the use of arsenic and soda economical and effective up to a point. The proportions recommended are as follows:—7 lb. arsenic, 7 lb. washing soda, 100 gallons water; 1 lb. of soft soap may be added. The whole thoroughly dissolved. The nozzle should be held as closely to the sheep treated as possible.

Sheep Licks.

The experienced manager will quickly detect a loss in condition in the flocks under his care. Apart from feed deficiency this loss in condition may be brought about by worm infestation. The remedies are at hand and quick action is necessary in the endeavour to check the spread of the pest. However, this loss of condition may be due to another cause—mineral deficiency in the pastures. This should be proved by analysis of the water supply, if artificial, and the ordinary grasses to which stock have access. Most Australian pastoral country is notoriously deficient in phosphates, and if this is found to be the case, it is the duty of the manager to ascertain what is wanted to make up the known deficiencies and to supply them in the form of a lick. Some good proprietary licks are offered for sale, but a prescribed lick for a certain set of circumstances is preferable, unless the proprietary lick happens to contain the ingredients wanted.

Shearing and Marketing of the Clip.

The manager would be well advised to make early preparation for shearing. Too often this is left to the last day with consequent hurry and bustle. The machinery and engine should be attended to, the shed clean, yards and gates put in order, flooring battens fixed if necessary, down shoots put in order, and counting-out pens fixed for convenient working. All supplies necessary on the board for dressing wounds should be in readiness, the wool press overhauled and packs handy—in fact, a multitude of details which, if attended to in time, make for a smooth start.

A good manager recognises the necessity for an expert wool classer, and here let it be said that the payment of a good man should never exercise the minds of those finding the money. The right man earns his money and a handsome surplus for his employer.

Finance.

It is essential that the successful manager should have some knowledge of local pastoral finance, and, further, he should be a good judge of stock values. A proposal founded on sound conservative lines is likely to meet with success, and although borrowing is not generally advocated, the industry is such to-day that outside finance enters largely into it. When money is available on satisfactory terms, one is justified in using same for specific purposes, provided the purchasing prices are not too high, and that one gives due regard to the capital value of the holding. Close touch should be kept with the local values of all stock. To buy well is a good deal half completed, and a fair proportion of the profits on the property come from a wise sale, either in the case of taking advantage of a temporary rise in prices or a sale made at a fair price with the specific idea of lessening numbers to the direct benefit of stock left on the holding. Small economies may be effected in management. Never buy a thing because it is cheap, unless there is direct use for the article. Repair at once what will cost you twice as much later on, and observe economy in management without depreciating efficiency.

THE DAIRY INDUSTRY.

THE DAIRY COMMITTEE SCHEME.

THE Dairy Committee scheme is a movement among the Local Producers' Associations of Queensland to group all members engaged in dairying activities. By distributing addresses on topics of interest to dairy farmers the scheme should result in making local producers' meetings more interesting and profitable to members.

The appointment to the position of leader of some member who has the welfare of fellow-members at heart will provide a link between the L.P.A. and the Dairy Branch of the Department of Agriculture and Stock. The leader's duties will be to act as official correspondent of the L.P.A., to make himself acquainted with departmental activities, to advise members in respect to such activities, and to generally lead debate and guide the committee's activities. In a large number of L.P.A.'s the secretary, no doubt, would be prepared to undertake these duties, in addition to his secretarial work.

The first address was forwarded to L.P.A.'s on the 25th May, and subsequent addresses have been and will be forwarded at regular periods. The fullest possible discussion is invited on all addresses submitted so that the maximum benefit may be obtained. Matters which arise out of the address may be referred by the leader to the Department for reply.

An effort is being made to have all leaders brought down to the Department and the Animal Health Station, so that they may become thoroughly conversant with departmental activities. The first quota is now attending a course of instruction in Brisbane.

The programme includes lectures on technical subjects and demonstrations at the Animal Health Station; also visits to a butter factory, cold stores, ice-cream works, piggeries, and the Brisbane Abattoir. It is hoped that the scheme will bring about closer co-operation between dairy farmers and the Department, which is working in their interest.

The scheme has become effective through the active support of the Dairy Cattle Improvement Board, which recognises it as a movement of considerable educational importance and the primary objective of the Dairy Cattle Improvement Act.

It is expected that as the scheme progresses other features of interest and benefit to dairy farmers will be included.

SERVICES AVAILABLE THROUGH THE DEPARTMENT OF AGRICULTURE AND STOCK.

It has been the aim of the Department at all times, through the extension of its services, to strengthen the economic position of the primary producer and to maintain primary production on the soundest basis possible.

It must not be thought that the extension of services in this State involves experimentation. Every movement represents the adaptation of practices of other countries. Their effect on the economic life of the people is noted carefully and their development followed closely. The benefits likely to accrue to the people through their entire adoption or adaptation is the sole consideration of those who are charged with the framing of agricultural policy.

It is at times found necessary to give statutory authority to such movements to help those who will not help themselves, or to prevent those who will not see from jeopardising the welfare of the great majority. Unfortunately, we find such authority regarded with a sense of foreboding.

Let us get a fresh outlook of agricultural legislation and regard it merely as a collection of rules of our organisation, for that is exactly what it is. Let us examine those rules dispassionately, and we will find they meet with almost unanimous approval. Let us calculate the outgoings or the membership fee of our organisation and weigh it against the benefits to be derived, and we shall gladly contribute the small membership fee and feel grateful that we belong to such a well-regulated benefit society.

No doubt many dairy farmers are turning over in their minds the question of what benefits are available. Of course, the Primary Producers' Co-operative Associations and Marketing Acts under which the Commodity Boards, the Council of Agriculture, and our Local Producers' Associations are formed will come readily to mind. The fact that the association formed under legislative authority was responsible primarily for the acceptance of favourable marketing conditions throughout Australia

is well known to us all. Its benefits in returning millions of pounds to the farmers' pockets are, however, regarded with an equanimity which suggests that those benefits are not appreciated fully.

It now becomes a difficult matter probably to call to mind any other real benefits. This is due simply to a peculiar trait in human nature. We do not, as a rule, appreciate anything which comes to us without much effort. We value in life most highly the things that are difficult to obtain. We value the services for which we have to pay. We regard them only in proportion to their cost. Let us proceed to examine the various benefits which are available to members of local producers' associations who are following the dairying branch of production.

ACTIVITIES OF THE DAIRY BRANCH.

Production Recording.

Herd testing, or production recording, as it is now generally termed, is probably the most important feature in progressive dairy practice. In every dairying country in the world dairy farmers have realised its necessity and willingly pay large sums of money each year to secure the service. In New South Wales, where dairy practice is most near our own, from 140,000 to 180,000 cows are recorded each year, for which a fee of 6s. per cow is charged, and yet in our own State, where the service is absolutely free of cost, we find a paltry 10,000 or so cows recorded each year!

In every country in the world dairy farmers are required to contribute a similar sum for the service, and yet in Queensland we find they will not take advantage of it as a gift. Surely a serious indictment of our commercial instincts!

It has probably come to the notice of some members that production recording is now being conducted at butter factories. This has been rendered possible by the co-operation of the co-operative dairy associations, which are wholeheartedly supporting the movement towards the improvement of dairy live stock. The work is still being carried out by the Department, but as each centre grows and the numbers submitted justify the transference of the work to the factory, arrangements to that end are made immediately. While the local factory will be doing the testing of the samples, the production records will still be compiled in the Head Office.

Rebates of Freight.

Inseparable from production recording in the breeding of better dairy cows is the use of bred-for-production sires. To encourage their use a further benefit has been made available. They may be railed within the State free of cost, providing the freight does not amount to more than £10, which is the maximum grant made. This is another gift, and yet we find that only nineteen farmers have availed themselves of it in the past eleven months in which it has been on offer.

Literature.

Leaflets and pamphlets are available free of cost on all phases of dairying, representing the findings of science as applicable to modern dairy practices. The libraries of the world are thus opened to members.

Animal Health Station.

At the Animal Health Station, Yeerongpilly, situated about 5 miles from Head Office, the free services of two veterinary surgeons, with the advantage of ready service on all stock ailments are available; it is expected that this service will shortly be doubled. In addition, there is a trained staff of bacteriologists to conduct investigatory work. The Station has given particular attention to the more common ailments among stock in Queensland, and prepares and distributes vaccines at cost price. For instance, in the case of mammitis, vaccine is supplied at 6d. per dose when ordering 100 doses.

Blackleg vaccine is distributed for £2 per 100 double doses, natural pleuro virus 3d. per dose, and blood for tick fever innoculation 6d. per dose. Now, these supplies carry the hall mark of Government guarantee, which means that they are prepared by the most modern scientific methods and at least as good as can be procured anywhere. Yet, what do we find? Large numbers of L.P.A. members prefer, apparently, to pay much higher prices elsewhere for similar commodities.

Apart from the foregoing monetary benefits which are available to the dairy farmer members of the L.P.A. organisation, we must consider the activities of the Department which are directed solely towards their benefit. In the dairy section, assistance is given in the producing and manufacturing sections directed towards the maintenance of a high standard of quality which can only benefit the producers.

In the agricultural section, demonstrations and trials are provided with grasses and methods of fodder conservation; moulds are loaned to farmers for the construction of concrete silos; while advice and literature are available on all phases of agriculture.

In the Entomological and Plant Pathological sections, literature and advice are available on insect pests and diseases in pastures and fodder crops, while extensive investigatory work is conducted to ascertain methods of combating such troubles which annually represent a terrific wastage in our primary wealth.

In the Agricultural Chemist's section, a highly trained staff co-operates with the other sections of the Department in conducting analyses of stock foods, soils, waters, fertilizers, pest destroyers, and general analytical work, and furnishes to primary producers valuable information for their guidance and protection.

It may be that some L.P.A. members have not been aware of the extensive services at their disposal, and are desirous of availing themselves of them in certain directions. If such be the case, they have only to write to the Department of Agriculture and Stock, William street, Brisbane, which may be looked upon as the headquarters of their organisation.

When seeking veterinary advice or supplies, letters should be sent direct to the Animal Health Station at Yeerongpilly to avoid any delay.

It may not be amiss at this stage to mention some pre-requisites to receiving prompt information, such as the manner in which samples should be transmitted.

Firstly, it is necessary to differentiate between chemical analyses and bacteriological examinations. In the former, a fairly large sample, say, a beer bottle full, is necessary for analysis, while in the latter only a small sample is required, such as an ounce or so. For bacteriological work, extreme care should be exercised to see that the bottle (and cork) used is itself free from any contamination, and for this purpose care should be taken to boil the bottles and cork before placing the fluid, be it water or milk, in it. Do not add preservatives to milk forwarded for bacteriological examination, as it merely destroys the micro-organic life which it is desired to be examined.

The name of the sender should be written on each parcel, so that it can be readily identified on arrival with letter of advice. Dozens of parcels are received daily.

If contagious mammitis in a herd is suspected, send a sample of the strippings from an infected quarter to the Animal Health Station, at the same time advising the number of cows it is desired to treat, should the examination disclose the disease.

If contagious abortion be suspected, a sample of blood is required for examination. After clipping away the hair with a pair of scissors, cut with a sharp knife across a large vein on the top outside of the ear, and allow the blood to flow direct into a scrupulously clean and perfectly dry bottle. Half a fluid ounce (one tablespoonful) of blood is required in an ounce bottle. The sample must not be shaken up, but left to stand undisturbed for an hour or two, in order to form a firm clot. Then pack and despatch the sample with as little delay as possible to the Animal Health Station. Decomposed samples of blood are of no use for the test. If the samples are cooled in ice before despatch, they carry very well.

Full directions for taking samples of soil for analysis or for forwarding insect specimens or plant life are in the hands of every L.P.A. leader.

The silo moulds are loaned free of charge, but borrowers are required to lodge a deposit of £3 as a guarantee for their return in good order and condition. Freight is also required to be paid from and to the departmental store. The Department has a set of 14-feet steel moulds weighing 17 cwt., and a set of 15-feet wooden moulds weighing 14 cwt. at present on loan.

In the case of mammitis vaccine, both the autogenous and stock vaccines are supplied from Yeerongpilly.

Members of local producers' associations are exhorted to make the fullest use of the services at their disposal, and it is believed that with the helpful co-operation of all concerned a steady and certain advancement in dairy practice, calculated to result beneficially to dairy farmer members, is assured.

[*In subsequent issues of the Journal, specific dairying problems and points in dairy practice will be discussed in popular form and simple language.*—ED. "Q.A.J."]

CANNABILISM IN PIGS.

IT is unusual for sows to become cannibals and eat their own young, but it does sometimes happen. The food supply of the sow prior to and after farrowing is all-important, and on it very largely depends the health and wellbeing of sow and pigs. As far as is known, there is no disease which would definitely cause a sow to eat her pigs, but the trouble referred to as depraved appetite may be cited as the one possible cause. In some sows cannibalism is a habit formed at a previous farrowing and due to the sow being of such an excitable nature as to lose control of herself and temporarily become insane. In other sows there is an abnormal craving for blood, or for some food element not present in the ordinary rations.

Faulty diet is usually the cause of the trouble. It is possible that the mineral elements in the food may be lacking. Such elements as calcium, phosphorus, &c., are often insufficiently supplied. Many foodstuffs and pastures are deficient in mineral content; many grain foods are also deficient in protein flesh-formers; many pigs are fed an excess of fat-forming foods—maize, &c.—and an insufficient supply of flesh-formers. Lucerne and similar green foods, milk, &c., make up for deficiency of protein, while charcoal bone and meat meal, linseed meal, and a greater variety of food make up for mineral deficiencies. Sows that are allowed to graze over succulent nutritious pastures and that have balanced rations rarely, if ever, will be guilty of cannibalism. Sows that are kept in small yards and that become constipated and very feverish at farrowing time may become over-excited, and may temporarily lose self-control. Brood sows should not be allowed to eat the placenta or afterbirth, as occasionally partly formed or still-born pigs may be entangled in these tissues, and in this way the sow may be tempted to go further and eat the live pigs.

Some sows, particularly aged sows, become very heavy and clumsy, and overlay their pigs, and they then turn round and eat these and thus may be led to eat the others. Other causes are when the suckers, with very sharp black teeth, bite the sow's teats and udders and cause her to become excitable and snap at her young. She may draw blood, and in this way also become a cannibal. It is a good thing, where the litter fight and cause annoyance, to nip off the sharp black teeth of baby pigs, using a pair of tooth nippers or a small file.

Some breeders have found that by smearing the young pigs with a mixture of vaseline and bitter aloes, soon after they are born, trouble is prevented, particularly with a sow that has previously eaten her pigs. Other authorities advise giving the sow a good thick slice of salt pork between two slices of bread as a cure. Lack of green food and water, and lack of exercise and the feeding of unbalanced rations, is probably the cause in most instances.

In your case, we suggest reducing the amount of crushed wheat and adding more green food and mineral matter to the ration. If you do this, we shall be glad to have advice as to results, but would remind you that a great deal of time may be lost in carrying unprofitable sows. The purchase of fresh breeding stock would be productive of good and might pay a long way better than carrying on with the animals you have.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Answers to Correspondents.

BOTANY.

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

Dawson Valley Plants Identified—Sandalwood.

M.H. (Theodore)—

The specimens have been determined as follows:—

1. *Acacia fasciculifera*, a species of wattle.—The wood is said to be very durable in the ground. We have not heard the name Tulip Wood applied to it before. The name Tulip Wood in Queensland is generally given to *Harpullia pendula*.
2. *Cassia tomentella*.
3. *Citriobatus pauciflorus*.—This small plant belongs to the Pittosporum family (*Pittosporaceæ*). It is very common in parts of Queensland, mostly growing in scrubs about 50 to 100 miles in from the coast. It is not known to possess any poisonous properties.
4. *Abutilon indicum*.
5. *Santalum lanceolatum*, commonly known in Central and Western Queensland as Plum Bush or Scent Wood.—This wood is exactly the same as the Sandalwood exported from North Queensland. For many years we were always under the impression that it was only the Northern trees of this species that possessed scented wood, but during the last two or three years we have found that the heart wood of big trees in the more Southern parts of the State, even as far South as Dalby, possesses a strong, very pleasant, sandalwood odour. The wood from younger trees and the sapwood seem to lack the typical odour altogether.

   Send specimens of what you call sandalwood, but we think there is little doubt that this is *Eremophila Mitchellii*, a small tree common in Western Queensland and extending to New South Wales. In the latter State it is commonly known as budda. The wood is very pleasantly scented, and is occasionally exported as a second grade sandalwood under the name of rosewood. It is used in the West for fencing posts and as a fuel. We have recently found out, however, that the wood is likely to have considerable value for oil extraction. Wood distillation, however, is rather different from the distillation of leaves such as in the eucalyptus oil industry. It requires an elaborate plant, and if the industry becomes established the wood will have to be sent to some larger centre such as Brisbane or Sydney for distillation. Sandalwood oils are used as a fixative in the manufacture of soaps, tooth pastes, &c., and the quantity used industrially is far greater than the quantity used medicinally.

   We were interested in the notes you made on the specimens you sent, and would always be pleased to have any further observations on the specimens from your locality.

Swamp or Native Millet.

T.H.P. (Nambour)—

The specimen is *Echinochloa Walteri*, sometimes known as Swamp Millet or Native Millet. It is quite a valuable grass in wet situations. The grass is worthy of propagation, but seed is not stocked by nurserymen. If you desire to increase it, however, you should have no difficulty in doing this from seeds and cuttings from your own plants.

Bowstring Hemp.

A.F. (Cordalba)—

The specimen is Bowstring Hemp, *Sansevieria zeylanica*.—This is an excellent fibre plant, but has never been a great commercial success. We should say it would be an excellent plant for the manufacture of high-grade paper, but do not know that it is used for that purpose to any extent. There are many fibres that can be used in the manufacture of high-grade paper. If you write to the Curator, Technological Museum, Harris street, Sydney, New South Wales, he may be able to tell you whether there is any market for this fibre at the present time, and if there is any demand for it for paper-making.

Milk Vine. *Salvia Coccinea.*

H.D. (Rathdowney)—

The vine is Milk Vine, *Marsdenia rostrata*, moderately common in parts of coastal Queensland and Northern New South Wales. It has been definitely proved by feeding tests to be poisonous to stock, and its eradication is therefore recommended.

The red flowering herb or small shrub is *Salvia coccinea*, a native of tropical America, now a naturalised weed in many warm countries. It is fairly common in coastal Queensland and has the reputation of causing abortion in stock, but this has not been verified by feeding tests. However, in view of the known use of oils of its allies as abortifacients, it is just as well to look on the plant with suspicion. Personally, we rather doubt stock would eat it in sufficient quantities to cause trouble.

Paraguay Tea.

H.F. (Bundaberg)—

The plant advertised as Hervea is the Paraguay Tea, *Ilex paraguariensis*, a native of parts of the Argentine, Southern Brazil, and Chile. It occupies in many South American countries the same position as ordinary tea does in Australia, and the amount collected is very considerable. It has been exported abroad during the last few years, and many claims have been made for it. The Department has introduced seeds of it on occasions, but no success has been achieved in raising them.

Tie Bush. Chinese Burr. Rattlepod.

C. (Bundaberg)—

No. 1—*Wikstroemia indica*, sometimes known as Tie Bush on account of the fibrous nature of the bark. This plant has been suspected of poisoning stock at different times, but feeding tests were carried out a few years ago at the Animal Health Station, Yeerongpilly. At the end of about a fortnight's feeding the animals were in a very emaciated condition and suffered from bloody scours. When taken off the Wickstroemia, however, the animals gradually recovered normal health. It is doubtful if stock would eat sufficient of the plant under normal circumstances to cause death. The berries are poisonous, and a recent death of a child at Nambour, it seems, can be fairly definitely traced to this source.

No. 2—*Triumfetta rhomboides*, Chinese Burr. A common weed in Queensland, also has a wide distribution in tropical countries. It is not known to possess any harmful or poisonous properties.

No. 3—*Crotalaria Mitchellii*, Rattlepod. Several members of the Rattlepod genus have been definitely proved, both in Australia and abroad, to be poisonous to stock. No feeding tests have been carried out with the particular one you send, but it has several times been suspected, and of the plants you send we are inclined to look on this one as the most likely cause of the trouble.

Blue Couch.

R.H.M. (Pimpama)—

So far as we know, seed of Blue Couch is not obtainable through the ordinary commercial channels. The general practice for lawns, of course, is to lay down from turves, small rooted pieces, or, in damp weather, even from ordinary lawn clippings. The only test so far carried out by the Seeds Branch of the Department of Agriculture and Stock yielded 5 per cent. fertility. In spite of this, however, we think the plant must be spread by seed, because its spread has been so phenomenal during the last ten years; and it must be carried from district to district by seeds, most likely seeds passing through stock. If you want to sow from seed we think you will have to arrange to gather it yourself, but in damp weather the plant spreads so rapidly from roots that we think you will find this in the end the most satisfactory method, though it may be a bit expensive in the beginning. Blue Couch is undoubtedly a valuable fodder, though, of course, it has not the carrying capacity, nor do we think the milk-producing properties of a grass such as Paspalum, but it will grow where Paspalum will not thrive. Farmers with Paspalum paddocks may be a bit afraid of it, because it is so vigorous that when once it gets a hold it will crush out all other grasses and herbage, and will even, in time, conquer Paspalum—that is, where the Paspalum is closely fed or especially overstocked.

Setaria palmifolia.

E.W.H. (Hillview)—

Setaria palmifolia, a native of India, now much cultivated in tropical and subtropical countries as an ornamental grass. It is grown fairly extensively in Queensland gardens, and here and there has run out and become half naturalised. It is generally grown purely for ornamental purposes, and we have little or no information on its fodder value, but if you say that stock are eating it readily it should be worth while propagating. It grows rapidly and is easily propagated from division of the older plants. We have not heard a common name given to it.

Mimosa Bush.

F.I.T. (Yeulba)—

The specimen of Mimosa Bush is the ordinary Mimosa of Western Queensland, *Acacia Farnesiana*. Reports on this are rather conflicting, but most graziers who have spoken to us about the plant say that in spite of its prickly nature sheep will feed readily on it. Analysis of the leaves and young shoots shows the plant to be undoubtedly nutritious. Others state that the plant is worthless. It may be a matter of locality. We do not know. It seems to us, the only method of eradication of the plant is by brushing and subsequent burning. Burning, of course, should be done before the plants set seed, as otherwise the fire, especially if followed by rain, would assist germination.

Hop Bush. Kangaroo Apple. Rag Weed.

E.A.T. (Chinchilla)—

1. *Dodonæa viscosa*, Hop Bush, generally regarded as useful food for stock during dry periods, though not one of the best fodder trees or shrubs.
2. *Solanum aviculare*, Kangaroo Apple. This plant is definitely poisonous to stock. Usually speaking, it is left untouched, but quite recently some deaths of sheep were directly traceable to this plant.
3. *Pterocaulon cylindrostachyum*, a common weed. The only local names we have heard applied to it are Rag Weed and Stink Weed—names also given to other plants in Queensland. It is not known to possess any poisonous properties, but is apparently more or less useless as a fodder. It is in no way allied to Wild Mint.

A Useful Fodder Plant *Hedysarum coronarium* Sulla.

C.B.D. (Corfield, N.Q.)—

Hedysarum coronarium, Sulla has been introduced into Australia at odd times but never seems to have taken on to any extent, due, no doubt, to its being overshadowed by lucerne, but there is no doubt that there would seem to be a future for it in dry, rocky places where lucerne will not thrive. It is a native of Southern Italy, and is much cultivated in the Mediterranean regions—Southern Italy, Sicily, Malta, Algeria, &c.—where it is treated as an annual or as a perennial like ordinary lucerne, but in the more northern parts of Italy, where the winters are severer, it is treated strictly as an annual. We think that in Australia it would probably do best somewhere on the coast, say, between Brisbane and Gympie, but as it is said to stand a good deal more tropical conditions than ordinary lucerne, it is worth trying in the North. In Australia, it has been grown to a limited extent in as cold a place as Glen Innes, New South Wales, where it was found to make good growth during the winter, spring, and early summer, but did not set seed. We do not know how much seed you have, but if you could spare us a pinch we would be pleased to have it, and if you could spare another pinch and send it to Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Townsville, the favour would be much appreciated.

Balsam Apple.

J.A.O'N. (Gayndah)—

The specimen is the Balsam Apple, *Momordica balsamina*, a vine widely spread over the tropical regions of the world and much cultivated on account of its ornamental foliage and fruits. It is not known to possess any poisonous or harmful properties. A larger species, *Momordica charantia*, is cultivated as a vegetable by the Indians and Chinese. The fruit is soaked in salted water for some hours to rid it of its naturally bitter taste. It is then cut up and fried or used in curries.

General Notes.

Staff Changes and Appointments.

The following transfers of officers in the Department of Agriculture and Stock have been approved:—W. G. Hancock, Agent, Banana Industry Protection Act, from Pomona to Currumbin; D. McLaurin, Agent, Banana Industry Protection Act, from Gympie to Wynnum; C. N. Morgan, Inspector, Diseases in Plants Acts, from Thulimbah to Brisbane.

Messrs. C. Schindler and J. H. Horsley have been appointed Inspectors under the Diseases in Plants Acts, the latter also an Agent under the Banana Industry Protection Act, and will be stationed at Thulimbah and Pomona respectively.

Additional Cane Testers for the present crushing season have been appointed, and these are Misses J. Orr, M. T. Smith, E. Christsen, J. O'Flynn, D. Marles, and Messrs. T. P. Brown, L. Chadwick, J. Howard, and R. D. Woolcock, who will be stationed at the Bingera, Fairymead, Isis, Maryborough, Millaquin, Gin Gin, Moreton, Rocky Point, and Mount Bauple Sugar Mills, respectively.

Additional Assistant Cane Testers for the present crushing season have been appointed, and these are Misses T. M. Payne (Bingera), D. Aldridge (Maryborough), V. Page (Millaquin), and E. Mullin and P. Southwick (Moreton).

Mr. E. H. Gurney, Senior Analyst, Agricultural Chemical Laboratory, has been appointed Agricultural Chemist, Department of Agriculture and Stock.

Mr. N. G. Cassidy, Research Assistant, Bureau of Sugar Experiment Stations, has been appointed Analyst, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

The Officer in Charge of Police, Home Hill, has been appointed an Acting Stock Inspector.

The following have been appointed members of the Stallion Boards as hereunder specified:—

The personnel of the Wide Bay District Stallion Board and the Burnett District Stallion Board is the same, and consists of—Messrs. A. F. S. Ohman, M.V.Sc., Chairman (Government Veterinary Surgeon), G. Elliot, and R. J. F. O'Bryen. East Moreton District Stallion Board—Messrs. J. C. J. Maunder, B.V.Sc., Chairman (Government Veterinary Surgeon), W. Frood, and S. R. Watson.

The resignation of Mr. H. Crollick as Honorary Acting Inspector of Stock at Gradule has been accepted, and Mr. F. J. McGovern has been appointed Honorary Acting Inspector of Stock at Gradule in place of Mr. Crollick.

The following have been appointed members of the Central Coast District Stallion Board:—Mr. J. C. J. Maunder, B.V.Sc. (chairman), J. Sprott (Talgai West, Ellenthorp), and W. C. Jeffrey (Miriam Vale).

Mr. W. G. Merrill, Finch Hatton, has been appointed Canegrowers' Representative on the Cattle Creek Local Sugar Cane Prices Board, vice Mr. E. A. Taylor, resigned.

Mr. K. R. Hack, Nerang, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Peanut Board.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of a member for each of the Districts Nos. 1 and 2 of the Peanut Board:—District No. 1 (Wienholt and Nanango)—Charles Frederick Adermann (Kingaroy), Gotfried Martinus Pedersen (present member) (Wooroolin). District No. 2 (Central Queensland)—Norman Albert Nielsen (Milman) (returned unopposed).

An election will be necessary for District No. 1 (Wienholt and Nanango) and voting papers will be sent out in due course. The date fixed for the return of the papers is not later than the 23rd August.

Dairy Cattle Improvement Act.

An Act to provide for the licensing of bulls and the improvement of dairy cattle was passed last Session, and a Proclamation has been issued bringing this Act into force as from the 12th January, 1933. Regulations have also been issued under the Act, and these contain a Schedule of the prescribed Forms of Application and Certificates of Licenses for bulls.

Separate District Executive for Tully.

Executive approval has been given to the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts amending those Acts by providing that the Tully River Central Sugar Mill Suppliers' Committee shall, in future, be deemed to be the Tully River District Cane Growers' Executive. At present, the Tully sugar-growers are affiliated with the Innisfail District Cane Growers' Executive, and following upon requests from growers concerned and others, the above action has been taken to form a separate District Cane Growers' Executive for the Tully growers.

Pineapple Levy.

Executive approval has been given to the issue of Regulations under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy for the purposes of the Acts on all pineapples marketed for the year ending 19th August, 1934.

These Regulations are similar to those in force last year, and provide that the levy shall be payable by growers on the basis of the quantity of fruit marketed, and shall be 1d. per case on all pineapples sold, or consigned, whether by rail, road, or boat, to factories; 1s. 4d. per ton, with a minimum of 1d., on all pineapples sold, or consigned by rail to any agent, person, or firm in Queensland, other than to a factory; ½d. per case, with a minimum of 1d., on all pineapples sold, or consigned otherwise than by rail to any Queensland railway station to any agent, person, or firm, except a factory. In instances where sold loose, at the rate of ½d., with a minimum of 1d., for twenty-four smooth-leaf or forty-two rough or Ripley pineapples, as being equivalent to a case of fresh pineapples.

The levy on all pineapples railed from any Queensland railway station (other than Toowoomba, Townsville, Rockhampton, Roma Street, Woolloongabba, Brunswick Street, South Brisbane, or Central Stations) to any other Queensland railway station may be collected by the Railway Commissioner to the extent of 1s. 4d. per ton, with a minimum of 1d.

Except as provided, the levy in the first instance shall be collected—

(1) On all pineapples sold, or consigned to factories whether by rail or otherwise, by the C.O.D. to the extent of 1d. per case;

(2) On all pineapples sold or delivered otherwise than by rail to any Queensland railway station to any agent, person, or firm, other than a factory, by such agent, person, or firm, at the rate of ½d. per case, with a minimum of 1d.

In the case of agents or persons other than the C.O.D., or the Railway Commissioner, the levy shall be collected by means of levy stamps obtainable from the head office of the C.O.D., Brisbane, which shall be affixed to account sales.

The sums raised by the levy shall be expended by the C.O.D. in the interests of the pineapple fruit section of the industry.

Canary Seed Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, giving notice of intention of the Governor in Council to extend the operations of the Canary Seed Pool until 31st May, 1936. The present pool will expire on the 28th February, 1933.

Provision is made in the Order in Council for the lodgment of a petition signed by not less than 10 per cent. of the growers of canary seed, requesting that a poll be conducted on the question of whether or or not the pool shall be extended from 1st March, 1933, to 31st May, 1936. The closing date for the receipt of petitions is 13th February, 1933.

Introduction of Poultry from Other States.

Present regulations governing the introduction of poultry into Queensland necessitate—(1) a declaration by the owner; (2) a certificate of health by a Stock Inspector; (3) a certificate by the Chief Veterinary Surgeon of the State from which the birds are being introduced; and (4) a permit signed by the Poultry Expert of the Queensland Department of Agriculture and Stock. However, an amendment of the regulations under the Diseases in Poultry Act has been approved which will render it unnecessary, in future, for an owner of introduced poultry to deliver to an inspector on arrival at the place of introduction a permit to import issued by the Poultry Expert of the Department of Agriculture and Stock in Brisbane. This amendment has been made, as Newcastle Disease is under control in the South, and the action would facilitate the movement of birds between States.

Rural Topics.

Apples for Export.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock), on his return from a visit to the Stanthorpe district, remarked that the Granite Belt had yielded a record crop of fruit during the past season, and as a result the export of apples to the United Kingdom had amounted to 32,000 cases for the year, or an increase of 150 per cent. over the previous season, when 13,000 cases were exported. "Queensland is just opening up an export trade in apples," continued Mr. Bulcock, "and it is very encouraging to note from a report I have just received from the High Commissioner's Office in London, through the Department of Commerce, that the quality of the fruit from this State on arrival in England was exceptionally good, and compared with the best from other dominions. Of course, in the initial stages of a venture such as this some defects are bound to be noticed, and it appears it will be necessary to adopt a tighter pack in future shipments.

"Some shrivelling was noticeable in the case of the Jonathan variety, due probably to leaving the fruit exposed to the hot sun after picking. These are matters, however, which can with care be easily overcome, and with the exercise of this little extra attention there should be a very satisfactory future for the apple export trade."

Sunlight Butter.

British butter merchants will not give as high a price for Australian butter as they give for Continental or Maoriland butter. The Briton prefers the taste of Danish or even Russian butter to that from the Commonwealth. But there is another and a far better reason than mere idiosynerasy in palate why Australian butter should not merely start level but be preferred to the products of the foggy north. Sir Arbuthnot Lane, president of the New Health Society, repeatedly stresses it.

Our butter is the product of sunshine. Our cows live in the full light; our grasses develop and flourish under the brightness of blue skies. This is no mere sentimental bunk; the sunlight is a material asset, and, if properly exploited by Australian publicity men, is calculated to place the price of our butter above that of Danish.

Sunlight dredging the grasses and the cows during their whole existence means that the butter they produce is rich to saturation-point in the vitamins which are essential to human health. A pound of Australian butter may not suit the British taste as a pound of Danish butter does, but scientific investigators will say that it contains a much greater content of the vitamins which make for body-building.

While the search for a butter which will appeal to the English palate should not be relaxed here, the more important point of the excess food value of the Australian product should be pushed before the British consumer. . . . —"The Bulletin" (Sydney).

Picking a Piggery Site.

Some important points should be considered when picking a site for a piggery. In the first place, drainage should be effective. The site should have a gentle slope, without being steep, and if the aspect is to the east, it will be so much the better. The drainage should be of a surface kind, the result of the fall or slope, and should not depend upon underground drains, which are apt to get choked up and can never be kept in the same sanitary condition as those to which the sunlight has access.

If there is a piece of rough ground on the farm that is conveniently situated and otherwise satisfactory it may be very suitable for the piggery. Regard must be had, too, for the position of the residence, for if the prevailing winds carry the smell of the piggery to the dwelling, one or other will probably have to be moved quite soon.

Light, absorbent, sandy loams are preferable to stiff clays or soils with a clay subsoil. Clays are apt to become saturated with offensive matter in time, and thus to give rise to unhealthy conditions, especially during wet weather. Where there is a good fall, however, clays are less objectionable.

The buildings should be constructed so as to admit plenty of sunlight. There is no disinfectant so cheap or effective as sunlight, and whatever the fall of the land the piggery must be arranged so as to get the maximum amount of it. It is also essential that the buildings be closed on the side from which bad weather mostly comes, and should face the good weather quarter.

Potato Improvement in the South.

At a time when so much is being said regarding the condition of Australian agriculture, it is encouraging to observe at least one evidence of its vitality—that represented by the operations of the New South Wales Agricultural Bureau. Here is an association of producers concerned, not only with the problem, "What is the matter with farming?" but with the much more pointed question, "What is the matter with the farmer?" Improvement of farming methods by mutual education is its primary objective, and in every part of the State there are signs of its success in this direction. It may fairly be said that a district could offer no better proof of the sincerity of its interest in rural progress than that afforded by a branch of the Bureau.

Branches are carrying out a variety of valuable projects. An interesting example is the potato improvement work in the Batlow district, thus described by the Hon. Secretary, Mr. J. E. Dodds, in a recent issue of "Bureau Record":—

"Some six years ago the executive of the Batlow branch realised that potato-growing as an industry in the district was falling back. Investigation showed that this was mainly due to the 'running out' of seed, with resultant low crop returns. Potato crop-growing competitions were seriously taken up as a means towards the improvement of these conditions, and a committee was appointed from the branch to endeavour to educate the growers as to the correct methods of avoiding this 'running out' as well as of bringing the best varieties back to a prolific habit.

"It was quickly realised that success in potato-growing could only be achieved by strict attention to three aspects of production—viz., seed selection, soil fertility, and cultural methods.

"Dealing with their problem under the first of these heads, the committee at first thought that the introduction of seed from outside districts would suffice. This was done, but results were disappointing. They then realised that the grower himself must improve his seed by rigid selection.

"The potato consists mainly of starch, and since vigour and production of leafage are the main factors governing starch content, any conditions unfavourable to these functions are likely to cause failure in the crop. Many of the recognised diseases, particularly those of the virus type, seriously interfere with vigour and leaf production in plants, and there were also found in every crop certain types of plants not suffering from the, at any rate, commonly recognised diseases, which were seriously deficient in vigour and leafage. This led some growers to definitely select plants from the growing crop for certain qualities, such plants being marked in the crop by a stake during the growing period.

"The qualities looked for were:—(1) Freedom from the virus diseases leafroll and mosaic (and lately an effort has been made to reduce the incidence of rhizoctonia, not so much as a tuber disfigurement as a factor seriously affecting germination and the vigour of the plant during growth); (2) general vitality of the plant, luxuriance of top and resistance to adverse conditions; (3) good yield and quality of tubers when dug, and conformity of type of plant and tuber to the standard of the variety. The produce of plants filling these requirements is bagged separately and used for the grower's own seed or 'mother' plot. When sown the following season these seed plots are carefully rogued of all undesirable plants, and the whole of the produce of these plots is used by the grower himself for seed for the commercial crop in the following season. This work has contributed perhaps more than any other factor toward the improvement achieved so far.

"The stimulus of competition has engendered a good deal of private experiment among our members in manuring and feeding the potato crop. There is considerable variation in the chemical and physical characteristics of the soils within the district, and to date no general formula is acceptable to all our growers—nor is there likely to be for the above reason. Whilst in some instances the use of superphosphate alone is doing all that can be asked, there is a general tendency toward the use of sulphate of ammonia in combination with various quantities of superphosphate. All are now agreed, however, on the importance of humus as the basic requirement of the potato in this district. Means are taken to replenish this content in soils which have been depleted by continuous cultivation. In some instances such reconditioned soils are giving better results than new ground.

"Careful preparation and handling of the soil are essential to success. This district is specialising in seed production, and for this purpose a moderate-sized tuber is the objective. Close planting, both in the rows and between them, is becoming common. It has by no means been proven that this practice will give the biggest yields in all seasons, and it would certainly be fatal in other than thoroughly prepared land. To this end deep ploughing in the winter is in order, permitting the absorption of the heavy winter rains obtaining in this district and also any heavy thunderstorm

rains in the summer during the growing period, which provide a good storage from which the plants can draw moisture during a dry spell. The rows being very close prevents the use of the scarifier in the crop, but it has been found here that the use of the light harrow from the time the plants are above ground up to flowering time keeps the weeds in check and effectively conserves moisture. From this stage onward the plants themselves tend to smother any later weeds and prevent any serious evaporation from the soil.

"The committee in charge of the work and the growers generally, whilst encouraged by the improvement in both the cropping and the quality of the product, as well as the general increase in the yield per acre in the district even with growers outside the branch, fully realise that whilst they get the variation in yield in the individual plants adjoining one another obtaining to-day, they have only started a very long climb toward more satisfactory production in this crop.

"A valuable result of the work here has been the initiation of the seed organisation as a branch of our local co-operative society, and it is handling an increasing output of certified potato seed to the satisfaction of both seller and buyer."

An Effective Formula for Poisoning Green Timber.

An effective way of rapidly killing green timber and at the same time reducing suckering to a minimum is to frill the tree and poison it by pouring into the frilling a solution of sodium arsenite. The best time to carry out the operation is when the sap flow in the tree is ceasing, a period which varies in different districts, but as a rule commences about February.

A useful formula for quick and effective work in all kinds of timber is arsenic, 1 lb.; washing soda, 1 lb.; or caustic soda, ½ lb.; water, 3 gallons. Arsenic—the ordinary white arsenious oxide of commerce—is not soluble in water to any great extent, so that soda, either the ordinary washing soda or caustic soda, has to be used to dissolve it. When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution caustic soda will possibly be found the handiest.

When preparing the solution, whether caustic soda or washing soda is used, first dissolve the soda in a convenient amount of water, using heat, if desirable, to hasten the process; then slowly add the arsenic, which has been previously made into a thin paste, stirring all the time; place on a strong fire, and after it has come to the boil, allow it to remain boiling for at least half an hour; stir from time to time, and be careful to stand on the side away from the fumes, as they are poisonous and are apt to cause sickness. When the arsenic is thoroughly dissolved, the solution may be made up to the required bulk by adding the remainder of the water, either hot or cold.

Frilling the tree consists of a succession of downward axe cuts completely round the trunk, each cut well overlapping the adjoining ones, so as to leave no unsevered section of bark up which the sap can flow. Frilling alone would ultimately kill the timber, but the poison does it in a fraction of the time; in fact, trees have been killed in a few days. The cuts must be through the bark and well into the wood proper, and as close down to ground-level as it is convenient to cut them consistent with the shape of the tree—say, from 6 to 10 inches up. For trees of 4 feet in diameter, pour about a quart of solution into this frilling right round the tree, using an old teapot or kettle, as the spout makes pouring easy, and less is wasted by spilling. Smaller trees naturally need less solution. Saplings may be cut off low down, and the solution dabbed on with a swab-stick to kill and prevent suckering.

It is very important that the frilling and the application of the poison be consistently and thoroughly carried out if good results are to be looked for.

There need be no fear of stock being poisoned by eating the fallen or dead leaves from poisoned trees, for with the comparatively small quantity of solution used the likelihood of leaves absorbing any free arsenic is very remote; but there is some danger to stock grazing on areas frilled and poisoned, and it is desirable to keep all stock off for three or four weeks, when all possible chance of danger will have disappeared.

Although arsenite of soda is obtainable as such from drug merchants, its use when procured in that form cannot be recommended for the poisoning of green timber, as it is most irregular in its arsenic content. Prices for arsenic, caustic soda, and washing soda are apt to alter frequently. It is, therefore, advised that when a considerable area is to be treated, one or other of the wholesale chemists be written to and quotations obtained.

Arsenic pentoxide may be substituted for the arsenic and soda. It is soluble in water, but as it has a corrosive action, wooden or earthenware containers will be required.

Although the method described kills the tree much more speedily than frilling alone, the usual drying out must take place before the tree can be burnt.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.

PLANNING THE CHILDREN'S MEALS.

The following instructions issued by the New Zealand Society for the Health of Women and Children should be useful to Queensland mothers:—

PLANNING the children's meals is not much extra trouble. It is more a matter of method and management than actual work—more head than hand work.

If the general family meals are plain and nutritious the same food should be suitable for the older child.

Where the small child's dinner has to be cooked wholly or partly separate from the general meals, steaming is a most economical and convenient method of cooking. A steamer may be bought to fit saucepans of standard size, and is a purchase which will pay for itself many times over in different ways. A potato, a piece of cauliflower, a young carrot, or whatever vegetables are the order of the day may be cooked together in the steamer, having been slightly sprinkled with a little salt. There they can go on cooking merrily over boiling water, or perhaps over something which is cooking for the family meal. Cooking in this manner allows the vegetable to retain the mineral salts which are so necessary for the maintenance of good health and nutrition. Cooking vegetables in the ordinary method by boiling allows these valuable substances to be more or less lost in the water used. All that is needed is a little common-sense experimenting in regard to the length of time necessary for thorough cooking of various foods. Generally speaking, when steaming food, about half as long again as for ordinary boiling is required, but constant watching is not necessary, and a longer time does not mean spoiling of the food in case of unforeseen delay. Fish may also be cooked in the steamer—say, placed in a saucer with a tablespoonful of milk, a tiny dab of butter, and a pinch of salt. This can be placed in the steamer beside the potato or other vegetable.

If a joint is being cooked for the family dinner it is easy to select and save a specially tender little piece for the child, but if it is preferred not to give meat, the gravy or good stock should be saved. Made gravy consisting of flour only slightly cooked is not suitable for children. If sauces are being used with fish or vegetables they must be very well cooked and free from lumps.

Of course, baking in the jacket is the ideal way of cooking good potatoes, as it is just under the skin that mineral and vitamins are found. If the oven is in use many foods may be most satisfactorily cooked "en casserole"—that is, in a well-covered dish or pot of earthenware or "pyrex." Meat, fish, or chicken are commonly cooked in this way, but it is not so generally realised that fruits and vegetables can also be excellently cooked in the same way. Vegetables should be sliced on top of meat, or they may be cooked along with a very little water, a sprinkle of salt, and perhaps a small piece of butter. Fruit should be sliced and placed in the dish with a little water and sugar if necessary. The casserole should be placed in a hot oven at first, then a slow oven is quite suitable, when a milk pudding may be cooked at the same time.

Choose the children's food carefully from the following list, so that they have some of each group every day:—

Group I.

Fresh, uncooked fruits—Oranges, apples, pineapples, bananas, &c.; lemon drinks.

Salad—Lettuce, tomatoes, &c.

Green vegetables—Spinach, silver beet, cabbage, French beans, &c.; not cooked too long, nor with too much water, and never with soda.

Other vegetables—Carrots, pumpkin, green peas, &c.

Group II.

Milk, eggs, cheese (grated for young children).

Meat, chicken, fish, fish roe, tripe, liver (or lamb's fry).

Dried peas, beans, and lentils.

Group III.

Whole wheatmeeal and oatmeal.

Wholemeal bread (if white bread is eaten, give a tablespoonful of cooking bran daily).

Potatoes and sweet potatoes. Rice, sago, &c.

Honey, golden syrup, sugar, jams, in moderate quantities.

Dried fruits—Raisins, dates, prunes, &c.

Group IV.

Butter, cream. Beef or mutton dripping.

Bacon is not so good, but may be given sometimes.

Each child should, if possible, have one pint of milk daily, or at least half a pint. Give some uncooked fruit or green vegetables every day. Do not waste your money on fancy foods.

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.

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 them 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 3½ 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 prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

THE HOME VEGETABLE GARDEN.

Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

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.

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.

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.

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.

HERBS FOR THE KITCHEN.

Given suitable soil conditions, the various culinary herbs (sage, thyme, marjoram, mint, &c.) are easily cultivated in Queensland, and every garden should have at least sufficient plants for home requirements. Commercial production, too, presents possibilities, especially of those herbs which are sold in a green state, the chief of which are mint and parsley. During the winter months a demand exists for both these herbs. Under cool conditions little growth is made, and some growers have therefore resorted to production under glass, especially in the case of parsley. The increased popularity of peas as a vegetable has tended to the more extensive use of mint at all seasons of the year. Owing to the necessity for freshness in the product, the metropolitan market for mint and parsley is supplied by suburban growers.

There is some household demand for dried herbs, which are used also by butchers for the flavouring of sausages. The consumption is very limited, however, and those contemplating commercial production are therefore advised first to make sure of a market for their produce.

For the successful cultivation of herbs a rich, loamy, friable soil is necessary, and a plentiful supply of water must be available during their growing period. Wherever possible, the soil should be dug to a depth of 9 to 10 inches and should be well supplied with well-decomposed stable manure. As the seeds of all these herbs are fairly small, it is necessary to cultivate the soil to a fine tilth.

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, sorghum, 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 foregoing has been written mainly in respect of 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, two to three eyes are left spaced around the butt, and 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 —two of the former to one 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 Nauru 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 aphis 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.

QUEENSLAND SHOW DATES, 1933.

Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Imbil: 1st and 2nd September.
Enoggera: 2nd September.
Malanda, 6th and 7th September.
Innisfail: 8th and 9th September.
Mary Valley: 1st and 2nd September.
Kenilworth: 30th September.
Southport: 6th October.
Nerang: 13th October.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of June, 1933 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter-Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
JUNIOR (3 YEARS OLD, UNDER 3½ YEARS), STANDARD 270 LB.				
Fancy of Navillus	C. O'Sullivan, Greenmount	10,871·5	384·464	Charmer of Glenleigh
SENIOR (2 YEARS OLD, OVER 2½ YEARS), STANDARD 250 LB.				
Dolly II. of Headlands	G. A. Heading, Murgon	10,345·21	380·835	Duchess Jellicoe of Fairfield
Gwen of Montcairn	A. E. Vohland, Aubigny	7,295·95	326·966	Plum Boys Pride of Pinelands
JUNIOR (2 YEARS OLD, UNDER 2½ YEARS), STANDARD 230 LB.				
Marn Patty	R. Martin, Coalstoun Lakes	7,620·5	361·844	Triumph of Happy Valley
Amy II. of Navillus	C. O'Sullivan, Greenmount	8,313·25	343·563	Midgets Sheik of Westbrook
Stately 2nd of Blacklands	A. Pickels, Wondai	7,777·75	317·782	Fussy's Monarch
Balcarres Maiden	Mrs. C. A. Littleton, Pinelands	6,748·35	310·755	Envoy of Morden
Westbrook Blanche 7th	F. C. G. Couper, Westbrook	6,141·68	247·822	Novai Talisman
Roxey of Montcairn	A. E. Vohland, Aubigny	6,138·85	247·388	Dandy of Wilga Vale
Westbrook Biddy	F. C. G. Couper, Westbrook	5,061·62	242·768	Novai Talisman
JERSEY.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Oxford Dafodil (200 days)	E. Burton and Sons, Wanora	6,345·24	392·418	Oxford Brighton King
JUNIOR (4 YEARS, UNDER 4½ YEARS), STANDARD 310 LB.				
Keepers Darling	J. Sinnamon and Sons, Moggill	8,362·09	404·363	Keeper
Kelvinside Olive Oil	B. J. Jensen, Rosevale	6,533·5	369·317	Mercedes King of Glen Iris
SENIOR (2 YEARS, OVER 2½ YEARS), STANDARD 250 LB.				
Bremerside Snowflake	B. J. Jensen, Rosevale	5,271·5	312·064	Kelvinside Noble Chieftain
JUNIOR (2 YEARS, UNDER 2½ YEARS), STANDARD 230 LB.				
Waverley Pretty Lady	D. R. Hutton, Cunningham	5,534·63	266·493	Oxford Gem's Noble II.
Airlie Handsome Girl 3rd	D. Finlay, Yarranlea	4,293·25	240·941	Airlie Twylish
GUERNSEY.				
JUNIOR (2 YEARS, UNDER 2½ YEARS), STANDARD 230 LB.				
Moonji Peeress	W. R. Smee, Peeramon	7,390·15	342·483	Caramara Favour

CLIMATOLOGICAL TABLE—JUNE, 1933.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	79	69	83	1, 2	63	9	179	9
Herberton	..	69	53	77	1	43	9	173	10
Rockhampton	30·10	74	52	79	9, 10, 30	42	25, 26	155	6
Brisbane	30·14	70	51	74	4	38	28	137	7
Darling Downs.									
Dalby	30·16	68	39	75	2	27	27	102	6
Stanthorpe	..	60	35	67	2	21	27	249	13
Toowoomba	..	63	42	69	13	28	27	71	8
Mid-interior.									
Georgetown	29·99	82	58	87	7	38	24	37	3
Longreach	30·11	73	46	80	16	37	25, 26	118	5
Mitchell	30·17	66	37	72	8, 16	27	19	113	3
Western.									
Burketown	30·02	80	58	87	29, 30	42	26	24	3
Boulia	30·10	74	47	83	16	37	26	34	1
Thargomindah	30·15	69	43	76	16	35	25	7	1

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, 1933 and 1932, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1933.	June, 1932.		June.	No. of Years' Records.	June, 1933.	June, 1932.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·59	32	2·83	0·83					
Cairns	2·82	51	4·23	0·71	Clermont	1·66	62	3·31	0·14
Cardwell	1·99	61	2·54	1·40	Gindie	1·44	34	..	0·16
Cooktown	2·02	57	1·79	0·17	Springsure	1·76	64	1·79	0·77
Herberton	1·10	47	1·73	0·77					
Ingham	2·30	41	3·30	0·80					
Innisfail	7·14	52	7·75	3·87					
Mossman Mill ..	2·08	20	3·17	0·75					
Townsville	1·28	62	3·88	0·15	*Darling Downs.*				
Central Coast.					Dalby	1·70	63	1·02	1·62
					Emu Vale	1·56	37	1·28	0·36
Ayr	1·39	46	4·13	0	Hermitage	1·87	27	1·26	0·45
Bowen	1·59	62	2·89	0	Jimbour	1·73	45	0·76	1·61
Charters Towers ..	1·26	51	1·45	0·02	Miles	1·81	48	2·11	0·74
Mackay	2·62	62	3·02	1·09	Stanthorpe ..	1·95	60	2·49	0·80
Proserpine	3·30	30	3·23	0·48	Toowoomba ..	2·47	61	0·71	1·05
St. Lawrence ..	2·52	62	1·45	0·88	Warwick	1·79	68	1·39	0·64
South Coast.									
					Maranoa.				
Biggenden	2·20	34	1·59	0·18					
Bundaberg	2·87	50	2·45	0·28					
Brisbane	2·77	82	1·37	0·60					
Caboolture	2·80	46	1·42	1·00	Roma	1·61	59	0·94	0·78
Childers	2·54	38	1·94	0·39					
Crohamhurst ..	4·71	40	2·00	1·71					
Esk	2·33	46	0·67	1·23					
Gayndah	1·84	62	1·00	0·61					
Gympie	2·74	63	1·84	1·08	*State Farms, &c.*				
Kilkivan	2·14	54	1·52	0·35					
Maryborough ..	3·10	61	2·28	2·25	Bungeworgorai ..	1·40	19	0·90	0·68
Nambour	3·92	37	2·44	1·93	Gatton College ..	1·92	34	1·03	1·04
Nanango	2·06	51	0·71	0·37	Kairi	1·32	19	2·33	0
Rockhampton ..	2·61	62	1·55	0·75	Mackay Sugar Experiment Station	2·31	36	3·53	1·15
Woodford	3·03	46	1·01	0·50					

GEORGE G. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1933.		September. 1933.		Aug. 1933.	Sept. 1933.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					MOONRISE.	
					p.m.	p.m.
1	6·35	5·21	6·7	5·37	12·19	2·24
2	6·34	5·22	6·6	5·37	1·18	3·33
3	6·33	5·22	6·5	5·38	2·24	4·39
4	6·33	5·23	6·4	5·38	3·33	5·42
5	6·32	5·24	6·3	5·39	4·43	6·42
6	6·32	5·24	6·2	5·39	5·52	7·41
7	6·31	5·25	6·1	5·40	7·8	8·39
8	6·31	5·26	6·0	5·40	8·0	9·38
9	6·30	5·26	5·58	5·41	9·2	10·35
10	6·29	5·26	5·57	5·41	9·56	11·35
11	6·28	5·27	5·56	5·42	10·53	..
					a.m.	a.m.
12	6·27	5·27	5·55	5·42	11·52	12·25
13	6·26	5·28	5·54	5·43	..	1·16
					a.m.	
14	6·25	5·28	5·52	5·43	12·47	2·7
15	6·24	5·29	5·51	5·44	1·40	2·51
16	6·23	5·29	5·50	5·44	2·34	3·32
17	6·23	5·30	5·49	5·44	3·26	4·8
18	6·22	5·30	5·48	5·45	4·12	4·40
19	6·21	5·31	5·47	5·45	4·57	5·11
20	6·20	5·32	5·46	5·46	5·37	5·43
21	6·19	5·32	5·44	5·46	6·10	6·15
22	6·18	5·33	5·43	5·47	6·40	6·48
23	6·17	5·33	5·42	5·47	7·10	7·25
24	6·16	5·34	5·41	5·47	7·42	8·11
25	6·15	5·34	5·40	5·48	8·13	9·4
26	6·14	5·34	5·38	5·48	8·47	10·5
27	6·12	5·35	5·37	5·49	9·26	11·9
28	6·11	5·35	5·36	5·49	10·14	12·15
						p.m.
29	6·10	5·35	5·35	5·50	11·9	1·21
30	6·9	5·36	5·34	5·50	12·11	2·27
31	6·8	5·36			1·16	

Phases of the Moon, Occultations, &c.

6 Aug.	○ Full Moon	5	31 a.m.
13 ,,	☽ Last Quarter	1	49 p.m.
21 ,,	● New Moon	3	47 p.m.
28 ,,	☾ First Quarter	8	13 p.m.

Perigee, 4th Aug., at 2.36 a.m.
Apogee, 16th Aug., at 12.48 a.m.
Perigee, 31st Aug., at 3.30 p.m.

The astronomical event of this month will be the annular eclipse of the Sun on the 21st. On a line from Port Darwin to 2 degrees south of Port Denison, not exceeding 170 miles wide, the beautiful effects of a golden ring of the Sun in place of its usual orb may be seen to more or less perfection. Throughout the rest of Queensland a partial eclipse of the Sun, greatest near the line mentioned, but a good deal reduced at Warwick and places near the southern border, will form a highly interesting spectacle. At Sydney, only about one-half of the Sun will be eclipsed, and this at sunset. At Brisbane the eclipsed part of the Sun will be somewhat larger.

The occultation of Antares by the Moon, which will take place on the evening of the 1st, will require binoculars or telescope as the Moon will be rather more than half full. Observers in Queensland near the 150th meridian should be on the lookout between 9 and 10 p.m.

On the 5th Saturn will be in opposition to the Sun rising as the Sun sets, and setting about the time of sunrise. At 6 o'clock on the following morning the full Moon will be passing from west to east of Saturn, which will be only half a degree to the north of it.

When the Moon passes Uranus on the 11th there will be a wide space equal to the length of the Southern Cross between them.

On the 17th, when Venus passes Jupiter, at a time when they are invisible here there will be apparently only one-tenth of a degree separating them.

On the following day Mercury will be 19 degrees west of the Sun, well above the eastern horizon more than an hour before sunrise.

Mercury rises 25 minutes before the Sun on the 1st and 1 hour 17 minutes before it on the 15th.

Venus sets at 7.23 p.m. on the 1st, and at 7.58 p.m. on the 15th.

Mars rises at 9.52 a.m. and sets at 10.22 p.m. on the 1st; on the 15th it rises at 9.23 a.m. and sets at 10.6 p.m.

Jupiter rises at 8.54 a.m. and sets at 8.40 p.m. on the 1st; on the 15th it rises at 8.6 a.m. and sets at 7.59 p.m.

Saturn rises at 5.37 p.m. and sets at 7.3 a.m. on the 1st; on the 15th it rises at 4.38 p.m. and sets at 6.3 a.m.

4 Sept.	○ Full Moon	3	4 p.m.
12 ,,	☽ Last Quarter	7	30 a.m.
20 ,,	● New Moon	4	20 a.m.
27 ,,	☾ First Quarter	1	36 a.m.

Apogee, 12th September, at 7.6 p.m.
Perigee, 25th September, at 8.30 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 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.