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. XXXVIII. 1 OCTOBER, 1932. PART 4.

Event and Comment.

Dairy Production—New Legislation.

MAINTENANCE of high standards in dairy production has material advantages obvious to everyone engaged in the industry, and a more effective stabilisation of those standards is one of the chief aims of the Dairy Produce Act Amendment Bill now before Parliament. A notable second-reading speech was made on the measure by the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, in the course of which he said that Queensland is the pre-eminent State in respect of butter production. Our average weekly factory output is 16 tons. For the other States the average weekly factory figures in tons are:—New South Wales, 10.6; Victoria, 8; South Australia, Western Australia, and Tasmania, about 4 tons each. It is plain that a consideration of the whole of the facts shows the necessity for maintaining a standard that will be acceptable to the people overseas, for taking full advantage of knowledge gained and efficiency attained, and for consolidating our present position in preparation for still further progress in the industry. The history of the industry in Queensland reveals a remarkable record of expansion in recent years. In 1904, when the original controlling legislation was passed, the butter output in the State was 17,000,000 lb., and that of cheese 2,600,000 lb. In 1931, the weight of butter manufactured was 97,500,000 lb., and that of cheese 12,250,000 lb. Not only has production increased so largely, but quality has improved to an extent that Queensland now enjoys a reputation for its butter second to none on the world's market.

Butter Factory Payments.

ONLY two new principles are embodied in the amending Bill, neither affecting the operation of the principal Act, and they were explained fully by Mr. Bulcock. The first is to ensure that all factories shall pay for their raw material in the same manner, but not necessarily at the same figure. By the application of this principle producers will be able to know whether one factory is paying a higher price than another factory for the same quality and grade of cream that they may be producing. The necessity for this amendment comes about by

virtue of the fact that the associations which were established on a co-operative basis years ago, and which were accepted as co-operative undertakings, have very largely lost their identity as co-operative undertakings and have become competitive corporations, the one in competition with the other. In other words, the practice in respect of methods of payment has very materially undermined that very essential principle—the maintenance of the true co-operative spirit. What is happening at the present time is that, in an endeavour to encourage cream to come to them and by a system of bookkeeping, some factories are trying to stimulate the desire on the part of individuals to send their cream to those particular factories; because, owing to there being no sound and satisfactory method of bookkeeping, those individuals are apt to believe that one factory gives an advantage over another. It is true that, in the aggregate, over the whole twelve months there may not be any very great variation as between factories; but from month to month there are often very considerable variations. It is established that in practice certain factories pay more for winter cream than the other factories, and they equate their books by paying slightly lower amounts for cream when it is more plentiful. The result is that there is no very great variation on the whole; but the practice tends to undermine the co-operative spirit, and makes the producers themselves discontented.

The new measure will determine the ability of the factories to pay, and will give a fair reflex of the position of all factories to enable comparisons to be made. There is undoubtedly in the industry a desire that some sound and satisfactory basis of comparison should exist. We hear the statement made by all the leaders of the dairying industry in Queensland—and they urge it very fully and forcibly—that there is a real necessity for a system of bookkeeping which will allow of comparisons between one factory and another being made by the ordinary farmer. There is no suggestion that there is malpractice in bookkeeping. Our system does not permit of that, and obviously no reputable dairy directorate would embark on dubious practices; but there is this variation of price caused by a variation in bookkeeping methods, which causes discontent.

The existing Act provides that cream supplied to a factory shall, according to the grade of such cream, be paid for as follows:—(*a*) On the basis of the butter-fat results, estimated in manner prescribed by regulations; or (*b*) on the amount of butter obtainable from such cream, estimated in manner prescribed by regulation. All butter factories in Queensland pay on the quantity of butter obtainable from cream. Manufacturers' butter-computing tables are used. If there were a uniform system of bookkeeping, the cream producer would undoubtedly have that basis of comparison which he desires. There is a real desire on the part of the supplier to have that basis, so that he may accurately estimate the relative merits of the factories operating within the territory in which he is producing. The passage of this Bill will very largely dispel the discontent which is very evident at present, and will have the additional advantage in the eyes of those who subscribe to the co-operative principle that it will formulate a system whereby a true basis of co-operation will be achieved, and not a basis of antagonism and competition. A uniform system of bookkeeping will do more to achieve that very desirable object than possibly any other single thing that could be suggested. The Bill, therefore, gives power to make regulations to compel factories to keep their books uniformly. To-day every factory has its own system of bookkeeping and its own financial year. It is obvious that sound bases for comparison do not exist. If the financial year of one factory terminates at one period, and another at another period, tedious calculations from the two sets of books are necessary in order to arrive at a clear understanding at just what one factory is doing in comparison with others. A uniform system of bookkeeping with the year terminating at a given period will supply a basis of comparison over the same periods. It is hoped that the objective that will be attained by the passage of this legislation will be to stimulate a better return, to provide for increased efficiency and economy, and that it will not be the means of misleading prices being arrived at by bookkeeping methods.

There is, perhaps, some misconception in relation to the intention of the Bill in this respect. It has been held that it will discourage the factories from paying high prices, but there is no such intention. The reverse is rather the case, because the Bill aims at promoting efficiency within the industry. If any factory feels that it is in a position to pay high prices, it will undoubtedly continue to pay those prices.

Cream Supplies—Wasteful Competition Prohibited.

THE second new principle, as explained by Mr. Bulcock, is the prohibition of the payment of freight on cream by the butter factories—a principle favoured by the general concensus of dairying opinion. There can be no doubt that the payment of subsidies on cream is a practice that is rapidly expanding. The average co-operative dairy association does not desire to pay these subsidies, but, because a neighbouring factory pays them, they are all being dragged into the system willy-nilly. The consequence is that cream is conveyed long distances on account of encouragement extended to the producer by certain factories at the expense of other producers. Cream is a perishable commodity. We desire to maintain the high quality standard our butter has attained, and every box of inferior grade butter that is produced is an affront to our endeavour to maintain that high quality standard. There is no reason why, with adequate supervision in the production of cream on the farm and its processing in the factories, with the added and improved means of transport, we should not continue to produce the best quality butter that the State is capable of producing.

A system which allows of the production of butter below the best quality is a system which calls for the closest examination. On examination, we find that one of the reasons is the distance over which cream must be carried before it is processed. As a State we cannot afford, more particularly in a major industry like the dairying industry, to neglect the economic equations. If we neglect them, and continue to produce butter that is not of the highest quality that can be produced from a given quantity of cream, we are definitely wanting in the promotion of that economic efficiency at which we should all aim.

The major point in association with this factor in the Bill is that provision is made that factories are not to defray the whole or any part of the cost of transport of cream to a factory. This does not mean that a supplier will not be able to send his cream to any factory to which he desires to send it. There has been an argument that we should zone the whole of Queensland into dairying districts, and that we should compel all producers in a given zone to send their cream to the factory or factories within that zone. That is a scheme that has been largely moving the minds of people in the dairying industry for a considerable time, and perhaps it would be the ideal thing were it possible of consummation. It is not at present argued that zoning is the real solution of the difficulty; but the amending measure is definitely a step in the direction of zoning when taken in association with a uniform system of bookkeeping. If it does not accomplish a full zoning, it will lead very forcibly to a recognition and realisation of the merits of zoning in the future. Possibly that will be all to the good of the industry concerned.

The audit of factory accounts by the departmental inspector is to be extended to the financial transactions of factories and agents, if deemed necessary. At present the inspector checks the manufacture and disbursements to suppliers, ensuring that the overrun has been distributed.

It is not claimed that the Bill fulfils all the necessities of the dairying industry, but it does very definitely represent another stage along the road that will bring us to the goal of maximum dairying efficiency.

Districts to which the legislation will apply are the Maranoa and Darling Downs, all along the coast from the New South Wales border to Rockhampton, including Moreton, Wide Bay, Burnett, and Port Curtis; the Atherton Tableland, and districts immediately surrounding Charters Towers, as well as the coastal belt between Mackay and Cairns. Considering the territory that is embraced by the administration of this legislation, the relatively small cost that is incurred, the very beneficial results that accrued to the dairying industry by the existing statute, and the material benefits that will be given by the legislative enactment proposed, it will be agreed generally that the dairying industry is being placed on that sound and firm foundation that is necessary in respect of the producer so far as factory management is concerned, and, last but certainly not least, the interests of the consumer.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

Part XXX.

Sugar Experiment Stations in Queensland.

SUGAR Experiment Stations are a comparatively recent development in the sugar industry of the world, and Queensland was not very far behind some of the earliest and was much in advance of others.

The first Sugar Experiment Stations created were those of Java and Louisiana in the year 1885.

That of Java was known as Midden-Java or Central Java, at Semerang; a year later the Experiment Station known as West Java was founded at Kagok, and the next year that of East Java at Pasoeroean. These were then run by separate independent planters' associations. They were, however, finally merged in the Pasoeroean Experiment or Proef Station of East Java.

The Sugar Experiment Station of Louisiana was situated at Audubon Park, New Orleans.

The next important Sugar Experiment Station to be established was that of Hawaii in 1895.

Queensland commenced with a Sugar Cane Laboratory in 1898, cane being also experimented with on the old State Nursery at Mackay which had then been in existence for some years. It was not, however, till November, 1900, that the Bureau of Sugar Experiment Stations began operations under its first Director, Dr. Walter Maxwell, who retired from the Queensland service in 1909, and died in July, 1931.

Other cane Experiment Stations were established in different parts of the world as follows:—

Station.	Year of Founding.
St. Kitts	1899
Argentine	1907
Porto Rico	1910
Trinidad, St. Augustine	1911
Cuba	1925
Peru	1927
Natal, South Africa	1927
Mauritius Sugar-cane Research Station	1930

The Queensland Sugar Stations.

The establishment of Sugar Experiment Stations in Queensland was advocated for many years before they were actually initiated.

When the Royal Commission on the Sugar Industry sat in 1888-1889, several witnesses stressed the necessity for Sugar Experiment Stations, and the benefit to be derived by the industry from their foundation.

In 1888, Mr. Peter McLean (at that time Under Secretary, Department of Agriculture) was commissioned to make inquiries in connection with the North Eton Central Mill at Mackay, and he was at the same time requested to make inquiries as to the establishment of experimental farms or test stations. In addition to sugar, it was stated by the

Minister that he was convinced there were many valuable products connected with tropical and semi-tropical agriculture which could be profitably introduced into Queensland, such as tea, coffee, cocoa, india rubber, vanilla, pepper, nutmeg, spices of all descriptions, rice, and fibre plants.

On his return Mr. McLean submitted a report in which he said:—

> "I have carefully considered the question of experiment farms or test stations, and have come to the conclusion that what is wanted at present are State Nurseries—one at Mackay and the other at Cairns. There is Crown land available at each place. Within 3 miles of the town of Mackay there is a reserve of 142 acres for recreation purposes, known as 'The Lagoons,' the land is all cleared, the soil good and suitable for the purpose, and a plentiful supply of water, and a nursery could be worked there at a comparatively small cost. It would be centrally situated and accessible to planters and farmers from all the surrounding districts.
>
> "At Cairns, there is a Government reserve about 8 miles from the town, near to the Barron River, and contiguous to the village of Kamerunga."

Accordingly, a State Nursery was established at Mackay on "The Lagoons," the Crown land mentioned in Mr. McLean's report. The area selected for the nursery amounted to 52 acres, and this afterwards became the site for the first Sugar Experiment Station in Queensland.

No chemical work was undertaken at this State Nursery, but sugar-cane, amongst other tropical plants, was experimented with, and reports were issued as to the behaviour in the field of the varieties of cane then undergoing trial. It was to the Mackay and Kamerunga State Nurseries that the New Guinea canes introduced by Messrs. Cowley and Henry Tryon were first brought. Experiments with fertilizers were also carried out at Mackay, but these appear to have been considerably criticised. In an editorial in the August number of the "Mackay Sugar Journal," however, it was admitted that, as leading up to proper Experiment Stations, the two State Nurseries were undoubtedly a step in the right direction.

Such diverse crops as oranges, mulberries, coffee, tea, rubber, Japanese plums, grape vines, mangoes, plantains, peaches, arrowroot, mangold wurzels, wheat, oats, rye, grasses, sisal hemp, rice, candle nuts, and sugar-cane were grown.

In sending out parcels of sugar-cane for trial on the surrounding plantations the overseer remarked in 1893 that the mill chemists would be able to determine the amount of sugar in the varieties, but, that as far as "tasting" went, a seedling cane he had received from Kew and had called "Kewensis," was the sweetest that had come under his notice.

In 1893, six varieties of cane (Cowley's collection), and subsequently in 1896, Tryon's collection, were planted at Mackay and Kamerunga.

In 1894 the lack of scientific control was much lamented. No analyses of sugar-canes were made, and it was said that, however conscientious the overseers might be, the nurseries, which were nurseries and nothing more, might be the means of propagating and distributing

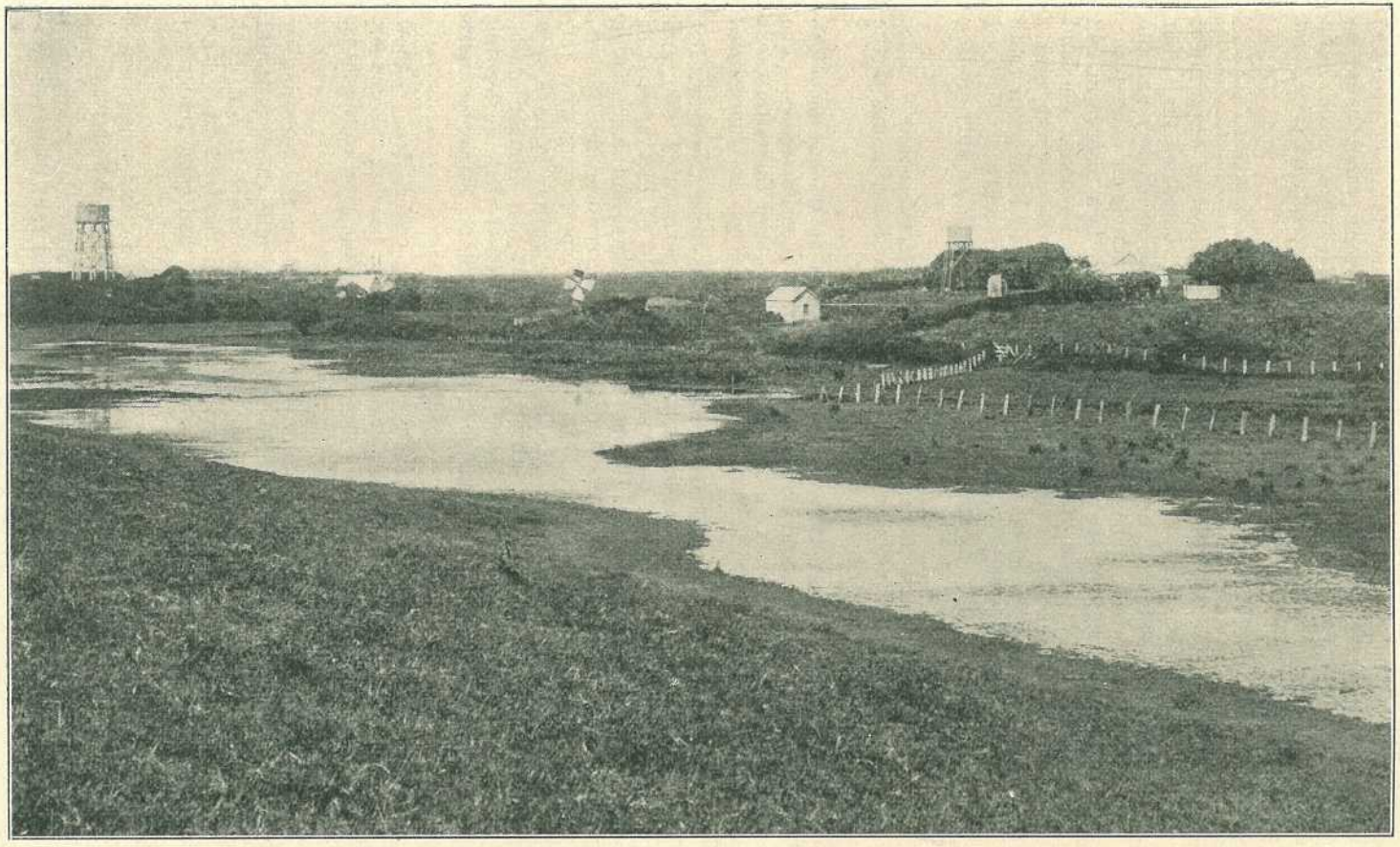

PLATE 128.—OLD STATE NURSERY, MACKAY.

disease, for the overseers could not be expected to detect all diseases without scientific help. The Government knew that Queensland sugar was then entering into competition with the world, and if it were to succeed must compete on equal terms. Every sugar country of importance had a Sugar Experiment Station, and many of these places had a world-wide reputation. Queensland stood alone in urging people to enter upon tropical agriculture, and then withholding the ordinary assistance which was necessary to success. Many sugar growers had to send samples of their soils to London to be analysed.

In 1895, an agitation for agricultural stations and a tropical experimental farm and laboratory was commenced. It was pointed out that the most important work in tropical agriculture was connected with sugar-cane. Mr. Tryon, the Government Entomologist and Pathologist at that time, set out in a report the objects of a Sugar Experiment Farm which, in addition to testing the qualities of sugar-cane under cultivation, included a laboratory for analyses of soils, manures, mill products, &c., and suggested that a Sugar Experiment Station should be erected and equipped by the Government in the first instance and afterwards maintained partly by contributions from the general revenue and partly by assessment of the cane growers on the basis of acreage under cane.

During 1897 and 1898 the subject was not lost sight of, and articles advocating the foundation of Sugar Experiment Stations continued to appear in the "Sugar Journal," and J. C. Brünnich was also a warm supporter of the idea, and in a report to the Government said that for the benefit of such an important branch of agriculture as sugar an Experiment Station should be established by the Government, and suggested it should consist of a central station with sub-stations at Wide Bay, Mackay, and Cardwell, the latter place including the Lower Burdekin, Herbert and Johnstone Rivers, and Cairns. He considered the chief station should be at Bundaberg.

At length in 1898 the "Sugar Journal" was able to announce that at last they were getting nearer to the establishment in the colony of a Sugar Experiment Station, and that the Minister for Agriculture had told a Mackay meeting that he proposed to take steps at an early date to add a laboratory to the State Nursery, and to initiate a series of experiments. He pointed out that only a small commencement could be made at first.

Later in 1898, the laboratory was erected on part of the site of the Mackay Nursery on "The Lagoons." Mr. J. C. Brünnich, late chemist to the Department of Agriculture, laid out this laboratory, which was a very convenient building (shown below) and which was well fitted for the work then required. Mr. A. A. Ramsay, now Chemist to the Department of Agriculture in New South Wales, was appointed chemist in charge (in which position he remained till the Bureau of Sugar Experiment Stations was created in 1900), and took over the whole of the State Nursery and the Laboratory.

The industry did not remain long satisfied with the State Nursery plus Laboratory idea, and in 1899 it was announced that the State Nursery would be done away with and the site be used on a more satisfactory basis as a Sugar Experiment Station. The fruit and other trees and crops were mostly grubbed out. In the meantime efforts were being

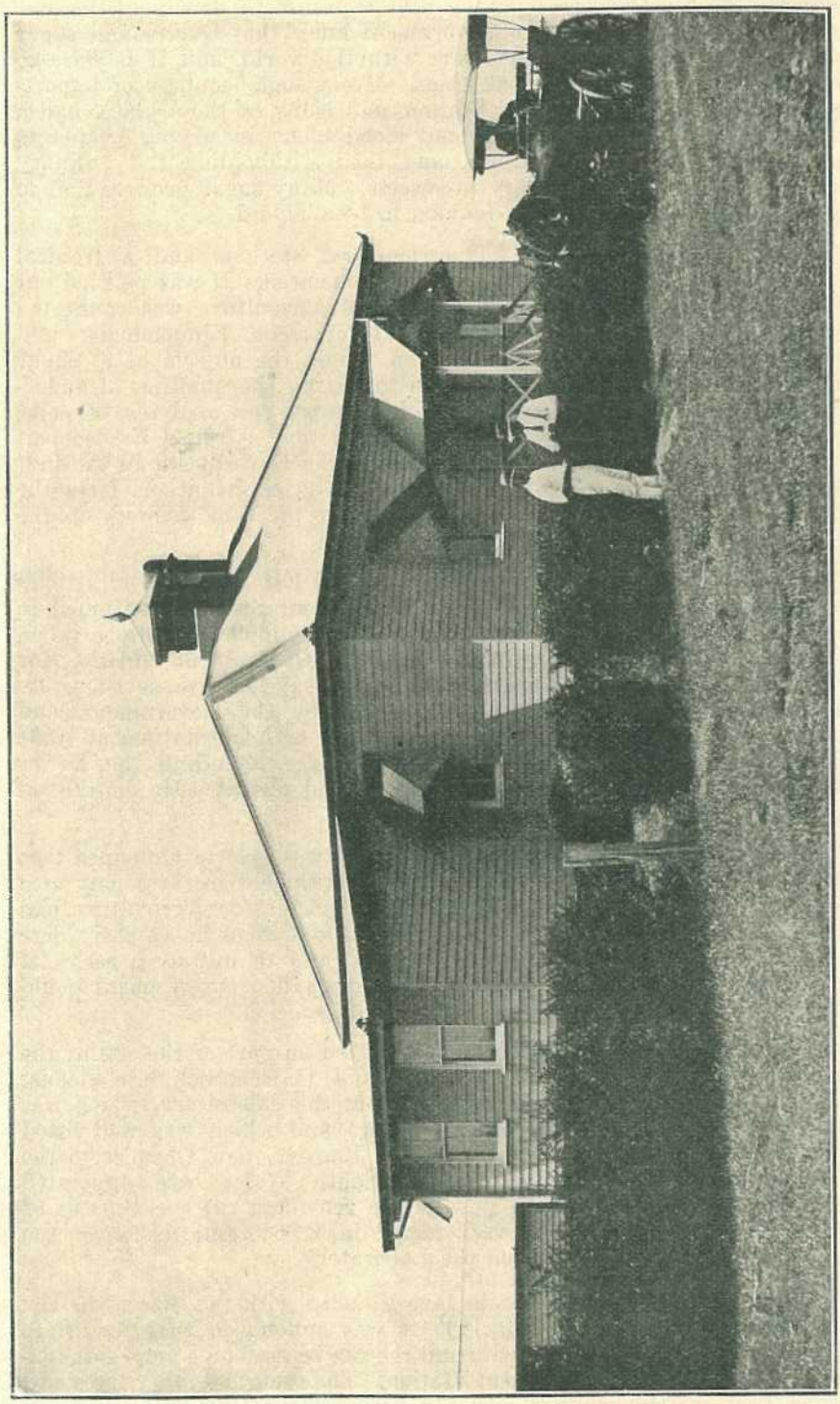

PLATE 129.—THE SUGAR CANE LABORATORY AT MACKAY ERECTED IN 1898.

made by the sugar growers to induce the Government to procure the services of Dr. Walter Maxwell, at that time Director of the Hawaiian Sugar Experiment Station, to visit Queensland and advise on the industry generally; the Bundaberg Planters and Farmers' Association taking the initial steps.

Later, the Minister for Agriculture, the late Mr. J. V. Chataway, who was interested in the "Mercury" newspaper of Mackay, and the "Sugar Journal and Tropical Cultivator," also published at Mackay, announced that Dr. Maxwell was about to visit Queensland for the purpose of making a report upon the sugar-growing industry. A short while after Dr. Maxwell arrived in Queensland, and was generally acclaimed as a possible saviour of the industry, and it was predicted that his visit should prove a turning point in the history of the cane industry.

Dr. Maxwell's report has already been quoted in this History, but his remarks as to Sugar Experiment Stations, were as follows:—

> "It is advised that the several sections of cane growers and manufactureres, as represented at present by local associations in the respective districts, shall unite themselves into one body, which shall be known as 'The Sugar Growers and Manufacturers' Association of Queensland.' A chief function of the association which shall be established upon a basis such as, or similar to, what is suggested, shall be to introduce modern scientific methods in the growing of cane, and to still further improve the modes of manufacture. The lines upon which these agricultural and technical reforms shall be instituted and carried out are hereby set forth in detail:—
>
> "Three experiment stations shall be established—one to represent the Cairns district, and to be located at Mulgrave, in the neighbourhood of the Mulgrave Central Mill; one at Mackay, which shall meet the needs of that district; and one in the vicinity of Bundaberg, which shall represent the Bundaberg and Isis district. The one at Bundaberg shall be the chief experiment station and headquarters of the Director and of the main laboratory and chemical staff.
>
> "A director shall be appointed who shall establish the said stations, appoint and locate an assistant director upon each station, and engage chemists for all laboratory requirements.
>
> "The functions of the director, after the establishment of the said stations, shall be as follows:—
>
> (1) To personally visit all districts and sub-districts where cane is grown, and to inspect the farms and plantations of the growers; advising in all matters of the field, such as selection of lands suitable, and leaving out of lands unsuitable, for cane; the individual acts of cultivation, the resting and rotating of the soils with other crops, the introduction of other economic crops and sources of profit; and the instituting of new means for the restoring and maintaining of the producing power of the lands.
>
> (2) To examine the soils in the field, and take samples for analysis in laboratories, and to advise manures according to the ascertained requirements of each soil and location.

(3) To inspect the mills during the crushing season, advising and aiding the manager in the several acts of the manufacture.

(4) To institute experiments at each of the three stations along the several lines of cultivation, planting, manuring, irrigating, and study of cane varieties; and likewise to study prevailing diseases and pests.

(5) To advise and aid the canegrowers and manufacturers on questions of sale and purchase of cane, and to be at the service of the association in its affairs which are connected with the State.

(6) To train and prepare the assistant directors, in order that they shall ultimately become fitted for the responsible direction of the respective stations. The term of requirement of the services of the director in chief should not exceed five years.

"To embody and execute the functions as set forth, it is seen that the director must, of necessity, be a thorough agriculturist, a highly trained scientist, and conversant with all questions of the field and mill. His practical experience and technical knowledge must be such as to secure the absolute confidence of the canegrowers and the mill officials, whilst his tact and business capacity must be to hand in all practical situations.

"The selection of the director will be the most important act of the association. His fitness for the position must be absolutely certain; then he must be given full responsibility and discretion. And his responsibilities will be varied and heavy; for he must not only talk with and advise the farmers in the fields and the managers in the mills, but he must appoint the work of the chemists in the analysis of soils, and control inspections of manures and know that they are accurately carried out; and he must advise the composition of the manures to be used, and know where the manures can be most economically obtained. In brief, the absolute direction of the experimental work that we are advising will be his hands, and its success will rest wholly with him. He, therefore, must be a man of the fullest and most unquestioned fitness for the position. Unless such a man is found and entrusted with the work, we cannot accept the responsibility for the adoption of the remainder of our recommendations.

"With the institution of such a system of scientific and practical experimentation as we have set forth, the direct advising and instructing of the growers and manufacturers along new and tried lines would begin. Upon these would follow the accurately ascertained results of the experiments at the stations, which results would serve as guides and as actual examples, showing what could be done on a larger scale. By these means would be set in movement the influence of new ideas and the knowledge of new methods and their results, until gradually, but surely, a new system and order of things will have taken root in the whole field of sugar production throughout the colony.

"Now appears to be the time to put this new work into operation. We have seen the lands and conditions of the sugar-growing areas, and are fully persuaded of their native capability

to produce; but we have also noticed the exhausted state of the soils and their demand for restoration and help. A decision of some kind cannot be evaded. If it is not determined to at once begin the new and advised order of things, then it is decided to let matters be as they are, or go from what they are to worse, until the opportunity is worn out. We most urgently advise that work shall begin at once, for great possibilities yet stand before the sugar industry of the colony.''

After perusal of the above recommendations it was naturally felt that there could be only one man for the position of Director—viz., Dr. Maxwell himself, if he would accept—and the Cabinet, owing to representations from the various sugar districts, decided in March, 1900, to write to Dr. Maxwell asking him to transfer his services to Queensland.

It should be pointed out that the Hawaiian Sugar Experiment Station had been very successful, and that Dr. Maxwell, as the Director, had a high reputation and was credited with having helped to regenerate the industry in Hawaii.

A Sugar Conference was held at Mackay in March, 1900, at which most of the sugar districts were represented, and it approved of Dr. Maxwell's recommendations that Sugar Experiment Stations should be established, and further, that the moneys raised for the purpose should be endowed pound for pound by the Government. The eagerness shown to obtain Dr. Maxwell's services contrasted oddly enough with the vials of wrath that were subsequently poured over his head by the very people who had been so warm to secure his services. However, he accepted the appointment of Director, and ''*The Sugar Experiment Stations Act of* 1900'' was assented to on the 14th December, 1900.

This Act was to provide for the establishment and control of Sugar Experiment Stations, the appointment of a Director, and created a ''Sugar Fund.'' So many Sugar Experiment Stations were to be established and maintained as the Minister thought necessary, and these could be provided and equipped with all buildings, laboratories, machinery, instruments and apparatus, and all other matters and things necessary or proper for the conducting of experiments in connection with sugar-cane and sugar, and the by-products thereof, and for preventing the spread of disease in cane.

The Director was to have the general direction, care, and control of all such Experiment Stations, appoint inspectors and officers, and make or cause to be made such inquiries, researches, and investigations as he thought fit.

The ''Sugar Fund'' was to be provided as follows:—

''The Minister might in each year make and levy an assessment not exceeding one penny on every ton of sugar-cane received at a sugar works (i.e., any mill) for the extraction of sugar-cane juice. Such assessment was to be paid to the Minister in the first instance by the owner of every sugar works upon the actual number of tons of sugar-cane received during the season with respect to which notice of assessment had been given; but such assessment was to be paid and borne by the owner of the sugar works and the grower of the cane respectively, in equal proportions, and the owner of the sugar works would be entitled to deduct the amount of such assessment from any moneys due by him to the grower.

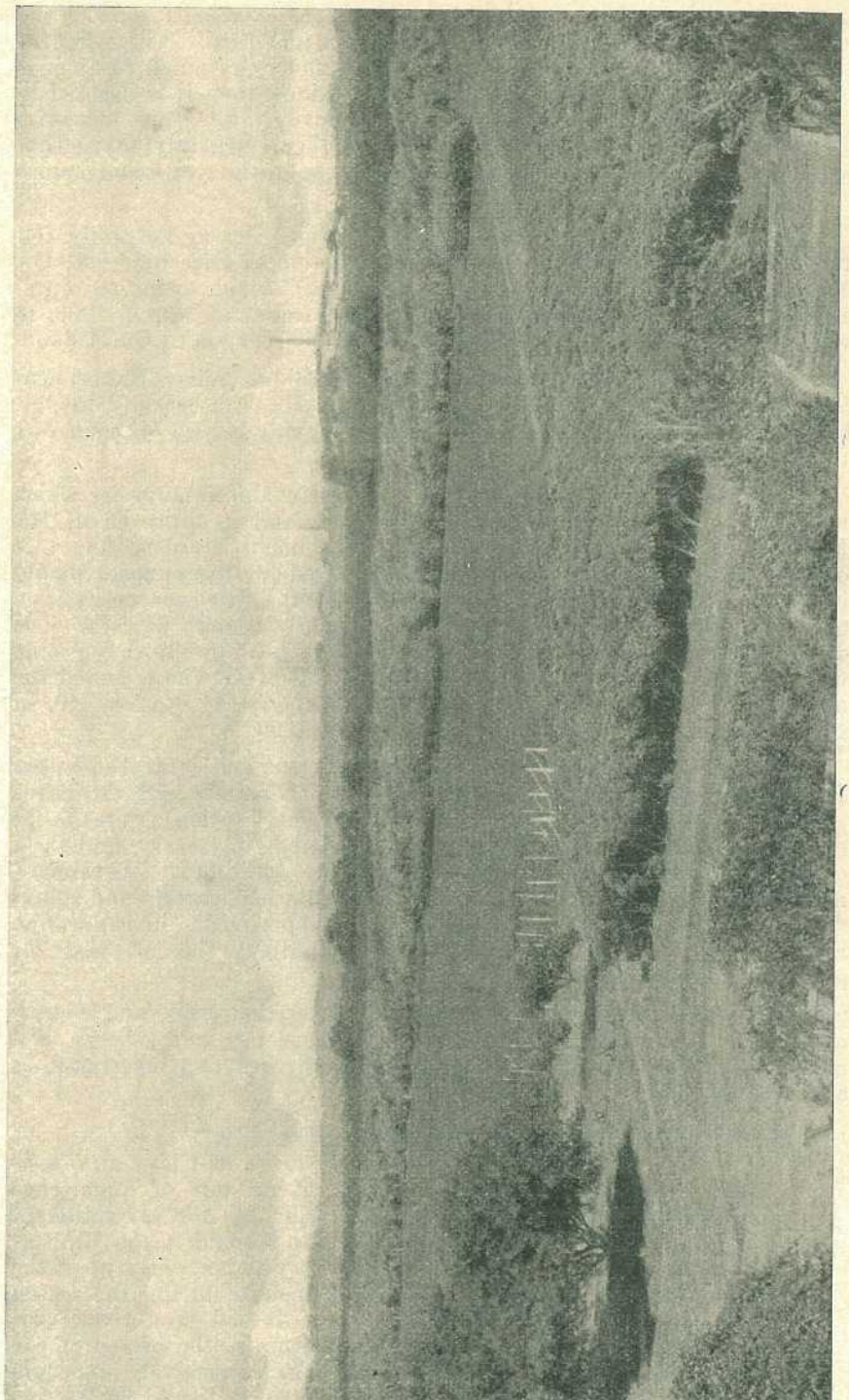

PLATE 130.—ON THE SUGAR EXPERIMENT STATION AT MACKAY, OLD SUGAR MILLS IN THE DISTANCE.

"In every year there was to be paid by the Treasurer into the Fund from the Consolidated Revenue a sum equal to the amount of assessments levied in each year.

"Provision was also made for the Director to make an annual report."

Operations were commenced forthwith, and in the Director's first report he stated that in Mackay an Experiment Station, with laboratory attached, was already in existence, and it was decided to make an immediate and full use of that station until other laboratories determined upon could be built and put into operation. The next step was to build a central laboratory in Bundaberg, where it was intended that the whole work of the chemical and other investigations should be carried on. In August, 1901, this Central Laboratory was ready, and chemical work began on 1st September, being chiefly devoted to soil analyses and examinations. The first chemists engaged were Messrs. Firman Thompson (First Assistant Chemist) and Dr. A. J. Gibson, G. R. Patten, C. H. O'Brien, and A. E. Anderssen. Messrs Gibson and Patten were subsequently First Assistant Chemists at the Bundaberg Laboratory. Mr. A. Henry, now Secretary to the Cane Prices Board, was the Secretary to the Bureau at that time, and the writer was the Assistant Director in charge of the Mackay Sugar Experiment Station.

In addition to the establishment of laboratories, the general plans of the Bureau included the establishment of field experimental work, comprising experiments with manures and different methods of cultivation. In view of prospective Commonwealth legislation pending at that period it was not considered wise to push on with the establishment of other Experiment Stations outside Mackay, so the Director decided to lay out a series of experimental fields on a small scale.

The main purpose and work of the Mackay Station was to be experimentation along the lines of sugar production, and to include cultivation, manuring, irrigation, and the introduction and determination of the value of different varieties of cane, and a selection of special varieties for special localities in respect of the nature of the soil and climatic conditions of such localities.

The first experiments carried out at Mackay were with the collection of canes brought over from New Guinea by Mr. Tryon, supplemented by a few older kinds introduced at an earlier date by Mr. Cowley.

Experimental work at Mackay subsequently included the thorough testing of all the New Guinea canes from a commercial and chemical point of view, and the ultimate selection of the best of these for distribution to the industry, and these afterwards became the standard canes of the Northern districts for many years, though they were not so much favoured in Southern Queensland owing to the fact that the variety known as D. 1135, or "Fairymead," was found to give good results in those localities. A large number of experiments in cultivation, subsoiling, fertilization, irrigation, and general husbandry of the sugar-cane plant were carried out, and the best varieties from other countries were imported and thoroughly tried out. Lectures to farmers throughout the Queensland sugar districts, by the Director and Assistant Director were also given, and some help was afford to sugar mills by travelling chemists.

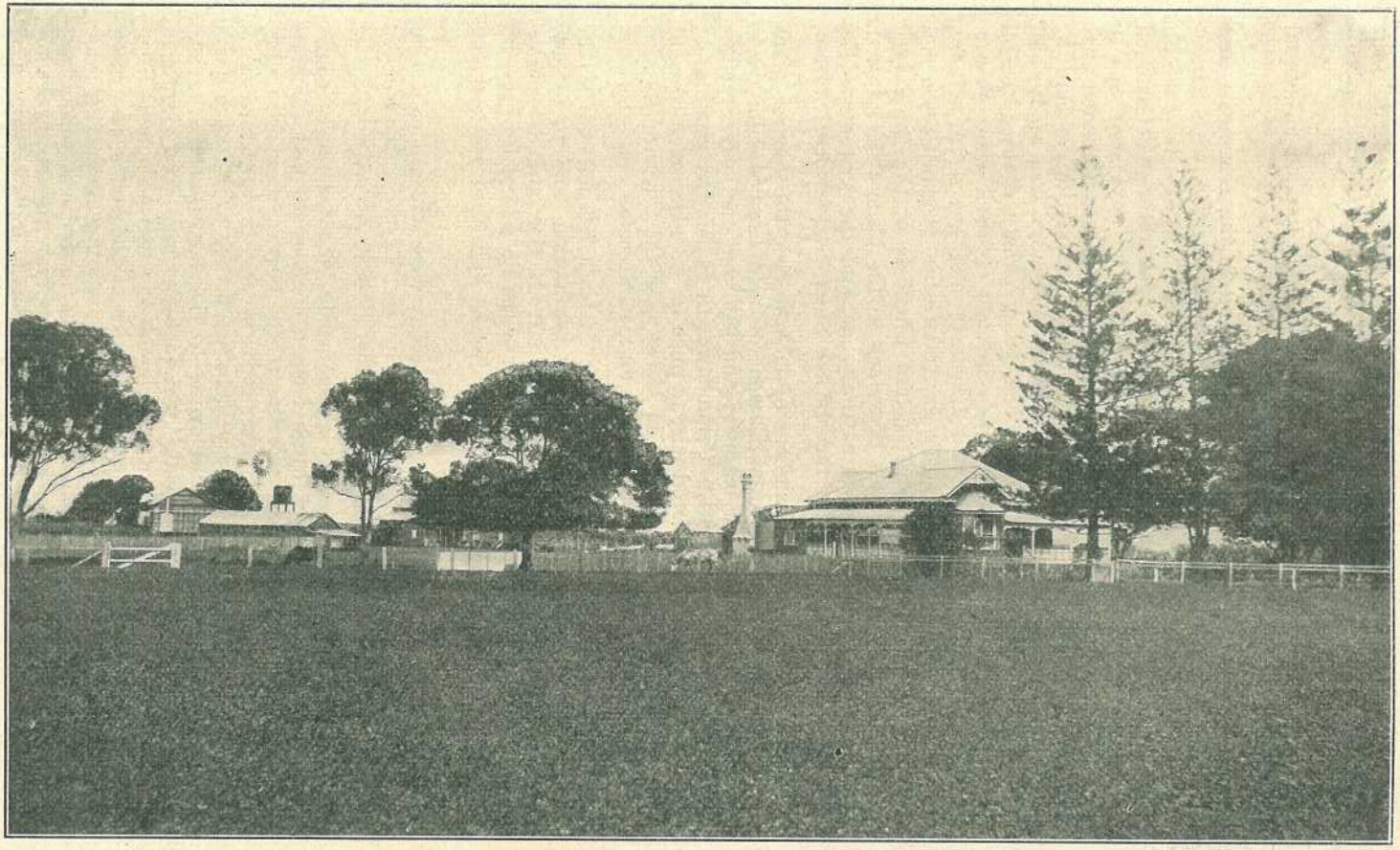

PLATE 131.—SUGAR EXPERIMENT STATION, BUNDABERG.

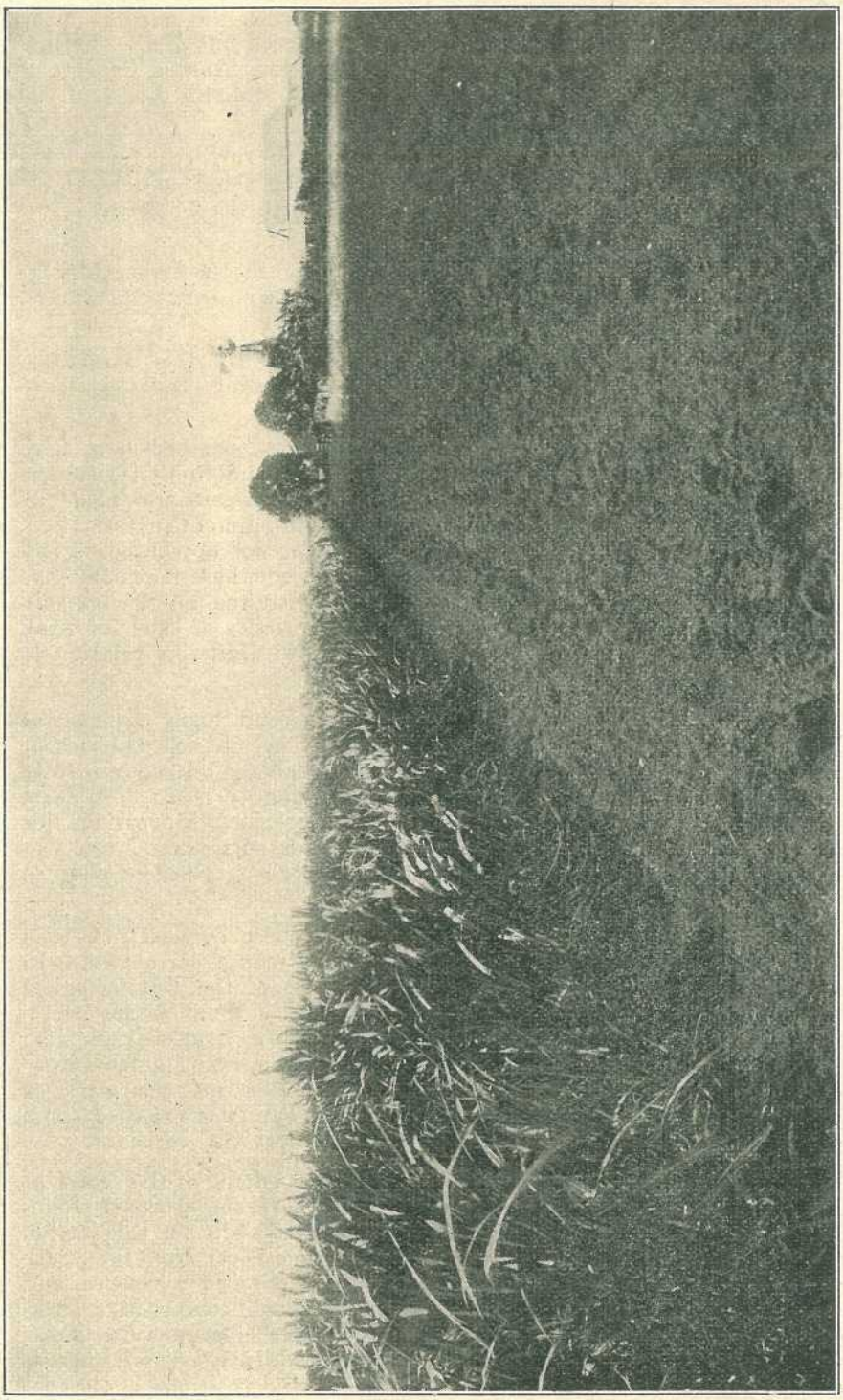

PLATE 132.—CULTIVATION AT SUGAR EXPERIMENT STATION, BUNDABERG.

It is not intended to burden this history with the results of the great amount of experiment work that was carried out at the Mackay Station. These will be found set out in the various Annual Reports of the Bureau, and in a more convenient form in Bulletin No. 4 of the Sugar Bureau.

During Dr. Maxwell's term as Director, no further efforts were made to extend the Experiment Stations to the south and north of Mackay, nor was anything done in connection with the matter of insect pests and diseases of cane.

A large number of soil analyses were made at the Laboratory at Bundaberg between 1901 and 1909, also of fertilizers, irrigation waters, and mill products.

The first Director retired in 1909, and in 1910 the Bundaberg Laboratory was closed, the analytical work being transferred to Brisbane and Mackay.

A new series of experimental field trials was established in both North and South Queensland in the year 1911, and in that year the first attempt to deal with the insect pests of sugar-cane was made by the appointment of an entomologist to take up this line of investigation, while a little later an assistant to the entomologist was appointed. Field assistants were also provided, to visit farmers, and where necessary give instructions on cane cultivation. During this year too, another expedition was sent to New Guinea to procure new varieties of cane for trial. A commencement was also made in the issue of Bulletins relating to the problems of the industry.

At the end of the following year, 1913, the second Sugar Experiment Station, that of Bundaberg, was instituted. The site selected was at Kalkie, about 3½ miles from the city of Bundaberg, but conveniently situated. It was an existing farm of average-quality land. The farm contained 45 acres, practically all red soil. Experimental work on this farm commenced in 1914, and a laboratory for sugar-cane work was established. Thus two of the original Sugar Experiment Stations planned were then in existence.

In 1914, the Entomologist engaged in America decided to return there, and steps were taken to engage another man from abroad. In the meantime the officer who is now in charge of the Entomological Station in the North, Mr. Edmund Jarvis, took charge as Acting Entomologist. In 1917, the entomological work was transferred from Gordonvale to Meringa, where new buildings, comprising a laboratory and residences, had been erected, and Dr. Illingworth, formerly a Professor of Entomology at the College of Hawaii, was engaged for a term of four years, and took charge with Mr. Jarvis as assistant.

This year, 1917, it was also determined to complete the chain of Experiment Stations by the creation of a Northern one at South Johnstone, near Innisfail. The piece of land chosen as a site for this station was upon the opposite side of the South Johnstone River from the South Johnstone Mill. The land was Crown land, portion of a reserve, and contained 92 acres in all. The necessary buildings, comprising a residence for the Chemist in Charge, a very complete laboratory for sugar soils, and other general work, and foreman's residence, men's quarters, and stables, were erected in 1918. The station land is situate at the foot of the Basilisk Range, and contains land of only average quality, low

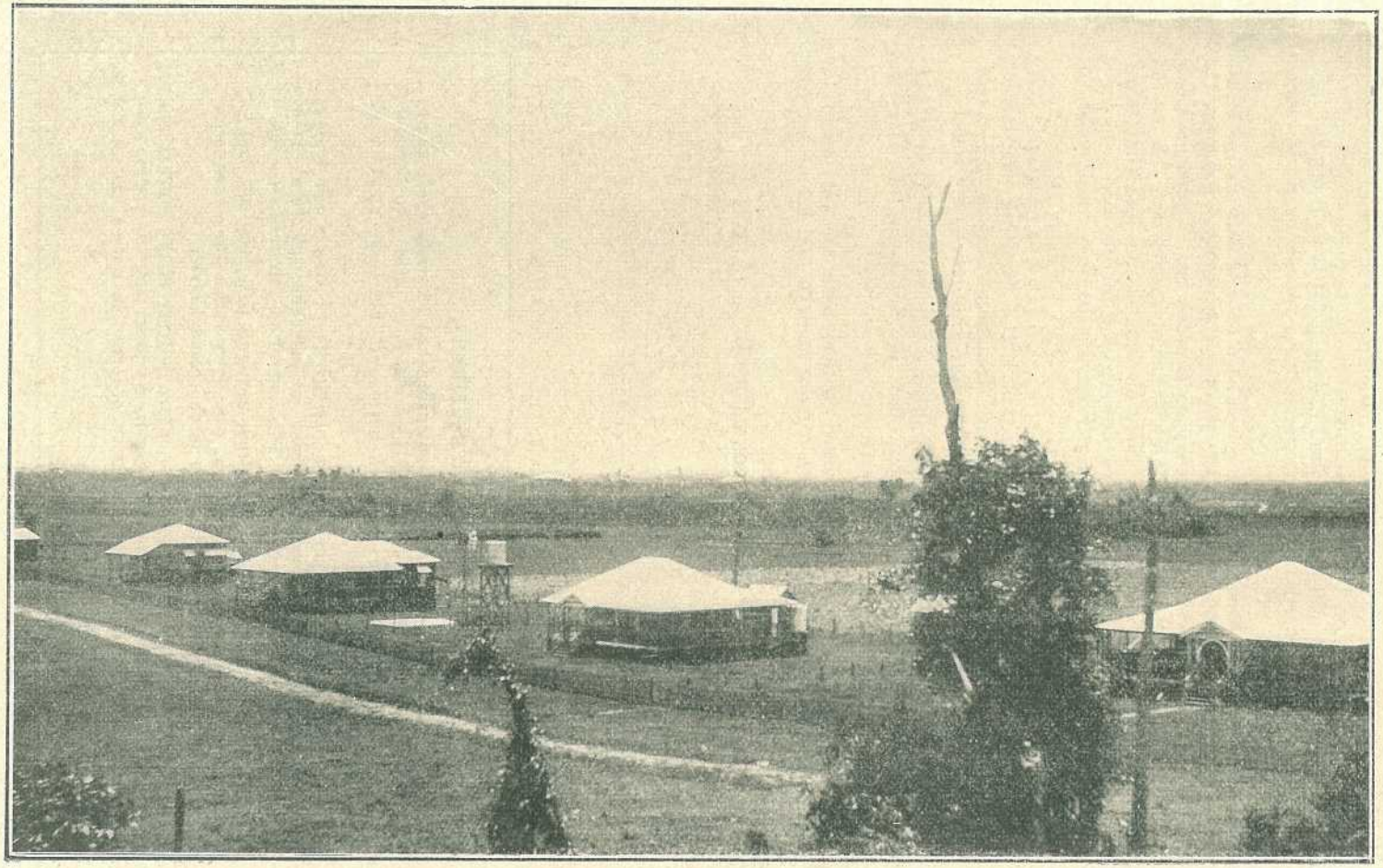

PLATE 133.—THE SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE.

in available phosphoric acid and lime. Much of this area had previously been under lease for banana growing. There were numbers of old stumps present, but otherwise the land had been fairly well cleared, and ere long it was fenced in and prepared for experiment work, which commenced in 1919.

The need for a Northern Station had been greatly felt, as one of the most important objects—that of the propagation of cane from seed—had been found impossible at Mackay or Bundaberg. Numerous trials had been made at the Mackay Station for many years, but due to the fact that the cane did not arrow freely on that station and that many varieties did not produce mature flowers, no fertile seed was ever procured—it being a necessity for cross-fertilization work that all varieties should arrow together. With the favourable environment in North Queensland the raising of cane from seed is a comparatively easy matter, and this work was commenced in 1921. Seedling propagation is now the principal work of the South Johnstone Station, which also supplies seed for similar work at Mackay and Bundaberg Stations.

By the opening of the South Johnstone Station the original plan of three Experiment Stations—one for the Southern, one for the Central, and one for the Northern areas—was fulfilled.

In the next article it is proposed to deal with the placing of the Sugar Experiment Station work on a more modern and scientific basis.

[TO BE CONCLUDED.]

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

THE TOBACCO STEM BORER.

By J. HAROLD SMITH, M.Sc., Entomological Branch.

LAST year, 1931, inquiries from the Bowen district drew attention to the existence of the tobacco stem borer, *Phthorimœa heliopa* Low., which had not previously been officially recorded in this State as a pest of tobacco. Investigation showed the moth to be a serious menace to plants in the seed-bed, the losses in some instances, where adequate precautions had not been taken, being considerable. Even stalks remaining in the field after the leaf had been harvested were riddled throughout their length with the burrows of the larvæ. During the current year the commercial development of the industry has been rapid, and it is now practicable to assess the importance of the pest to the grower, at least in North Queensland.

There the possibilities of the crop are being exploited on a large scale at several centres, notably Mareeba and Bowen. From most of these infested material has been received, and, while reports differ as to its importance, there can be no doubt that in some districts at least, the insect may be one of the greatest obstacles to successful tobacco growing. In many instances outbreaks have occurred in areas far removed from previous cultivation. Hence it would appear that the moth is indigenous to much of the country suitable for tobacco culture, or else one must suppose that migration over considerable distances is quite a normal habit of the species. Actually, in much of the forest country concerned, it is difficult to even conjecture a probable native host plant for an insect of this type, and it is possible that both hypotheses will ultimately share in the correct account of this year's incidence of the pest.

Comparison between Stem Borer and Leaf Miner.

The tobacco stem borer, *Phthorimœa heliopa* Low., is a close ally of the tobacco leaf miner, *P. operculella* Zell., already familiar to most growers. The two moths are moulded to the same generic pattern, being alike in size and with the habit of folding their wings roofwise when at rest. In freshly emerged specimens the colour differences are distinct, heliopa having the wings suffused with a brick-brown colour which contrasts strongly with the white flecked grey typical of the better known species. When specimens of each are collected in the field, they are, however, much the same in appearance. The scales responsible for the colour have been partly shed, and with them many of the distinguishing features. Hence there is a widespread confusion between the two forms, a confusion which is accentuated by their association together in the field. Perhaps this may explain the non-recognition of the pest previously, though tobacco has been grown for many years in Australia. Both species have been reared from the stems of plants which have collapsed in the field, and such losses can best be assigned to one or the other pest by the generalisation that superficial sub-surface burrowing is due to *P. operculella*, while core injury proper is caused by *P. heliopa*

Nature of Stem Borer Injury.

The injury may be considered in the two aspects which most concern the grower, the first dealing with the insect's activity in the seed-bed. Here the early indications of trouble may be seen in several of the seedlings showing tip malformation. The centre leaves do not

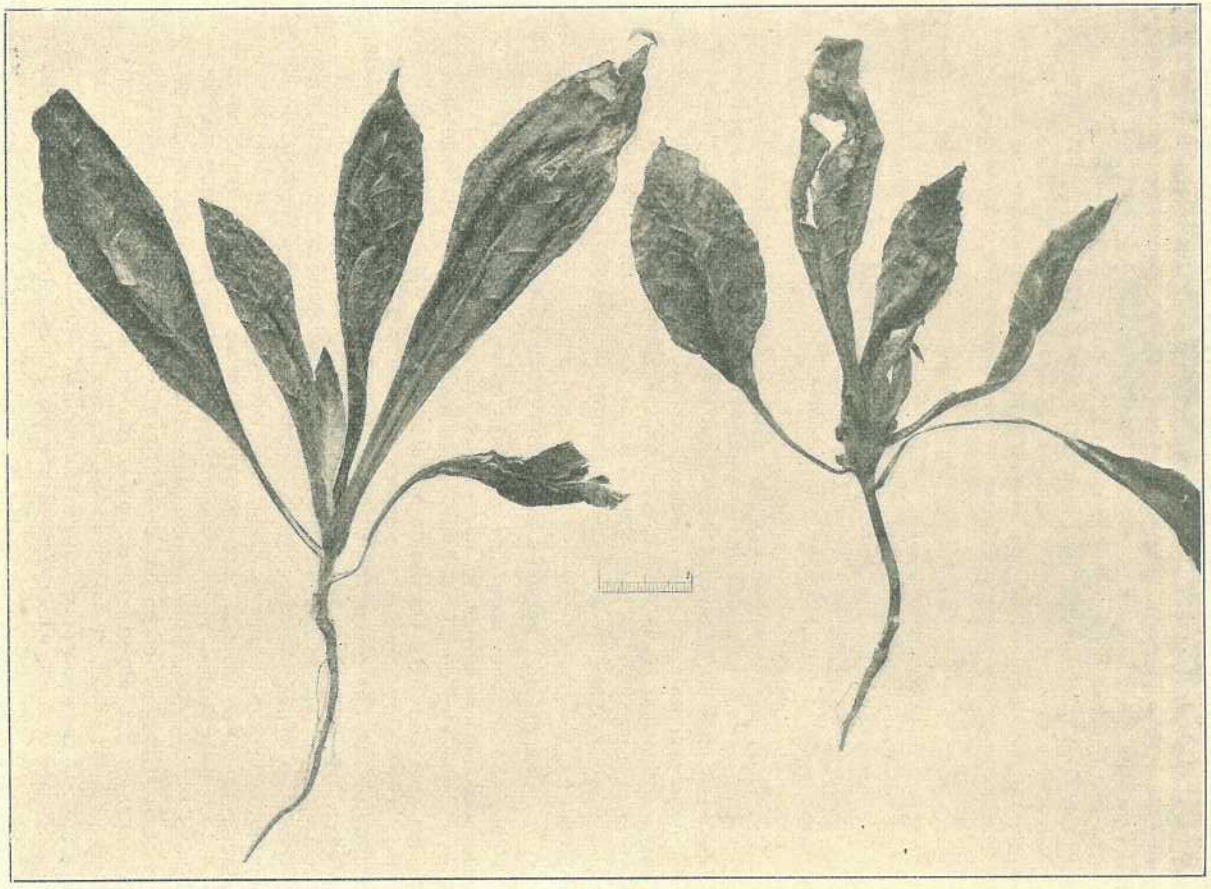

PLATE 134.

A normal tobacco seedling on the left. On the right a tobacco seedling showing the swelling at the base of the shoot caused by the presence of the tobacco stem borer.

unfurl in the usual way; they may be undersized, but more often are merely malformed as if the growth vigour of the plant was insufficient to effect its ordinary unfolding and spread. When infested seedlings are removed from the seedbed for examination their stalks will be found to be distended into galls (Plate 134), each of which harbours a single larva of the moth. These galls usually, but not necessarily, lie near the tip of the plant. The obvious interference with the ordinary development of the growing point leads to secondary suckering, the suckers being thrown from the leaf axils below the swelling in the stem. In the ordinary course of transplanting, such plants are usually discarded, but their rejection gives no guarantee that the remainder of the seedlings are free from infestation. A gall of visible dimensions is produced only when the larva within is more or less mature, hence seedlings taken from beds with only a sprinkling of galled plants may not only carry the eggs of the moth, but also young larvæ within the tissues, too small as yet to induce obvious gall formation. Such plants seldom flourish in the field. Sooner or later the main growing point is destroyed and the control of supplementary sucker growth from the lower parts of the stem compels considerable pruning at the expense of much labour. Though a crop may ultimately be harvested from such plants, it rarely has the uniformity which is considered so desirable in the field.

Attacks are, however, not limited to the seedbed, for plants may be perfectly free from the pest when set out in the field and yet succumb later on. Should the field infestation take place at an early stage, the plants react in much the same way as has been described for the seedlings. Should they be firmly established, the larvæ may develop freely within the stem without affecting the tip of the plant or causing obvious sucker growth. The mechanical disability suffered by the plants in such cases may not in itself be considerable, but too often the attack opens the way for saprophytic fungi, which may rapidly invade the healthy tissues of the stem and sooner or later induce the general collapse of the plants. Pith infestation (Plate 135) is most common in replants growing amongst an already heavily infested crop, and this suggests that resistance to new attack increases with the age of the plant. Attacks shortly after transplanting are consequently most to be feared, as they predispose the plants to general collapse, which follows the local injury caused by the larvæ and the fungal activity which it initiates.

Life History.

The life history follows more or less that of the better known tobacco leaf miner. Oval eggs, white in colour, and ornamented with reticulate surface sculpturing, are laid singly on either stem or leaf surfaces. Larvæ emerge from these in a week or so—observations are limited to the summer months—and shortly commence to burrow into the stem of the plant. Subsidiary mining of the leaves preparatory to stem boring has been recorded from other countries, and this phenomenon has also been seen here. The majority of the burrows are initiated near the axils of the leaves under the shelter of their extensions at the point of insertion to the main stalk. The nature of the burrow depends entirely on the maturity of the host, and may thus be a localised gall-like excavation, such as that described from young plants, or a wandering burrow which widens as the occupant grows. Several larvæ may be found together in the one plant. The larval period is completed in about four weeks. When full grown the larva hollows out a cavity abutting

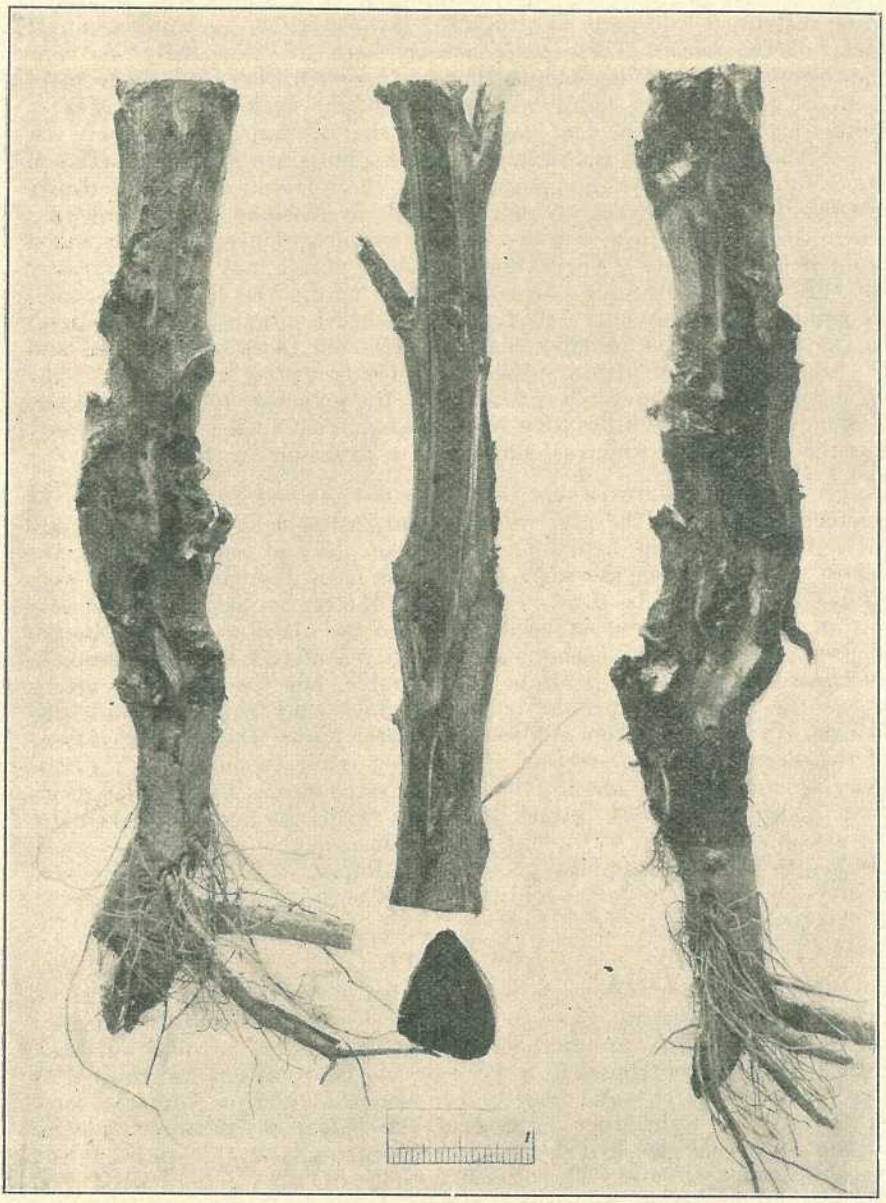

PLATE 135.

Tobacco stalks showing the nature of the attack of the tobacco stem borer in older plants.

on to the surface of the plant, an exit hole is made, and both it and the cavity are sparsely lined with silk. In this chamber pupation takes place, the adult emerging in some eight days.

In thus pupating within the stem, the tobacco stem borer differs from its close ally, the leaf miner, for the latter ordinarily leaves the host plant in the last larval stage and completes its development in the ground or, if on the plant, within the shelter of decaying leaf fragments.

Little precise information is available regarding the seasonal activity of the pest or the duration of its several stages. Apparently the female moth is capable of laying in the vicinity of one hundred eggs, these being laid irregularly over a period of three weeks. The whole life cycle occupies some six weeks, while the independent adult life is by no means brief, for adults have been kept alive without food for a month. Hence it may be safely conjectured that several generations occur in the year, these overlapping one another.

Control Measures.

With pests of this kind, control measures of any one type are not altogether satisfactory. Sprays afford no apparent relief, for the burrowing habit takes the larva beyond the reach of either stomach poisons or contact sprays very early in its life. Recourse must therefore be made to the influence of several farming practices on the pest.

Seedbed injury usually appears most significant to the grower's eye, for an epidemic phase of moth activity may ensure the wholesale destruction of his plants. As the moth is on the wing during the late afternoon, some growers have attempted to cope with them by fastening down the hessian storm covers daily about 3 p.m. The method may help, but in itself is insufficient to exclude the moths from the beds altogether should the insect population be above normal. A better method would provide for their total exclusion from the beds, if the anticipated moth infestation promises to be considerable, the advisability of the practice depending entirely on the general field losses during the previous season. Total exclusion could be effected by double covering the beds. (Plate 136). Either stockinette or a mosquito-net material would serve as a first cover, this being stayed to the sides and ends of the beds and to be regarded as permanent. In practice it would prove most convenient to fasten one side and have the other attached to a running pole which could take up an accumulated slack. Watering should be carried out through the stockinette. The usual hessian cover in general use as a protection against storm waters—so common during the later months of the year—would provide additional protection when necessary. With the dual device, plants may be raised free from lepidopterous pests up to the transplanting stage.

Cultural practices may be of material assistance in keeping the moth population down to manageable proportions. It is presumed on fairly sound grounds that the moth has few indigenous host plants in the immediate vicinity of the major tobacco districts. Hence were the infestation of the growing crop limited to adults wintering on these, the actual loss would be inconsiderable. In practice, however, laxity in the removal and destruction of volunteer plants and residual stalks remaining in the field creates a fund of additional breeding material in which the pest may continue to thrive. Growers ought therefore to uproot all

the plants in a cultivated area as soon as practicable once the leaf is removed in an endeavour to eliminate unnecessary breeding material. These plants have to be removed in any case before planting can be resumed in the following season, hence no additional labour is involved in the process. Ordinarily these uprooted plants will dry out rapidly if exposed to the sun and will be entirely unsuited for the further development of most of the larvæ which they contain. Those approaching maturity will shortly pupate and complete their development, but others will doubtless be destroyed. With the general adoption of such clean-up measures, the interim between the completion of harvesting and the commencement of the next season's planting should be sufficiently long to kill off the majority of the moths, in spite of their comparatively long adult life.

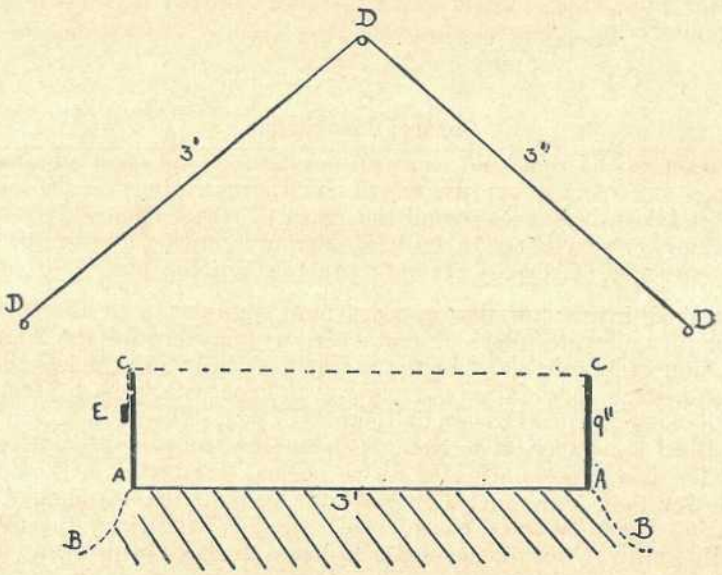

PLATE 136.

Cross section of seed-bed and approved covers for protection against the tobacco stem borer.

AA—Soil level of bed.

CA—Wooden side panels.

CC—Stockinette in position with running pole E.

DDD—Removable hessian storm cover.

Where irrigation facilities are available, growers may be tempted in frost-free districts to grow a winter crop immediately after the summer leaf is harvested. In an area free from the stem borer the venture may be quite successful, but this pest can easily upset calculations. The incidence of this and allied insects in second crops is invariably greater than that in the first—a natural consequence of rapid reproduction when the food supplies are ample. Consequently multiple cropping should only be proceeded with when the significance of the pest fauna and the practicability of its control under epidemic conditions has been thoroughly realised. It may be found later that the stem borer alone will make the practice uneconomical in the major tobacco districts.

Once plants in the field are affected, much can be done with the judicious use of the knife to ensure a crop. If the growing point is affected, the plant may be cut back to a sucker in the axil of a lower leaf, which will then function as the tip of the plant. Given subsequent freedom from heavy infestation, a crop may thus be assured, while, even if minor attacks do follow, the plants may be sufficiently hardy to grow normally. Galled tips removed from the plant in the process should in all cases be collected and destroyed.

From the foregoing discussion of control methods it will be obvious that the suggestions merely conform with the requirements of good farming, varied to meet the problem raised by the advent of, perhaps, the most serious of pests into tobacco districts. Eradication of the insect is quite impossible; control is a reasonable probability, and the latter is the goal at which growers must aim.

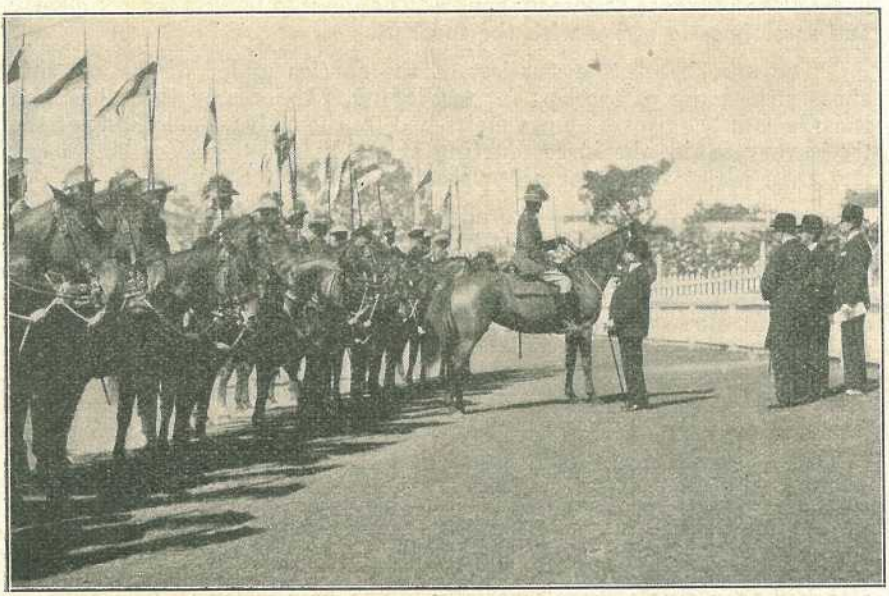

PLATE 137.

The Boonah troop of Australian Light Horse received congratulations at the Brisbane Show on their winning the interstate series of mounted military competitions (Forster Cup) by His Excellency the Governor-General, Sir Isaac Isaacs.

THE BOTFLIES OF THE HORSE.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

THESE notes deal with the three species of horse botflies—namely, the common botfly, *Gastrophilus intestinalis* De Geer., the throat botfly, *Gastrophilus nasalis* L., and the nose bot, *Gastrophilus hæmorrhoidalis* L.

The adults are all two-winged insects, bee-like in appearance, each species differing somewhat in colour markings, size, and habits. The common bot is a brownish-grey species with mottled wings and a white face. The female deposits her eggs on the hairs of the mane, chest, shoulders, and legs, most usually on the long hairs of the forelegs, inside and below the knee. During egg-laying the female hovers around the animal, curving the abdomen beneath the body in order to facilitate the deposition of the eggs, each of which is laid and fastened to the hair in about a second. The position of the abdomen at the time of egg-laying has given the impression that the fly stings the horse; but this is erroneous.

The throat botfly is smaller than the common bot and has a reddish thorax and a prominent black band across the abdomen. The wings are clear. The eggs are deposited by the female on the hairs under the jaws. The female fly is usually seen hovering near or between the forelegs of the horse and then quickly darting at the throat to lay her eggs. One to four eggs may be laid at the one time, each attached singly to the hairs. The presence of this fly causes the animal to nod its head violently and sometimes to strike with the forelegs.

The nose bot is the smallest of the species under discussion, and chooses the hairs of the lips for egg-laying, particularly those hairs on the edges of the lip which are moistened by the saliva. The flight of the fly is very rapid, the insect darting at the lips to deposit a single egg and then withdrawing for a few seconds to repeat the process.

As the mouth parts of the adult flies are rudimentary they cannot feed and are therefore comparatively short-lived. The common bot has been known to live as long as twenty-one days, but the average life is not thought to extend much beyond a week. The two other species live only about three to twelve days, the throat bot surviving the longer period.

LIFE HISTORY NOTES.

The Egg.

The eggs of these three botflies are glued to the hairs of the horse and differ considerably in shape, colour, and manner of attachment. The egg of the common bot is yellowish in colour and is attached to the hair for about one-third of its length, the free portion of the egg forming an angle with the hair. Frequently more than one egg may be attached to a single hair, especially if the hair is long. The eggs do not hatch until they are rubbed or licked by the horse. The minute, spiny maggots are ready to hatch in about seven days, though they may remain unhatched and alive for months.

The eggs of the throat bot are slightly different in shape to those of the common bot and are fastened to the hair for about two-thirds of their length. These eggs do not require friction to cause hatching, which takes place normally.

The eggs of the nose bot are black and stalked, the stalk being corkscrew-like and continued to the follicle from which the hair arises. Here, again, hatching does not require friction; the eggs nearest the moist edges of the lips hatch first, usually in five to six days, while those an inch away may take as long as eighteen days, and those some distance from the lips may not hatch at all.

The Larva or "Bot."

On hatching, the tiny larvæ of the common bot and nose bot are taken in by the mouth and eventually appear in the stomach, to the walls of which they adhere. In the case of the throat bot, the exact method by means of which the stomach is reached is not known for certain. As the tiny larvæ have been observed in the mucous membranes of the mouth, it seems possible that they may be able to bore their way through the skin between the jaws.

Once in the stomach, the larvæ of all three species attach themselves to the wall by means of a pair of strong mouth hooks. The common bots are reddish in colour and are found attached to the white covering of the left sac and along the ridge between the right and left sacs. The larvæ of the throat bot occur most usually near the pyloric or exit end of the stomach, and in that portion of the intestines leading out of it. Those of the nose bot may occur attached to various parts of the stomach, but are more usually located near the pyloric end. The larvæ or "bots" are all provided with rows of spines on the anterior border of the majority of the segments, the number and arrangement of the spines differing in each species. After living in the stomach for about eight to twelve months* the larvæ are fully grown and are passed out with the dung. Those of the common bot and throat bot pass out without any reattachment, but in the case of the nose bot the maggots fasten themselves to the rectum and again to the anus before they finally reach the ground.

The Pupa.

As soon as they reach the ground the maggots at once commence to seek some protection. However, they do not crawl very far, and burrow into the soil only a short distance. In one to four days the outer skin hardens and forms a protective coat, known as the puparium, inside which the transformation from the maggot or "bot" to the adult fly takes place. The puparium is brown to black in colour, but is otherwise similar to the bot. At the end of about three to ten weeks the transformation is complete and the adult fly emerges.

Injuries Caused by Botflies.

Possibly the greatest damage among horses through botfly presence is self-inflicted. Extreme annoyance and worry is caused during egg-laying by the females, as the horse recognises its enemy and makes desperate efforts to protect itself. The common bot appears the least irritating of the three species, probably because of the varied situations in which its eggs are deposited. Even so its presence keeps the animals in a continuous state of annoyance and prevents them from resting.

* The life history records are taken from "The Horse Bots and Their Control," by F. C. Bishopp and W. E. Dove, United States Department of Agriculture, Farmer's Bulletin No. 1503, 1926.

The throat bot causes the animal to throw its head about violently and makes it difficult to manage in harness. The nose botfly appears to be the most annoying species, for the insect, in depositing its eggs on the hairs of the lips, produces a severely irritating tickling. The actions of horses while the insects are about are very characteristic. The throat botfly causes them to stand together with their heads over each other's back, and if the nose fly is about they protect their lips by placing them against each other's body. Should the insects be numerous and the protections abovementioned be inadequate, the animals keep up a continuous movement, occasionally breaking into a gallop, in attempts to prevent the insects alighting and laying eggs.

It is commonly considered that the bots in the stomach are of little importance. It should be remembered, however, that the larvæ are developing for eight to twelve months in the horse's stomach, and during this period considerable harm may be done. The spiny armature and the large mouth hooks cause inflammation of those parts with which they may come into contact, which results in an interference with digestion. Very commonly many hundreds of bots may bring about obstructions and seriously interfere with the passage of food. The nature of the food taken in by bots is not known, but they certainly live at the expense of the horse, and the pinkish hue of some of the maggots indicates that they may be bloodsuckers. It has also been shown that their body fluid is decidedly toxic, and if a small quantity of this fluid is injected beneath the skin alarming symptoms result, sometimes followed by death in a very short while.

Protection and Treatment.

Various devices have been recommended for the protection of the horse against botfly attack. For the throat bot a piece of ordinary canvas attached to the nose band and tied to the headstall will completely cover

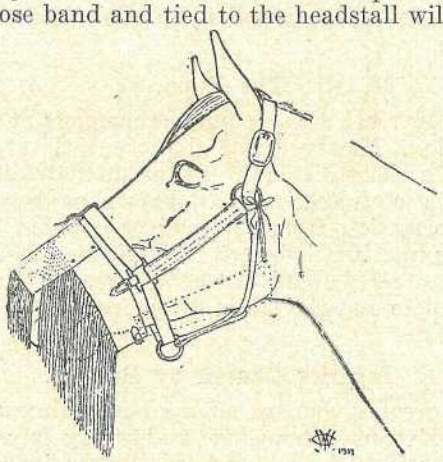

Plate 138 (Fig. 1).
Leather nose-fringe as protection against the nose botfly (after Hadwen and Cameron).

the region between the jaws. As protection against the nose bot the Canadian authorities recommend a leather band cut into thin strips and encircling the nose (Plate 138, fig. 1). In the United States excellent results have followed the use of a mouth guard constructed from ½-inch hardwood boards. For protection against the throat and nose flies it

is recommended that the throat be covered by a piece of canvas which is attached in front to the wooden mouth protector (Plate 139, fig. 2). Furthermore, this combination device is said to prevent the animal from taking into the mouth the common bots while attempting to bite or scratch itself. The hardwood guard completely protects the lips when the head is up, and the block beneath causes the guard to fall back when the head is lowered and does not interfere in any way with the animal's grazing.

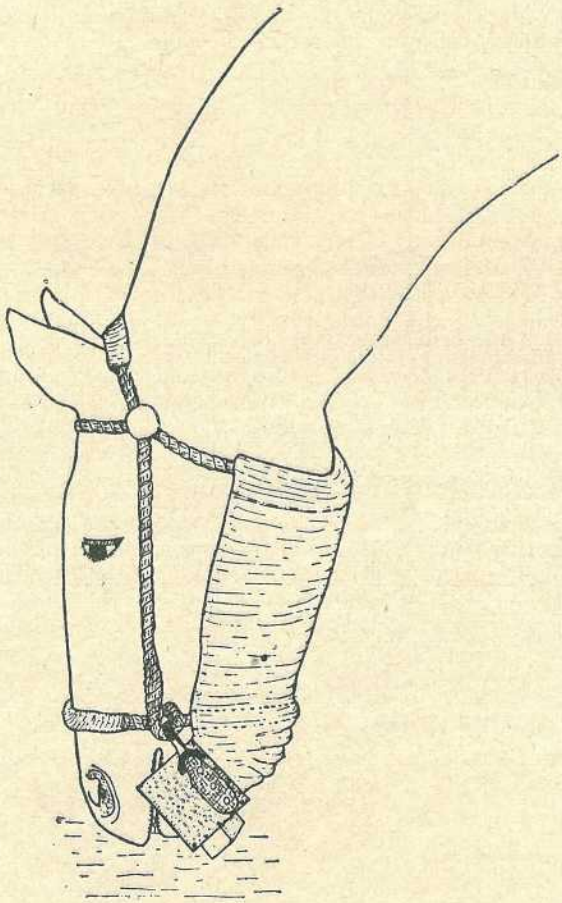

PLATE 139 (Fig. 2).
Device for protection against the throat and nose botflies (after Bishopp and Dove).

Another effective protector for use against the nose botfly when the horse is in harness consists of a piece of leather 4 to 6 inches wide attached at each side to the bit ring so that the entire lips are covered.

As the eggs of the common bot are not confined to any particular region of the horse, it is difficult to discover any good means of protection. The mouth guard mentioned above (Plate 138, fig. 1) will be found beneficial. In other parts of the world the provision of deep sheds or brush shelters is said to give some protection, for when the flies are bad the animals retire into the sheds, where they are not followed to any large extent by the flies.

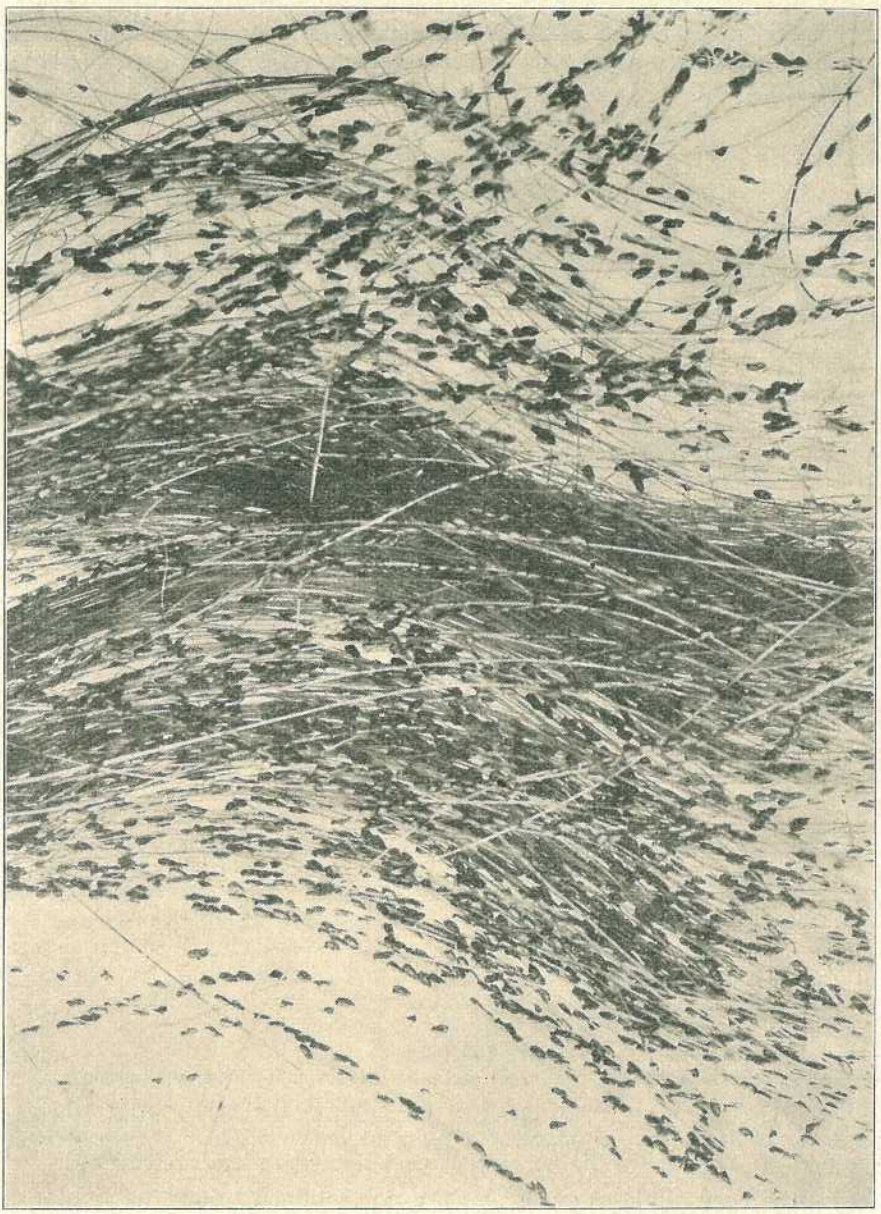

Plate 140.—Eggs of the Common Bottfly.

Frequest grooming and clipping of the hairs of the areas on which eggs are laid will aid in control, and a 2 per cent. carbolic wash applied with a rag will kill the majority of the eggs.

For the removal of the bots carbon bisulphide will be found very efficient. The animal should be fasted for eighteen hours before treatment and the drug given in a capsule, the dose rate being 6 c.cs. for every 250 lb. weight; horses of 1,000 lb. weight therefore requiring a dose of 24 c.cs. The capsule may be administered either by hand or with a balling gun. No feed or water should be given for three hours after treatment. No purgative is required either with or following the drug. If there is any question as to the animal's ability to tolerate this dose, divided doses may be given and the treatment suspended if ill effect follows the administration of a partial treatment. Great care should be taken in the administration of the capsule, for if it should break and the drug enter the lungs fatal results may follow.

It is also advisable to wash the animal thoroughly with the 2 per cent. carbolic solution before treatment to destroy any eggs, otherwise the young bots hatching from the eggs will be taken in and reinfest the stomach.

THE FARM HORSE—SOME IMPORTANT POINTS.

Discussing at a recent conference of the Agricultural Bureau of New South Wales the care and maintenance of the draught horse on the farm, and speaking more particularly of the eight or ten horse team of the average wheat farm, Mr. R. Ellis, Walla (New South Wales) drew attention to several points of importance in relation to health and efficiency.

It was pointed out that the shoulders needed the most careful attention when the horse was doing heavy and constant work. There was nothing more distressing to a driver, if he took any pride in his team, than having to work a horse with sore shoulders. Prevention was easier than cure with this complaint. Sore shoulders could be traced to several causes, of which badly-fitting harness was the most common. The collars should fit the horses properly; badly-fitting collars were the cause of many horses turning out "jibs."

The implements used on farms to-day practically all pulled from low down; that is, the draught was near the ground, causing the pull to come on the point of the shoulder. To overcome this, the collars should be stuffed full in the middle and be open at the pipe or the turn in the collar. Collars, as well as the skin of the horse, should be kept clean.

Careless drivers could ruin the shoulders of a horse in a few days if they did not keep the draught in the right place on the shoulder. Badly-shaped shoulders on horses were hard to deal with, and sometimes a breastplate had to be used instead of a collar. Clipping the shoulders was a great help, especially when the horse got a long coat in winter, and was a great preventive of sore shouders; or perhaps the horse could be clipped trace-high if he was carrying a big coat of hair. When breaking-in a young horse care should be taken during the first few days. The shoulders should be washed with cold water after work, a little salt being added to the water.

The feet should be kept in decent shape, and not allowed to grow too long. This was the cause of a lot of foot trouble with horses, and cracks, seedy toe, &c.

A stable was necessary both for the convenience of the driver and for the comfort of the horses. It was more economical to feed the team in a stable, and it was much better for the horses' health than feeding them in the open. He believed in watering before feeding, but his experience and observation proved that the horse would accommodate itself to any method in reason.

A SURVEY OF THE HELMINTH PARASITES OF THE DOMESTIC FOWL AND DOMESTIC PIGEON IN QUEENSLAND.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

THIS report is intended to record the several species of helminths collected by the writer from the domestic fowl and domestic pigeon during the past two and one-half years, together with certain observations on their prevalence and pathogenicity. The material was mainly obtained from a personal examination of 128 birds, principally from the Brisbane district, but also included several specimens forwarded from other parts of the State. Fifteen species are mentioned as being found during the course of the survey, eight of which have already been recorded by Johnston and one by Georgina Sweet. *Amœbotænia sphenoides* (*A. cuneata*), which was recorded by Johnston from the domestic fowl, has not been encountered.

Cestoda.

Davainea proglottina (Davaine 1860).

Sweet in 1910 recorded and described *Davainea varians* from Australia which appeared to differ from *D. proglottina* on certain head and rostellar characters. As these characters are extremely variable in *D. proglottina*, it is considered that the two species are probably the same. It cannot be regarded as a very prevalent parasite of the domestic fowl in Queensland, though heavy and generalised infestations in at least two flocks have been encountered. The species is regarded as extremely pathogenic in other countries and in the two outbreaks mentioned above very heavy losses were experienced. *D. proglottina* was present in 3·5 per cent. of the birds examined and was confined to about the first six inches of the intestine.

Raillietina (*Ransomia*) *tetragona* (Mol. 1858) R.Bl. 1891.

This species appears to be the commonest fowl tape-worm in Queensland, being present in 24·1 per cent. of the birds. It was generally taken from the last half of the small intestine, and was occasionally associated with nodule formation at the point of attachment. The suckers are armed with numerous rows of minute hooks, which in many specimens may be partly or entirely missing. The genital pores are unilateral and the rostellum is armed with about 90-110 hooks. The only species with which *R. tetragona* may be confused is *R. echinobothrida*, which was not encountered. In *R. echinobothrida* there are, according to Baylis, 200 rostellar hooks and the genital pores are alternating.

Raillietina sp.

This species is apparently very common among the pigeons of the Brisbane area as it has been collected on several occasions, frequently associated with a heavy infestation. The specific determination is not definite but it is thought to be *R.* (*Raillietina*) *nagpurensis* Moghe, 1925.

Raillietina (*Skrjabinia*) *cesticillus* (Mol., 1858.)

The prevalence of this tapeworm among the fowls examined was 14·6 per cent., some of the birds bearing fairly heavy infestations, one bird yielding 384 specimens. *R. cesticillus* is a moderately short species

with a rostellum armed with a double row of about 400 hooks. The suckers are unarmed. A report accompanied by specimens from the Dawson Valley indicated that this species was responsible for a heavy mortality among a flock in that locality. The species is usually to be found in the first third of the intestine and can easily be confused with *Choanotænia infundibuliformis*. This latter species, however, is recorded as possessing only a comparatively few rostellar hooks, 16-20, which are also much larger than those found in *R. cesticillus*.

Hymenolepis carioca (Magalh., 1898).

Only a few of the fowls examined, 5·8 per cent., yielded this species, which was present only in very small numbers.

Hymenolepis inermis Yoshida, 1910.

This species is a fairly common tapeworm among the fowls in the Brisbane area and several cases of gross infestation have been seen. *H. inermis* was found in the first third of the small intestine. The species is unarmed, up to about 9 mm. in length, with the cirrus sac extending practically half way across the segment. Its frequency was in the vicinity of 15 per cent. *H. inermis* is recorded from the domestic fowl for the first time from Queensland.

Nematoda.

Ascaridia lineata (Schneid., 1866).

Johnston recorded the presence of *A. galli* (*A. perspicillum*), but a careful examination has shown that the only fowl *Ascaridia* present in the material now under consideration is *A. lineata*. This nematode was present to the extent of 76·6 per cent. and was generally, when in moderate numbers, confined to the first portion of the small intestine. When the infestation is severe specimens may be encountered throughout practically the whole length of the intestinal tract and on one occasion a number of worms were collected from the gizzard.

The effects of even a heavy infestation by this parasite do not seem to be very apparent among the older well-grown birds but in young poultry up to at least about three months old the presence of the parasites even in moderate numbers causes a noticeable drain upon the vitality of the host. This was shown in the case of a three-month old chicken which was extremely emaciated, dull, and anæmic. The feathers drooped and it did not make any attempt to move when approached. On post mortem 320 fully grown and innumerable immature *Ascaridia lineata* were recovered from the intestine which exhibited a markedly catarrhal condition.

Ascaridia columbæ (Gmel., 1790).

This nematode has been met with on several occasions in the domestic pigeon. Like *A. lineata* it apparently is well tolerated by adult birds even in such large numbers that the intestine for a great portion of its length is simply packed with specimens.

Ornithostrongylus quadriradiatus (Stev., 1904).

This slender nematode is represented in the material by a single male, which was recovered from a pigeon in Brisbane. It is recorded from Queensland for the first time.

Heterakis gallinæ (Gmelen., 1790).

The coecum worm was the commonest nematode seen and was present in 94·6 per cent. of the birds examined. The infestation was usually moderate without any noticeable pathogenic effects, but in three well-grown birds which yielded 2,030, 1,862, and 1,679 specimens respectively the coecum walls were markedly inflamed.

Capillaria retusa (Rail., 1893) Trav., 1915.

This fine hair-like nematode, which occurs in the small intestine, was very frequently recovered and in many of the birds the infestation was extremely heavy. It was present in 40 per cent. of the birds examined. On several occasions it has been implicated in outbreaks with serious mortalities, but the evidence that the mortalities have been due to this nematode alone has not been conclusive.

Capillaria columbæ (Rud., 1819).

Obtained from the domestic pigeon on two occasions and from the domestic fowl once. It may be readily distinguished from *C. retusa* by the spicule sheath of the male which is transversely striated posteriorly, while in *C. retusa* it is spiny. This species is recorded for the first time from Queensland.

Oxypirura parvovum Sweet, 1910.

The poultry eyeworm was not seen in any of the birds examined in Brisbane. The only specimens in the collection are from Townsville, but it is known that the species occurs as far south as Rockhampton. The intermediate host of this nematode is the roach *Pycnocelus surinamensis,* which is very common in Brisbane.

Acuaria (*Cheilospirura*) *hamulosa* (Dies., 1851).

The gizzard worm of poultry was not very frequent among the birds examined and only two cases of infestation were noticed, both of which comprised only a small number of worms. These worms are said to weaken the gizzard wall to such an extent that large pouch-like dilations are formed.

Acuaria (*Dispharynx*) *spiralis* (Molin, 1858).

Like the gizzard worm, this parasite is regarded as a comparatively infrequent species in the Brisbane area and has been seen only in one bird, where it occurred in the proventriculus.

Summary.

The helminth parasites occurring in the domestic fowl and domestic pigeon in Queensland as recorded from examinations of birds during the past two and one-half years are as follows:—

Host.—Domestic fowl.

Cestoda—

Davainea proglottina (Davaine, 1860).
Raillietina (*Ransomia*) *tetragona* (Mol., 1858) R.Bl., 1891.
Raillietina (*Skrjabinia*) *cesticillus* (Mol., 1858).
Hymenolepis carioca (Magahl., 1898).
Hymenolepis inermis Yoshida, 1910.

Nematoda—

Ascaridia lineata (Schneid., 1866).
Heterakis gallinæ (Gmelin., 1790).
Capillaria retusa (Rail., 1893) Trav., 1915.
Capillaria columbæ (Rud., 1819).
Oxyspirura parvovum Sweet, 1910.
Acuaria (*Cheilospirura*) *hamulosa* (Dies., 1851).
Acuaria (*Dispharynx*) *spiralis* (Molin., 1858).

Host.—Domestic pigeon.

Cestoda—

Raillietina (*Raillietina*) *nagpurensis* (Moghe., 1925)?

Nematoda—

Ascaridia columbæ (Gmel., 1790).
Ornithostrongylus quadriradiatus (Stev., 1904).
Capillaria columbæ (Rud., 1819).

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THE TRUE CLUB SPIRIT AT NORWELL.

A very fine community spirit was shown at the annual gathering of the Norwell Home Project Club on Pimpama Island, Queensland, recently. Mr. and Mrs. G. L. Opperman, whose family was well represented in the club membership, had offered as a special prize a very fine A.I.S. heifer worth, possibly, 20 guineas, the prize being offered conditionally that it should not be taken by one of the Opperman children.

As it happened, when the awards were announced, one of the donor's boys topped the list, and came forward to be presented with the prize calf. The young lad briefly explained to the club organiser that he preferred the calf to become the property of the second prize winner, whereupon the next on the list came forward; he, in turn, explained that as his people had no A.I.S. bull available he would prefer the calf to go to some other prize winner. At this stage the third prize winner stepped forward, and to add to the complications he announced that he also was one of the Opperman family, and therefore desired the prize calf to go to the next on the list. The fourth member on the list therefore became the possessor of the 20-guinea calf, and accepted the award very gratefully.

The head teacher, Mr. Avery, specially thanked the donors for their commendable club spirit, and reminded the gathering that, though the prize had created a good deal of confusion, it emphasised a remarkable community spirit and the goodwill one towards another characteristic of the very best there is in the Home Project Scheme.

PLATE 141.—ARRIVAL OF NEW SETTLERS AT BEERBURRUM.

The group, which includes a family of sturdy young Australians, was welcomed by the Minister for Agriculture and Stock, Mr. Frank Bulcock (centre) and the Under Secretary and Director of Marketing, Mr. E. Graham (extreme left).

By courtesy, "The Telegraph," Brisbane.

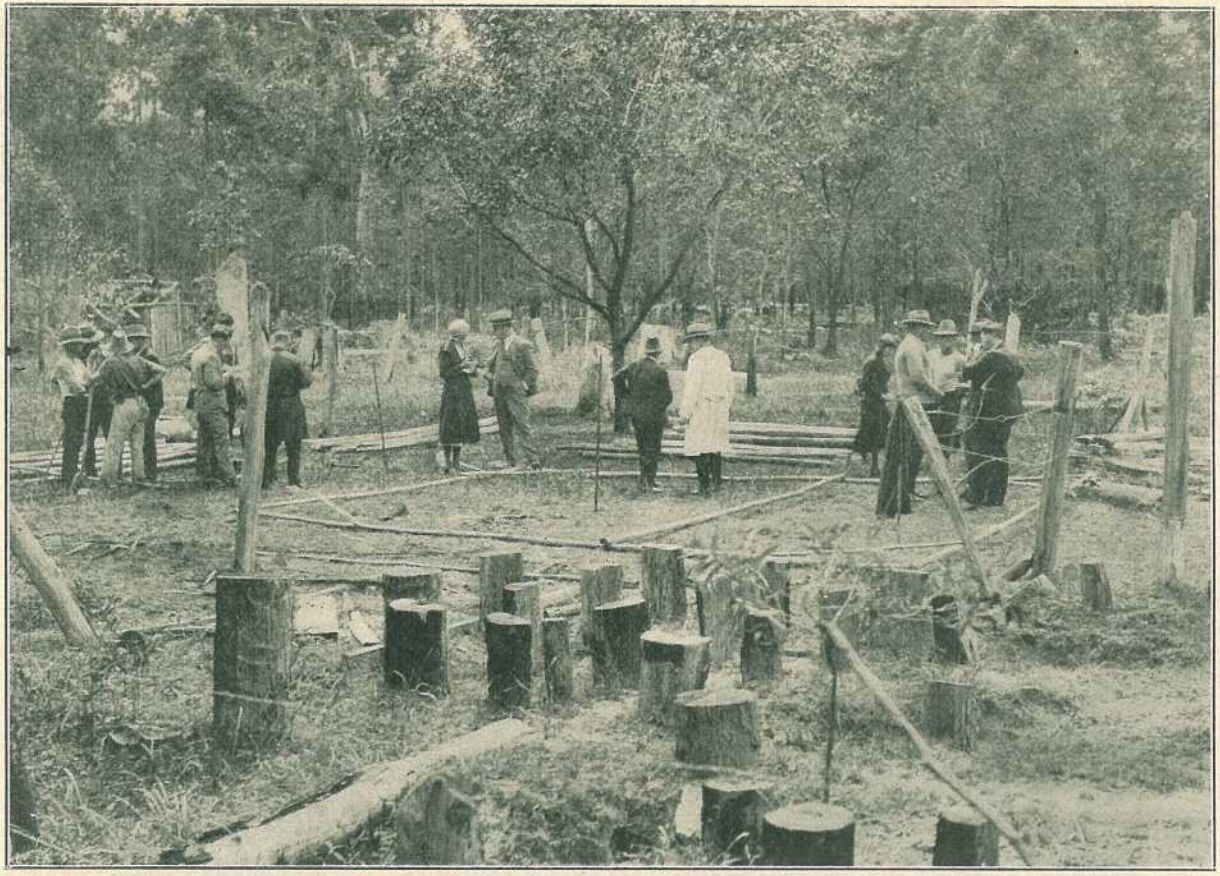

PLATE 142.—LAYOUT OF A TOBACCO GROWER'S FIRST HOME.

Plans and prospects discussed with the Beerburrum settlers by the Minister, Mr. F. W. Bulcock (with group on extreme left), the Under Secretary, Mr. E. Graham (right centre), and the Assistant Under Secretary, Mr. R. Wilson (left centre).

By courtesy, "The Telegraph," Brisbane.

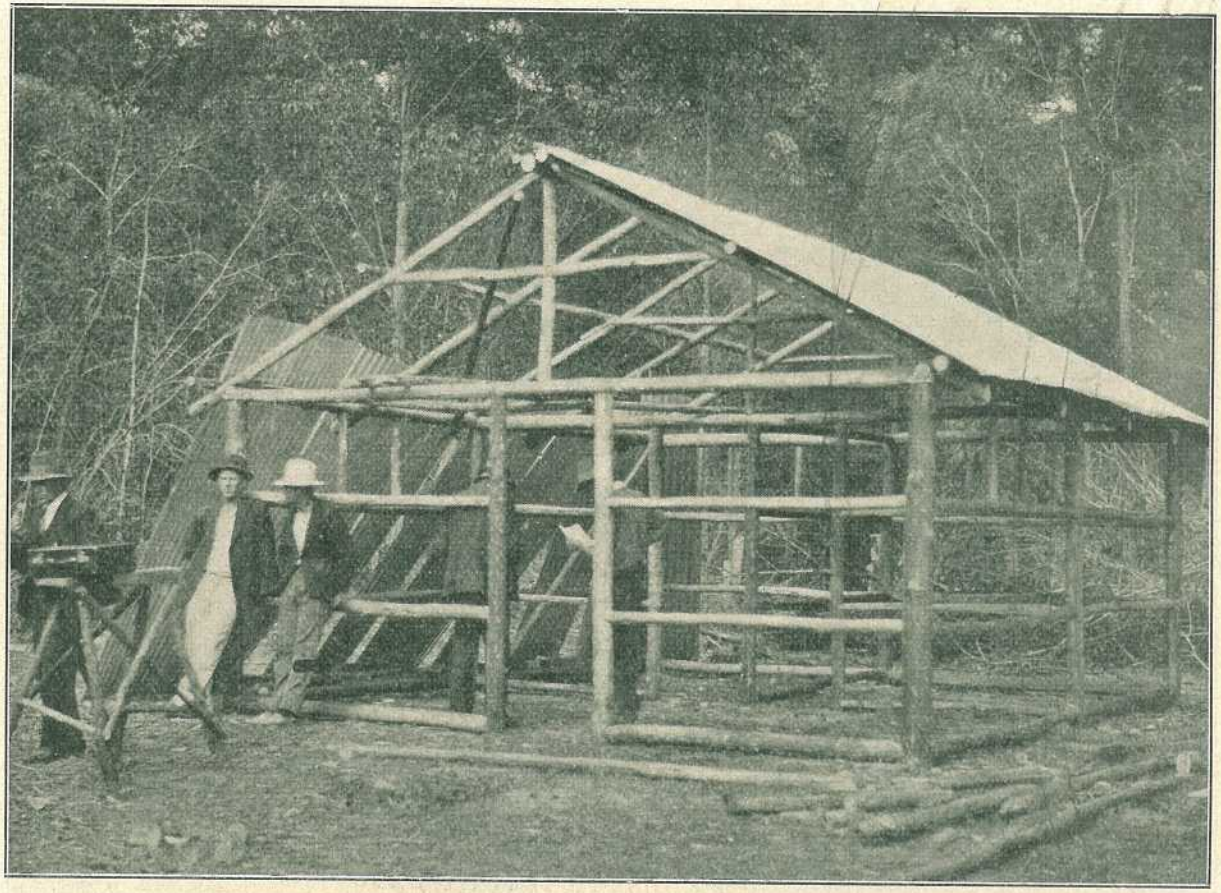

PLATE 143.—A SETTLER'S TEMPORARY HOME IN COURSE OF CONSTRUCTION.

Economy is the keynote of primary development on the Beerburrum Tobacco Settlement, so the round bush timber near the site comes in handy.

By courtesy, "The Telegraph," Brisbane.

PLATE 144.—A HAPPY FAMILY GROUP ON THE NEW TOBACCO SETTLEMENT AT BEERBURRUM.

The hut in the background is typical of the temporary homes built by the settlers. The Minister, Mr. Frank Bulcock (standing, centre), is taking a practical interest in the settlement in the vicinity of which very fine leaf has already been produced and has commanded a favourable market.

By courtesy, "The Telegraph," Brisbane.

PLATE 145.—PREPARING BEERBURRUM TOBACCO LANDS.

The Minister, Mr. F. W. Bulcock, discusses prospects with new settlers. Mr. E. Graham (Under Secretary) is also in the group.

By courtesy, "The Telegraph," Brisbane.

PLATE 146.—CHILDREN OF NEW SETTLERS AT BEERBURRUM VIEW THE PROMISED LAND.

By courtesy, "The Telegraph," Brisbane.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

(*Continued from the July issue.*)

PART X.

This is the tenth article of a series planned for the purpose of supplying information sought, from time to time, by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising in Queensland on relatively small holdings.

FARMERS' WOOL SCHEME.

THE Minister for Agriculture and Stock is prepared to assist farmers to obtain the best prices for the wool from holdings of less than 1,500 sheep, by receiving such wool, classifying it, and placing it on the market in bulk lines, thereby avoiding sale under Star Lot conditions.

A correct account of the wool will be kept, and each farmer will receive the amount received for same less the necessary broker's charges and other charges which are as follows:—

(1) A charge of 10s. per bale for classification. (This charge includes insurance in sheds, on rails, transit, and to selling broker's stores).

(2) All freight, handling, dumping, and rebaling.

(3) Other out-of-pocket expenses.

The Department of Agriculture and Stock will charge no commission; an advance of 60 per cent. will be made, free of interest, upon the estimated value of the wool as at the time of receipt of the wool in the Department's store.

The wool will be sold as soon as possible following a sufficient accumulation to enable wool to be sold to best advantage.

It must be understood that the limit of this arrangement is 1,500 sheep, and that the Department will not accept a clip from a greater number, and is prepared to take those classes that do not reach five bales.

The weights as taken in the Departmental Store and the classification before sale is to be accepted as final.

Farmers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, of their intention, before consigning the wool, advice of which, with all particulars, brands, weights, &c., should be given.

Consign the wool to the Under Secretary, Department of Agriculture and Stock. Roma street, Brisbane.

Recommendations.

(*a*) The bales should be branded on the cap only, so that the same packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(*b*) Locks and belly wool should be kept separate in bar bales.

(*c*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

(*d*) All merino wool should be kept separate from other grades and breeds.

Sheep belong to the ruminating or cud-chewing type of animals, of which there are two orders, goats and the sheep, or ovis order, of which there are three varieties, *Ovis Ammon, Ovis Musmon, Ovis Aries* or domesticated.

Many sheep are without horns, other breeds produce horns when a few days old. The various ages of sheep are described thus—Lambs, weaners, hogget wethers or ewes, rams. If shorn as a lamb they are called shurled hoggets after shearing.

The teeth are the best medium by which the age may be ascertained.

The accompanying plate, taken from Professor Simmonds' "On the Age of the Ox, Sheep, and Pig" is an illustration of the incisors or cutting teeth. In Plate 7 is shown the molars or grinders at various periods of the sheep's life up to maturity, which is, roughly, four years (Armitage's "Sheep Doctor"). At maturity a sheep has thirty-two teeth, eight incisors and twenty-four grinders.

At birth a lamb possesses two central temporary incisors, and at the end of four weeks all the temporary incisors (eight) are up, with three molars in each of the upper and lower jaws.

From the age of four weeks to the time of cutting the central permanent incisors, at from twelve to fifteen months, the only changes that occur are in the molars. At three months the fourth molar is cut, and is a permanent tooth. Six months later another molar, the fifth, is to be seen. At eighteen months the sixth permanent molar is cut; the third temporary molar, like a shell, covers the top of the permanent tooth, while the first and second permanent molars have pushed off the temporary ones. Thus, a sheep has all its permanent molars at from eighteen months to two years old.

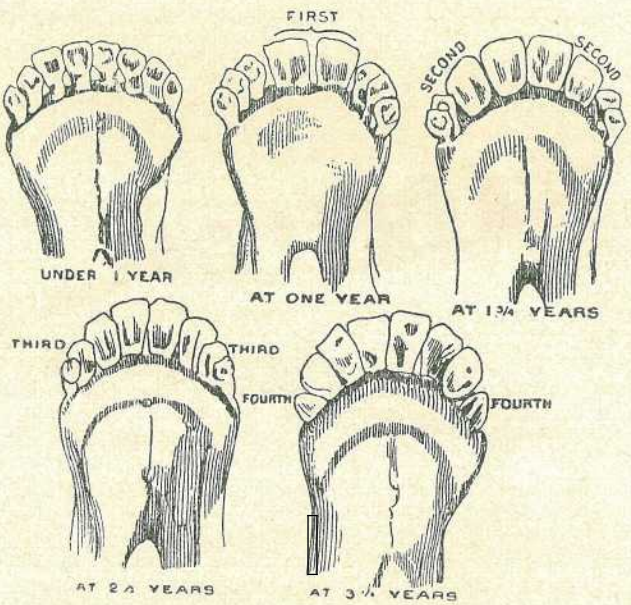

Plate 147.—Dentition—Incisors.

With the incisors, the first two, or central permanent teeth, make their appearance at from twelve months in early and fifteen months in late, dentition. At from eighteen months to twenty-four months, the second pair of permanent incisors are up; at from twenty-seven months to thirty-three months, the third pair are in use; and from thirty-six months to forty-two months, the fourth and last pair of permanent incisors are shown, and the sheep is "full-mouthed" at about four years.

After this, it depends upon the class of country, and the early or late maturity of the breed, as to the wear of the teeth, whether the mouth is defective or otherwise. Only experienced sheep-masters can, even approximately, give the age of any particular animal. In the case of "broken-mouthed" sheep it is wise, if only three or four or fewer teeth are left, to pull them out and leave the animal "gummy." They cannot bite with odd or gapped teeth as well as they can with gums. But do not buy old sheep unless very cheap, and other conditions justify the purchase.

Other indications of old age are dependent paunch, sagging of the loins, distended nostrils, deterioration of fleece in quality and quantity, and malformed feet.

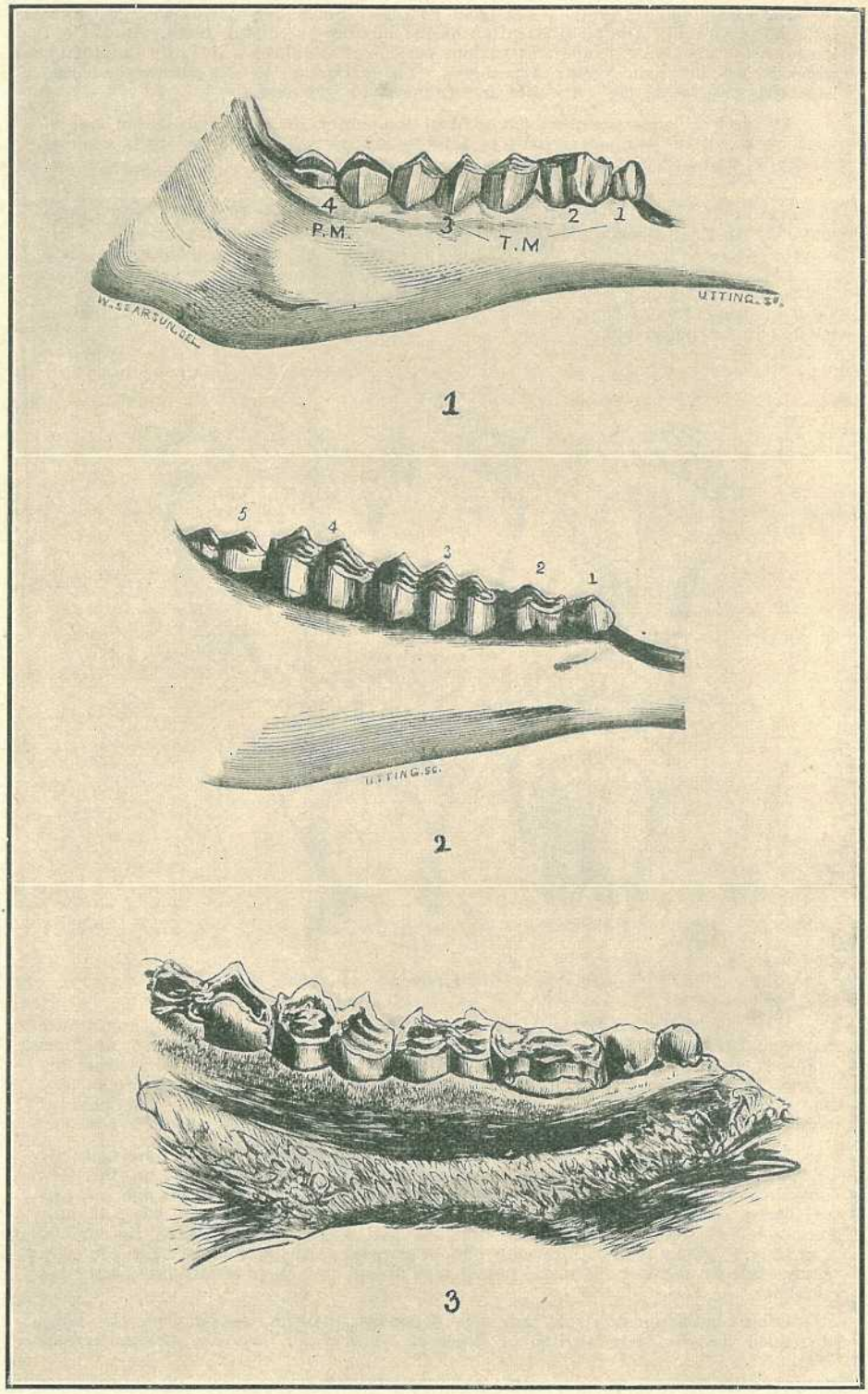

Plate 148.—Dentition—Molars.

LICKS FOR SHEEP.

In providing a lick for sheep, it is necessary to possess some knowledge of the elements required by the sheep and, further, to ascertain to what extent these elements are supplied in their food and water.

When our grasses are in the growing stage most of them will provide a sufficient supply of all the necessary elements required, but when the grasses become dry and perished they lose their virtue.

This is a common and regular occurrence especially in regard to our native grasses. In many districts winter herbage will respond to light rains, and those that are relished by the sheep are very useful as they provide a most succulent bite for sheep when the natural grasses contain very little nutriment. If suitable licks are supplied during the time that grasses are dry and no herbage available they will whet the appetite, assist digestion and assimilation, and in this way create a better relish for the rough food that is available and assist the sheep in making better use of it. During the time the pasture is good the sheep should lay on condition, thereby fortifying themselves against times of scarcity or when the feeding value of the pasture has deteriorated. If the sheep can be held in fair condition at all times, better results will be secured both in respect of wool production and immunity against pests and disease. Wethers can undergo hardships to a greater extent than breeding ewes. Therefore the ewe flock should receive a greater amount of attention. If herbage is wanting during the time the grasses are dry there is likely to be a protein deficiency which can be supplied by feeding with concentrates such as sheep cubes and nuts and maize at the rate of 2 oz. per day. Should this deficiency be supplied through a lick, care must be exercised that it contains the requisites for supplying mineral deficiency.

As all our pastures when in a dry state are wanting in mineral constituents, and knowing that sheep require a certain percentage of it for their wellbeing, it is most economic to supply it through a lick. The water supply available to sheep varies considerably and must be given full consideration. In the case of sub-artesian water it is most satisfactory to have it analysed.

Sheep can take a fair amount of salt in their water, the chief factor being the balance between it and other minerals, but the greater the amount of salt it contains the less need there is for salt in their lick. In the case of soft water which contains little or no salt, the sheep will require to have a fair percentage of salt added.

The actual quantity of salt required by a sheep under normal conditions is from 4 to 5 lb. a year, and this quantity is usually fully supplied during that portion of the year when the grass is growing. During the same period other mineral constituents, lime, and phosphoric acid are also available, probably in suitable quantities for the maintenance of adult sheep, but in the case of pregnant ewes and during the lactation period their requirements increase considerably, as is also the case with growing lambs.

Where the water is saline and the pasture deficient in lime and phosphoric acid a lick be necessary, but to add salt (as many pastoralists do during a drought) only aggravates the trouble. Therefore it should be omitted.

Finely ground Nauru phosphate contains nearly equal quantities of lime and phosphoric acid, but, owing to its having neither taste nor odour, sheep will not take readily to it. When salt is not necessary, linseed or other meal can be added in such quantity as to induce dry sheep to take up to ½ oz. of Nauru phosphate a day, although they can eat more without injury. If the meal induces dry sheep to eat more than that quantity it can be reduced. Molasses sprinkled over the lick, and then thoroughly mixed, is also useful for the same purpose. Sheep as a rule will not change readily from one lick to another. If they are on a lick that does not contain a high proportion of phosphate it can be added to the lick that they are used to, having the aim to ultimately reach the basis of 45 per cent. finely ground Nauru phosphate and 35 per cent. crude ground salt, the remaining 20 per cent. to be added to suit special purposes and may include 10 per cent. of meals.

In some cases 3 per cent. sulphur, 2 per cent. sulphate of iron, and 5 per cent. molasses will be found suitable. When the food is dry, 5 lb. of Epsom salts to every 100 lb. of lick can be added with advantage. If potassium iodine is required, add it at the rate of 1½ oz. per 100 lb. mixed lick; so far we have no evidence

that such deficiency exists. To add it, spread the mixed dry lick evenly over a clean floor, not too thick, dissolve the 1½ oz. iodine in 1 pint of warm water and sprinkle it evenly over the lick and mix thoroughly and evenly.

Experiments have been carried out in recent years by the Department of Agriculture and Stock, South Africa, on sheep infested with worms, and many lick mixtures were tried. As recorded in subsequent reports, it is recommended for practical stock raisers, on farms which are infested with worms, to supply a daily lick which contains 14 lb. of tobacco dust added to 100 lb. mixed lick, which is an important measure for reducing the infection of nodule worms in sheep and in keeping up the body weight, although the lick does not act as a preventive.

The best method of administering lick is to place it in a V shaped trough capable of holding a bag or more with an opening the full length of the trough 1½ inches wide and 2 inches above the lick board, which should be 10 inches wide and about 15 inches from the ground.

If the container is securely covered with a removable galvanised iron lid, the lick will retain its normal condition and fall by gravitation through the bottom opening as the lick is consumed from the lick board.

AUTOMATIC LICK CONTAINER ON ELLANGOWAN, DARLING DOWNS.

This lick container consists of a V-shaped trough with a lick board running at the apex of the V at a suitable distance. In practice, the roof was taken off, the salt (coarse Liverpool) placed in the trough, and the lid replaced. The salt by gravitation falls through the slit, 1½ inches wide, running the full length of the lick board at the apex, and stays until the sheep lick it away. As fast as it is taken from the lick board it is replaced automatically from the trough. Herewith is a drawing which speaks for itself—

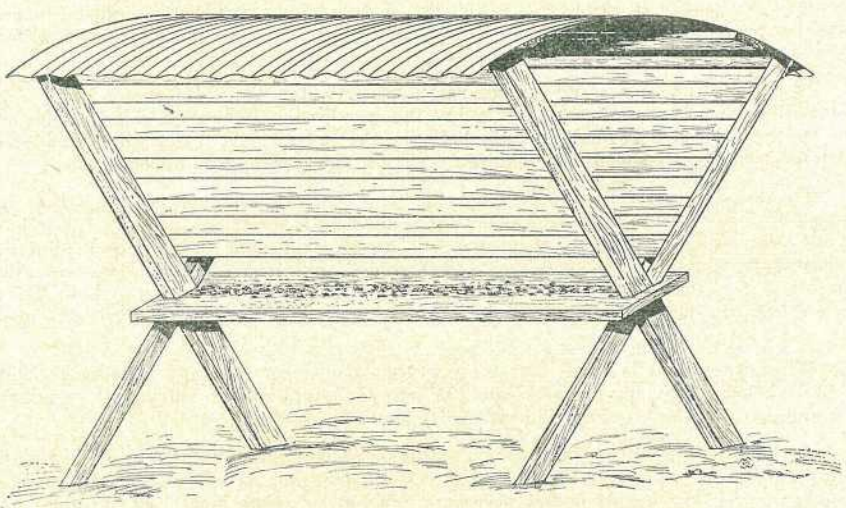

PLATE 149.—SALT-LICK FOR SHEEP AT ELLANGOWAN.

There are many good licks now on the market, all of which must carry a label setting out the ingredients contained, which acts as a guide to the sheep farmer as to their value.

In order to become better acquainted with the deficiencies which occur in our pastures, the Department has secured many samples of water, grasses, shrubs, and trees on which the sheep have been living for the purpose of analysis, the result of which should act as a guide in recommending licks for sheep running on the pastures from which the samples were taken. More recently the contents from the different stomachs and intestines of sheep were secured and analysed. Some of these sheep were specially fed for two weeks prior to slaughter, and the analysis showed very important results.

THE CULTIVATION OF MAIZE.

By C. J. McKEON, Instructor in Agriculture.*

MAIZE is grown extensively in Queensland along the coastal areas and inland within the 30-inch rainfall belt, the chief districts being Moreton, Wide Bay, and Darling Downs, which between them usually produce over 80 per cent. of the State's total crop. The next district of importance is the Atherton Tableland, which, due to the comparatively safe rainfall, has much the highest yield per acre over a number of years.

It will be seen from this what a vast area is suitable for the production of this crop, and also the wide variety of soils on which it is being successfully produced.

Providing the rainfall is sufficient, and the land is naturally well drained, maize can be grown on any good quality soil, the alluvial flats found along rivers and creeks and the deep volcanic soils being particularly suitable for its growth. Good drainage is absolutely essential, as maize will not stand wet feet.

It is one of the easiest crops to grow, and, unfortunately, advantage is frequently taken of this fact, and many crops are grown under conditions which would be fatal to many other crops.

To get the best Results.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during the winter, and allowed to lie in the rough until the early spring. The action of the frost and rain will have a sweetening effect on the soil, and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a nice fine condition.

If a crop of weeds is turned under during the second ploughing planting should not be carried out for a few weeks at least to allow decomposition to take place. On land which is not too heavy and moist this will be greatly assisted by rolling, as the rolling will consolidate the soil and cause the decomposition to take place much more quickly. It will also at the same time make a good firm seed bed. Rolling should always be followed by a light harrowing.

Preparation of Seed Beds.

The preparation of the seed bed is one of the most important points in the production of maize, and no amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in growth but in the colour of the foliage also, between crops grown side by side, and where one has been sown on thoroughly prepared and the other on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a good seed bed—and by a good seed bed is meant not only a well-prepared one but one in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to Plant.

The best times to plant will naturally vary according to the different districts. In districts which have a long growing season and a comparatively regular rainfall, this can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district in which it is to be grown; and secondly, to try and have the crops tasselling during periods in which there is usually a good chance of getting rain. Maize must have moist conditions during tasselling, and if hot dry winds occur during this period the pollen is destroyed and fertilization cannot take place.

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* In a radio lecture from 4QG.

Seed should be sown in drills spaced from 3 feet 6 inches to 4 feet apart, nothing less than 4 feet for the tall-growing, late-maturing varieties. As a general rule, single spacing gives the best results, the grains being dropped singly along the rows, with a distance of approximately 12 inches between the grains for the quick-maturing varieties and from 15 to 18 inches for the late-maturing varieties.

From 9 lb. to 10 lb. of seed is sufficient to plant an acre when sown in this manner.

The most satisfactory method of sowing is with a seed drill, as in this way it is possible to get a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

Field Practice.

The land can be lightly harrowed even until the plants are a few inches high. This will not only destroy young weed growth but will also greatly improve germination in the event of heavy rain falling shortly after planting and causing the surface soil to become caked. Many growers are afraid of injuring the young crop, but if harrowing is done on a bright warm day, when the young plants are not brittle, and care is taken to prevent dragging of rubbish which may collect under the harrows, the crop not only will not be injured but will be greatly benefited.

In districts where the rainfall is heavy, and difficulty is experienced in keeping weed growth in check, many growers before planting run out shallow drills a few inches deep with a light plough or other suitable implement, and then sow along the bottom of the drills with the planter. When the young plants are high enough the cultivator is worked through the rows, and is set in such a way that the soil is drawn in around the plants, filling up the depression made when drilling, and thereby smothering the young weeds which have sprung up in the rows. This, of course, to be effective must be done while the weeds are very young.

During the early stages of growth the crop should receive at least two good inter-row cultivations to keep weed growth in check and to keep the surface soil in a nice friable condition, and on no account should the surface soil be allowed to remain in a caked condition while it is possible to work a horse cultivator in the rows.

Harvesting.

The picking of the crop still remains a hand operation, and although machines have been tried, one of which was invented and built in Queensland and which performed well at the trials, none of these have so far reached a stage where they can be successfully worked in the majority of crops.

The ears should be allowed to dry out thoroughly before being shelled, for, apart from the fact that the grain if shelled too early is likely to heat in the bags, a large amount of grain is broken and damaged during the shelling process and the appearance of the sample is spoiled. A considerable wastage also occurs through the cores being too soft to withstand the pressure of the drums, and these break up into small pieces and pass out through the machine with the grain still attached.

Cost of Production.

To make maize-growing profitable the cost of production has to be reduced to a minimum, and this can only be done by increasing the yields by the use of pure strains of seed which have proved suitable for the locality, and also by practising the best cultural methods. Good quality seed not only gives an increased yield per acre, but also an increased return per bushel, as a better price will always obtain for grain which is of good even type and colour.

The use of modern machinery also plays a very large part in lessening the cost of production, and hand work must be eliminated wherever possible, and the combined husker and sheller has done a great deal towards this.

Storage.

Maize can be stored for very long periods at no very great cost other than the initial cost of the tanks, yet growers frequently dispose of their entire crops for very low prices during flush seasons, whereas if they had the storage accommodation, and, of course, were in a financial position to store their grain for a time, they would receive very much better prices. One thousand gallon tanks are very suitable for this purpose, and hold approximately 3½ tons of grain. The lids of the manhole and shoot should be so constructed that they can be made quite airtight by puttying or by the

use of puddley clay. First and foremost the grain should be thoroughly dry, and should not contain more than 14 per cent. of moisture at the time it is placed in the tank.

If the grain is showing signs of weevil it can be fumigated by placing a couple of saucers on the top of the grain and pouring into these 1½ to 2 lb. of carbon bi-sulphide. Place the lid on as quickly as possible and puddle up the edges of the manhole cover to make it perfectly airtight. The tank should be kept sealed for twenty-four hours, or longer if desired, and then remove the lids from the manhole and discharge shoot and cover the discharge shoot with strong gauze to prevent the grain from running out. After forty-eight hours the covers can be put back. Grain for seed purposes should not be left for such a long period, and should immediately after fumigation be exposed to the air, otherwise the germination may be seriously affected.

Carbon bi-sulphide is highly inflammable, and care should be taken to see that no lighted pipe or other light is near the tank when the fumes are released.

DISEASES OF THE PIG.

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

PILES.

THE rectum is that part of the lower bowel acting as an outlet from the body—through the anus—for the solid portion of the waste intestinal products.

Protrusion of the rectum indicates that portion of the lower bowel has been forced out of position, and is noticed as a large fleshy-looking tumor beneath the tail. The trouble is sometimes referred to as prolapse of the rectum or anus, and a similar condition in the case of the genital organs of the sow is spoken of as inversion of the uterus, or prolapse of the lower portion of the sow's breeding passage. In non-technical language this trouble is frequently referred to as "Piles."

This disorder in pigs occurs with animals of all ages, but is more frequently noticed in pigs in the fattening stages—i.e., from four to six months of age. It sometimes happens in very young pigs, but is not usually so serious with them as with more mature stock.

Causes.

Ordinarily the trouble results from violent or continuous straining, such as is to be expected where the animal is severely constipated or is suffering from profuse diarrhœa, though pigs that are out of condition or are overfat are not entirely free from risk of the trouble. Breeding sows rearing litters, or those approaching the farrowing stage, are also subject to it, while a number of cases have been noted in sows not in pig that have reared their litters and had not again been mated. In these cases the exciting causes are traceable to affections of the bowels or breeding organs, while some authorities are of opinion that bladder troubles, gravel, gallstones, or retention of the urine due to inflammation are often responsible. It will be readily understood that diarrhœa is an exciting cause, so also is the constant straining after difficult farrowing, or in cases of retention of afterbirth. Doubtless some cases are due to irritation caused by intestinal parasites or the too free use of purgatives or foods of a gassy nature like buttermilk, whey, soup, offal, or decayed fruit.

Treatment.

Treatment will depend entirely on the condition itself and the class of animal affected. If the bowel protrudes more than an inch, as it often does, or if the trouble has not been noticed till the fleshy-looking tumour has become a dark bluish-red colour, is swollen, lacerated, or is bleeding as a result of exposure, the treatment is much more difficult than in simple cases in young pigs noticed soon after feeding. Similarly inversion of the uterus in a breeding sow is very difficult to treat. In most cases also the pig is a very bad patient, and is not only fractious and noisy but is difficult to restrain while treatment is in progress.

If treatment cannot be arranged immediately, or if the animal is ready for the butcher, it is better to slaughter and clean the carcass and utilise same as fresh pork, for this trouble is not one that would lead to condemnation if the carcase is otherwise normal. If treatment is to be proceeded with one of three methods must be employed.

Firstly, the protruding portion must be returned to its proper position; secondly, it must be kept there; or thirdly, it must be removed in part or whole.

In the first two cases the protruding portion should be thoroughly washed with warm water to which carbolic disinfectant has been added. If the animal is fractious and struggles to be free it may be useful to administer a drench containing morphia or opium and treacle or honey (which the chemist would prepare). The parts should then be well smeared with carbolised vaseline or other healing ointment. After thoroughly cleansing the protruded part must be forced back into position and be held there for a few minutes; should it be forced out again it must be replaced. In very bad cases a few stitches of catgut or silk thread may be effective. The animal must be kept very quiet and very clean and be without solid food for twenty-four hours or more, and then only be fed very lightly for a week or ten days. Prior to treatment an enema of warm soapy water to clean out the lower bowel and free it of accumulations of dung will be well worth while, this to be followed by a liberal dose of castor oil in warm milk repeated the following day if necessary.

An old stockman advises that syringing the anus with cold water will often prevent recurrence of the trouble once the protruding part has been replaced—this, of course, to prevent straining and forcing the bowel out.

There are cases, however, in which the protrusion is so persistent that more drastic treatment than the above is necessary. Where such is the case it is advisable to secure the services of a district Inspector of Stock or Veterinary Officer or the help of an experienced farmer accustomed to handling sick animals.

The protruding part may, after thorough cleansing, be treated by passing a ligature of strong silk thread or catgut around as close to the body as possible, and tying tightly by means of a double knot. This checks the flow of blood to the area, which will then gradually slough off, but during this treatment the bowels must be kept very loose by the use of purgatives, and the affected area must be kept as clean as possible in order to prevent infection and infestation by flies, &c. Sloughing off will probably take several days. Applications of stockholm tar may be effective in keeping the parts clean. The following ointments are very useful in treating open wounds:—

Antiseptic Oils.

Recipe No. 1, specially advised for farm and homestead use for application to open wounds, sores, is made up by dissolving 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When quite clear add to it 1 pint of olive oil. Shake well and bottle and label distinctly, Antiseptic Oil No. 1.

Recipe No. 2 is more suitable for aged pigs in which wounds are more pronounced and in which the healing process is more lengthy. It combines the active ingredients of the above with a more tenacious and adherent basis. Olive oil is replaced by Stockholm tar. The formula in this case will be:—Dissolve 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When dissolved and quite clear add 1 pint of Stockholm tar. Shake well. Bottle and label distinctly, Antiseptic Oil No. 2.

These antiseptic oils are much preferable from a humane standpoint, and as they stimulate natural healing processes and repel flies are to be recommended in preference to kerosene and fat or other bush remedies.

Thorough cleanliness and care in the feeding of the animal play an important part in treatment.

BACON MANUFACTURE IN THE NORTH.

The North Queensland Co-operative Bacon Association, at Floreat Siding, Mareeba, continues to make satisfactory progress under the general supervision of the Northern Pig Board. During a period of very short supply 792 pigs were handled during the midwinter period, July, of which 644 were taken over by the Bacon Association, and the balance sold live to butchers for use as pork. Sales of the factory's products continue satisfactory, and in common with other factories in Queensland pig prices have been increased to the rate current at the 1st September—5d. per lb. dressed weight, 90 to 120 lb. prime baconers, with a tendency to still further increases as the season advances. The supply of pigs in the far North is not nearly sufficient to maintain trade connections.

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

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

On Tuesdays and Thursdays of each week, as from 4th October, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures arranged:—

SCHEDULE OF LECTURES.

By Officers of the Department of Agriculture and Stock.

Radio Station 4QG, Brisbane (Australian Broadcasting Company).

Tuesday, 4th October, 1932—"Potato Pests." J. A. Weddell, Assistant Entomologist.

Thursday, 6th October, 1932—"Shade and Ornamental Trees." C. T. White, Government Botanist.

Tuesday, 11th October, 1932—"Tobacco Pests." R. Veitch, B.Sc., Chief Entomologist.

Thursday, 13th October, 1932—"Cotton Thinning and Spacing." R. W. Peters, Cotton Experimentalist.

Tuesday, 18th October, 1932—"Constituents of Stock Foods and Their Functions." E. H. Gurney, Senior Analyst.

Thursday, 20th October, 1932—"Tobacco Diseases." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Tuesday, 25th October, 1932—"Valuation of Stock Foods." E. H. Gurney, Senior Analyst.

Thursday, 27th October, 1932—"Rust in Wheat." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 1st November, 1932—"Comments on Various Stock Foods." E. H. Gurney, Senior Analyst.

Thursday, 3rd November, 1932—"Diseases of the Passion Vine." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 8th November, 1932—"Feeding Standards for Stock." E. H. Gurney, Senior Analyst.

Thursday, 10th November, 1932—"Insects Attacking Young Cotton Crops." R. W. Peters, Cotton Experimentalist.

Tuesday, 15th November, 1932—"Bot Flies." F. H. S. Roberts, M.Sc., Entomologist.

Thursday, 17th November, 1932—"Cleanliness and Comfort for the Pig." L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 22nd November, 1932—"Back to the Land." J. F. F. Reid, Editor, "Queensland Agricultural Journal."

Thursday, 24th November, 1932—"The Cultivation and Green Manuring of Orchards." W. J. Ross, Senior Instructor in Fruit Culture.

Tuesday, 29th November, 1932—"Corn Ear Worm in Cotton." R. W. Peters, Cotton Experimentalist.

Thursday, 1st December, 1932—"Fruit Packing." (First Lecture.) J. Gregory, Instructor in Fruit Packing.

Tuesday, 6th December, 1932—"Topping, Suckering, and Harvesting Tobacco." R. A. Tarrant, Instructor in Agriculture.

Thursday, 8th December, 1932—"Fruit Packing." (Second Lecture.) J. Gregory, Instructor in Fruit Packing.

Tuesday, 13th December, 1932—"Housing and Maintenance of the Angora." J. W. Munro.

Thursday, 15th December, 1932—"Hot Weather Complaints in Pigs." E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 20th December, 1932—"Bird Life." W. D. Wilson, Ranger, Animals and Birds Acts.

Thursday, 22nd December, 1932—"The Future of Agriculture." J. F. F. Reid, Editor, "Queensland Agricultural Journal."

TANNING MARSUPIAL AND OTHER SKINS.

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

WE have received numerous letters asking for instructions in curing and tanning marsupial and other skins. The following recipes should prove satisfactory:—

The general principle is to trim off the useless parts of the skins and remove all fat from the inside. Soak the skins in warm water for about an hour; then apply a coating of borax, saltpetre, and Glauber's salts, 1 oz. of each, dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This latter mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. of alum, 3 oz. salt, and 2 oz. of saleratus; dissolve these in hot water, and when cool soak the skin in it for twelve hours. Wring out, and hang up to dry. If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

Another method is, first to remove the flesh and fat. Then wash the skin in a solution of sal. soda and water. Take 4 oz. of powdered alum, 8 oz. of salt, 1 quart of new milk to 4 gallons of salt water, and 1 pint of prepared starch. Stir well, and then put in your fur skins. Air them often by hanging them over a stick laid across your tan tub. Handle them occasionally until they have been in the liquor for a day or two. Then remove the skins and add to your liquor a half teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour. Then take them out and wring and rinse off in soft lukewarm water, and hang them up in a cool place. When they begin to get white, work and stretch them till they are dry.

Hides of larger animals, such as kangaroos, calves, &c., should remain longer in the solution.

To cure a tough skin, trim it on the flesh side with a sharp knife and then well brush with a solution of 2½ lb. of alum and 1 lb. common salt in 1 gallon of warm water. The skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board to dry.

Note that each kind of skin requires some special treatment—that is, all skins cannot be tanned in the same manner, but the general principle is the same as above.

Still another method is by what is known as "the lightning tanning process," which is said to be the quickest method of tanning wallaby, rabbit, and other skins, and is very simple. It is as follows:—Pour 5 or 6 quarts of boiling water over 2 quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to blood-warm water as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add 1 oz. of sulphuric acid (H_2SO^4). Immerse the skins in the liquor, stirring them occasionally until tanned, which will be in about twenty minutes. When tanned, rinse in clean water and hang out in a shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft and white.

Preparing Wattle Bark for Tanning Small Skins.

Chop a quantity of wattle bark finely and soak in a barrel to extract the tannin. The quantity of bark to the gallon of water is difficult to state, as the bark varies in quality. Make the liquor fairly strong, like very strong tea, and when ready pour into a clean wooden cask, and throw in the skins and let them be for a week or two. Then take them out, spread on a slab, and scrape any remaining flesh off and trim them up. Put the skins back into the cask for another week, after which wash them in clean water and peg them, flesh side out, in a shady place to dry. If they are stiff rub them well, apply a mixture of mutton fat and neatsfoot oil, and pull them backward and forward over a smooth pole to soften and stretch them. Heavy hides and skins take much longer to tan, and ordinarily can be prepared by other methods.

How to Prepare Skins for Rugs, Vests, and Mats.

A simple and inexpensive method of preparing for use skins of sheep, goats, and other animals with wool or hair on is this:—

Take one spoonful of alum and two of saltpetre, pulverise and mix well together, then sprinkle the powder on the flesh side of the skin and fold over so that two

* Revised from previous notes and brought up to date by the inclusion of additional recipes and extracts from various publications.

powdered sides will come together leaving the wool outside. Then fold the skin up as tight as you can and put it in a dry place. In two or three days, or as soon as it is dry, take it down and open and scrape the flesh side with a blunt knife until it is clean and supple. This completes the process, and makes an excellent saddle cover. If it is desired to use the skin for a rug, it should be well washed in soapsuds, rinsed in running water, and allowed to get partly dry, then rubbed together until it is soft and dry.

Another Method of Tanning with Alum.

The "New Zealand Journal of Agriculture" recommends the following method of tanning skins and fleeces with the cover on, for use as rugs, clothing, &c.:—

Mix bran and soft water sufficient to cover the skins. Immerse them and keep them covered for twenty-four hours; then remove, wash, clean, and carefully scrape off all flesh. Then take 1 gallon of hot water and dissolve in this 1 lb. of alum and ¼ lb. of salt. When cool enough to put the hand in immerse the skins again and leave for twenty-four hours in oatmeal and warm water. Partially dry in the shade, and finally rub until entirely dry. This leaves the skin like white leather and fit for use.

Process of making Basil, also Chamois Leather (so called).

The skins, having passed through the process of washing, are soaked in lime water, then in a mixture of bran and water or in a weak solution of sulphuric acid, after which they are beaten in a mill or are passed or dried out until no moisture remains. Fish oil is then poured over the skins, which are again well massaged until they are impregnated with it. This is done repeatedly until the skins can receive no more oil, and then they are hung for a short time in a heated room. They are then washed in a solution of potash (which the chemist will make up), which removes any oil that may still remain about the leather. In making chamois leather the wool and outer skin is removed, leaving the basil or pelt (free of wool) as the material to be treated. The process is much the same as for basils.

Tanning a Sheepskin with Wool on.

A fresh skin is the easiest to handle. Put the skin into a barrel of fresh spring water if it is newly taken off, say, within twenty-four hours. Soak for twenty-four hours; then lay over the side of a barrel and with the flesh side out. An old scythe which will fit oval around the skin on the barrel is excellent for a scraper. Stand at the end of the barrel on which one end of the skin hangs over, raise the end of the barrel so as to come up to the lower part of the abdomen, press the body firmly against the skin so as to hold it firmly, and scrape with the scythe blade till all the tallow, flesh, and blood are scraped off, then turn the other end of the skin in the same position and work likewise. If the skin has become dry in places, as often happens, scrape a little oftener, perhaps seven or eight times or strokes. If the skin is perfectly fresh it should be scraped all over the second and third day after it has been put in the water, allowing about fifteen to thirty minutes each day. If it has become dry a little more scraping would be better, and a day or so more soaking. If the skin is dirty on the wool side, tramp it in the barrel or pound with a plank before taking out for the second day's scraping, also scrape on the wool side, dashing water on it occasionally. Do not allow it to come into contact with the wool, as it has a tendency to colour it.

After the skin is ready for the tannage, lay the skin out flat, flesh side up, and apply the following:—Mix together pulverised alum ½ lb., common salt about 1 lb., saltpetre ½ lb., and about twice the quantity in bulk of bran as you have of the above chemicals. Mix them together and sprinkle a nice even layer over the skin, folding the edges over to the backbone, then roll from the head till you roll it tight. Put into a cool place for a week, keep damp. After a week open up and put on the other half of the bran and chemicals after scraping off the first applied; leave about another week. It would be advisable to dampen by sprinkling a little water—say, a pint—before the second application. After the second week hang over a scantling, hold the skin on one side of the scantling with the flesh side out, then start at the scantling and scrape down towards the ground with a mincemeat chopping knife till the skin is softened on the whole flesh surface, then do the same with the other end of the skin. Do this a day or two later as the skin dries. Then take a horse mane comb and comb out the wool, and it will make a fine rug or mat.

THE VALUE OF GREEN MANURING.

By H. W. KERR.

IT is pleasing to note that the practice of green manuring has become firmly established with the more progressive of our Queensland canegrowers; but there are still altogether too many of our farmers who fail to appreciate the true worth of this excellent practice. When it is remembered that every grower is obliged to fallow one-quarter of his cane land each year, it should not be necessary to emphasise the importance of a simple, convenient, and inexpensive method by which the productivity of the soil might be improved at this time in readiness for the succeeding cane planting season. Green manuring fulfils all these demands, and though the benefits which follow the growing and ploughing under of a crop of legumes have been repeatedly emphasised, their importance is such as to warrant further repetition.

Green Manuring v. Bare Fallowing.

When the last ratoon crop has been harvested, the grower has the choice of either allowing the land to rest under bare fallow, or planting up the area with a cover crop. A comparison of the relative merits of the two methods is interesting. Firstly, the exposure of the bare land surface to the torrential rain of our wet season has a decidedly harmful influence on the physical condition of the soil. Each raindrop acts as a tiny hammer helping to drive together the individual soil particles, causing the soil mass to become consolidated and destroying its favourable crumb structure. The presence of a cover crop at this time acts as a most effective buffer, and guards the soil against these evil influences. This effect is indeed one of the major virtues of the cover crop, and is reflected in the ease with which the land may be subsequently reduced to a state of good tilth when the legume has been ploughed under.

Secondly, the presence of a growing crop results in the absorption from the soil of appreciable quantities of available plant foods, much of which might be lost by leaching under bare fallow conditions. These are returned to the soil when the crop is ploughed under, to become available to the succeeding cane crop after the legume has rotted.

Thirdly—and this is most important from the point of view of the maintenance of an adequate supply of plant food in the soil at low cost—the leguminous crop is instrumental in adding to the land a net gain of as much as 200 lb. per acre of nitrogen, in a form which readily becomes available to our economic crop. This is brought about by the very interesting association which exists between all legumes and a peculiar set of soil microbes which invade their roots, where they establish colonies and continue to live and multiply under a condition of perfect harmony with their host. The presence of these microbes is manifested by the formation of those peculiar nodules so frequently observed on the roots of beans and peas. The myriads of minute organisms obtain from the legume the sugars which serve as their food supply, and in exchange they manufacture and yield a supply of nitrogenous compounds which nourish the bean or pea crop. The nitrogen from which these important foods are built up is drawn not

from the soil, but from the atmosphere in the gaseous condition, in which form it is quite valueless to higher plants. The nitrogen compounds are utilised by the host plant in elaborating the proteins which constitute an important part of its tissues; and when the green manure crop is subsequently ploughed under, the rotting of the plant stems, leaves, and roots in the soil results ultimately in the production of an abundance of nitrates, so essential to the nutrition of our cane crop.

A fourth benefit to be derived from the green manurial treatment is one the importance of which is frequently overstressed; that is, the gain in soil humus which is associated with the practice. A little reflection and simple calculation will show that the gains to be expected from the treatment have been greatly exaggerated. It should be emphasised that this note of disillusionment is struck, not with the object of discouraging our farmers from following this excellent practice; but rather to stress the fact that if they would attain success in the direction of humus conservation, more rigorous steps must be taken. Of this aspect of the question more has been said elsewhere.

Finally, unless precautions are taken to control weed growth, the "bare" fallow frequently results in a heavy production of weed seeds which add to the difficulties of the subsequent cultivation.

This brief discussion of the major benefits to be derived from green manuring should make it quite clear that bare fallowing on the cultivated lands of our coastal belt of high rainfall is a practice which cannot be too strongly discouraged.

The Choice of a Suitable Legume.

A very important factor in the successful growth of a leguminous crop is the selection of a suitable species or variety for the particular set of soil and climatic conditions under review. Mauritius bean, cowpea, rice bean, and giant cowpea have all received attention in our cane areas. Mauritius bean is most highly favoured in our Northern areas, while cowpea has been the standard crop in the Southern districts. Of recent years a species known as Poona pea has been tried out on the Mackay and Bundaberg lands, and the present indications are that it will speedily replace the familiar cowpea (to which it is closely related) in these districts.

The essentials of a satisfactory legume are—(1) that it should germinate and grow even under the adverse conditions which are so frequently associated with early summer weather in Queensland; (2) that it should afford an effective cover in a minimum of time and thus smother the growth of weeds and grasses which are all too ready to establish themselves; (3) that it should be at least tolerant to the attack of the bean fly maggot which so seriously affects late-sown cowpea crops in our coastal areas; and (4) that it shall attain its peak of succulent growth at a time when it may be conveniently ploughed under. The difficulties which follow the maturing of legume seed are often considerable. Mauritius beans continue to germinate for months after ploughing under, and the vines are very troublesome amongst the growing cane crop. Cowpea is readily controlled, but reports indicate that Poona pea also presents some difficulties if allowed to mature.

Legume Experimental Plots.

At the request of the Mackay District Canegrowers' Executive, a legume trial was set out on the Mackay Experiment Station during the past season. Four species were included in the experiment—Mauritius bean, cowpea, giant cowpea, and Poona pea. Three small plots of each were established, in order to add to the accuracy of the results. Careful observations were made of the habit and behaviour of the different species throughout the growing period, in order to determine to what extent each fulfilled the stipulated requirements of a satisfactory cover crop under these particular conditions. When each had attained its maximum growth, the crop was harvested and weighed. Samples were also dried and analysed in order to determine plant food values.

Good germinations were obtained of all but giant cowpea; the available seed of the latter appeared to be of poor quality, and therefore this legume was not considered in the final results. The following table brings out the essential features of the results of the trial:—

Crop	Weight of Green Crop per Acre.	Plant Food in Crop (lb. per Acre).		
		Nitrogen.	Phosphoric Acid.	Potash.
	Tons.			
Cowpea	9·3	81	18	46
Mauritius bean	7·0	126	24	41
Poona pea	9·8	114	27	69

It will be observed that the Poona pea produced the heaviest weight of crop; indeed, in every important respect this species proved superior to its competitors. It was the only crop which effectively covered the land; the remaining plots exhibited the appearance of a mixed grass and legume crop, with the former frequently predominating. The cowpea was seriously affected by the bean fly, while the Poona pea flourished in spite of parasitic infestation. Further, it is generally conceded that the growth period of cowpea is rather shorter than is desirable, attaining maximum development as it does in about ten weeks. In this respect the Poona pea again presents the advantage that it requires about three weeks longer to pod. The Mauritius bean displayed a retarded growth rate throughout the trial, and the age of the crop at harvesting was more than four months.

The plant food figures presented in the above table are worthy of special attention. It is usually found that of the nitrogen contained in a leguminous crop, about one-third is derived from the soil while two-thirds are directly due to the activity of the root-nodule microbes. Further, practically one-third of the total nitrogen is contained in the roots, while the remaining two-thirds are present in the aboveground portion of the plant. As the harvest results presented herewith refer only to the vines and leaves, it may be concluded that the figures given in the "Nitrogen" column of the table represent the net gain to the soil with respect to this plant food. Expressed in terms of the amount of sulphate of ammonia which would be necessary to supply this quantity of nitrogen, we find an average figure of almost 5 cwt. of this fertilizer. The cost of this material on the land would be in the neighbourhood of

£3. It is also seen that appreciable weights of phosphoric acid and potash are returned to the soil at the same time. Of course it must be emphasised that these plant foods were drawn from the soil supply, and therefore do not represent a gain to the land; but the provision in this way of an adequate supply of plant food in a form available to our plant crop of cane explains the fact that is often observed—that the cane crop following the ploughing under of a leguminous crop frequently does not exhibit a pronounced response to further additions of artificial manures. This statement does not hold for soils which exhibit a decided deficiency with respect to phosphates or potash, in which event provision should be made for a supplementary application of the appropriate manure as a drill dressing.

Again, it should be clearly understood that the beneficial influences of the legume crop can scarcely be detected in the ratoon crops, and care should be taken to see that the necessary fertilizer, supplying all three plant-food materials, is applied in amounts adequate for their requirements.

On the evidence of the above trial, the decided value of the Poona pea as a green manure crop in the Mackay area is clearly indicated; and growers are advised to test out this species in comparison with the customary cowpea. It should be emphasised that the results recorded herewith apply only to the particular environment under which the test was conducted, and it is not intended to suggest that Poona pea would prove superior to Mauritius bean in the humid areas of North Queensland. On the contrary, the short growing period of the former would be a serious objection where a cover crop is required for a longer period.

In conclusion, it should be remembered that legumes appreciate congenial soil conditions quite as well as any other crop, and any added effort which is expended in providing a favourable seed-bed will be reflected in the crop result. Further, the degree of thoroughness with which the land preparation is effected prior to green manuring, will have its reward in the ease with which the land may be reduced to a condition of good tilth in readiness for cane planting.

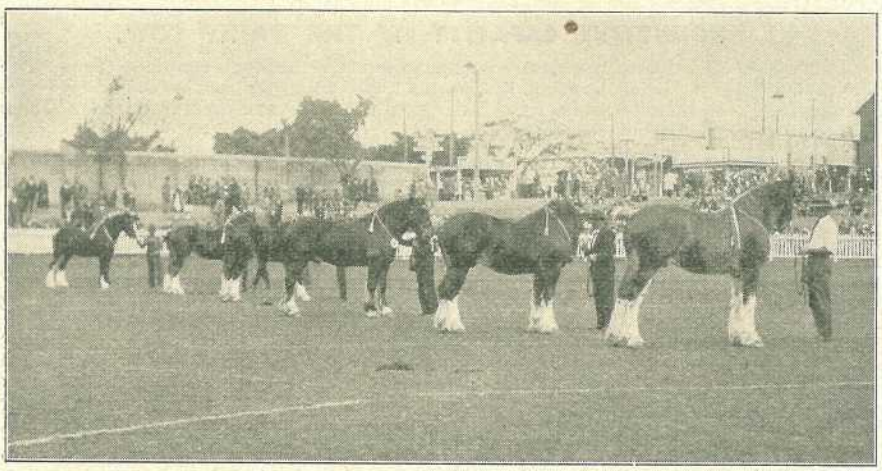

Plate 150.—Farm Horse Sires at the Brisbane Show.

PRODUCTION RECORDING.

List of cows 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 and The Jersey Cattle Society, production charts for which were compiled during the month of August, 1932 (273 days period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Blossom of Penrhos (365 days)	Mature ..	18,933·25	824·182	A. Sandilands, Wildash
Perfect 2nd of Rosenthal ..	Mature ..	10,589	475·209	S. Mitchell, Warwick
Freda 2nd of Morden ..	Mature ..	11,594·4	455·824	R. Mears, Toogoolawah
Rosebud 9th of Rosenthal ..	Mature ..	10,236	450·959	S. Mitchell, Warwick
Fussy's Choice 2nd of Coral Brae	Mature ..	11,290·75	445·377	Hemming Bros., Murray's Bridge
Beryl of French View (264 days)	Junior (4 years)	9,275·77	411·322	W. J. Barnes, Cedar Grove
Buttercup 2nd of Kingsdale ..	Junior (3 years)	7,452·8	300·959	T. Shuttlewood, Peachester
College Molly	Junior (3 years)	7,002·55	298·480	Queensland Agricultural High School and College, Gatton
Wunulla Charm 7th	Junior (3 years)	7,712·25	293·209	W. J. Barnes, Cedar Grove
Handsome 12th of Rosenthal	Senior (2 years)	6,617·75	278·487	S. Mitchell, Warwick
Greylands Sadie 2nd	Senior (2 years)	6,948	259·569	Hemmings Bros., Murray's Bridge
Beauty of Murray's Bridge ..	Junior (2 years)	7,770·5	315·852	Hemmings Bros., Murray's Bridge
Mona of Trevor Hill	Junior (2 years)	7,649·03	280·657	J. Hennessy, Ramsay
Handsome 13th of Rosenthal	Junior (2 years)	6,055·75	245·562	S. Mitchell, Warwick
Jewel of Trevor Hill	Junior (2 years)	6,701·78	245·242	J. Hennessy, Ramsay
Favourite of Loomhurst ..	Junior (2 years)	7,242·3	243·078	T. Shuttlewood, Peachester
JERSEYS.				
Primrose of Southport ..	Mature ..	6,376·9	377·716	R. J. Crawford, Inverlaw
Noble Ivy of Brooklands ..	Mature ..	7,217·25	394·795	Fowler and Sons, Coalstoun Lakes
College Rose	Senior (3 years)	5,403·8	299·707	Queensland Agricultural High School and College, Gatton
Ellerdale Vanillas Melba ..	Senior (3 years)	5,544	313·798	H. M. Thomason, Mt. Mee
Ellerdale Sue	Senior (3 years)	6,183·25	315·979	H. M. Thomason, Mt. Mee
Carnation Iris	Junior (3 years)	5,759·75	308·641	Spresser and Sons, Brassall
Yuruga Primrose (267 days) ..	Senior (2 years)	5,759	297·624	R. J. Crawford, Inverlaw
Rosevale Elderia	Senior (2 years)	5,393	297·871	H. F. Rowe, Kenilworth
Yimmin Society Lady ..	Senior (2 years)	5,289·55	275·668	R. A. Anderson, Yandina
Hamstead Beryl 3rd	Junior (2 years)	7,255·07	364·787	J. H. Roberts, Harristown

PRODUCTIVE CAPACITY OF THE DAIRY COW.

Only an actual test can determine the productive ability of a dairy cow. The truth of this is being continually proved, the disparity between the owner's estimate of his animal's productivity and the fact as revealed by the Babcock tester being in some cases very considerable indeed.

A personal instance, on the occasion of taking over a herd from its previous owner, was quoted by Mr. J. O'Meara, in the course of a paper read at the recent Cobargo conference of the Agricultural Bureau of New South Wales:—

> "The man in charge pointed out those he considered the best cows in the herd, and also pointed out several cows which he considered should be culled out for various reasons. At that time the herd had not been tested. Later on this herd (of sixty cows) was put under Government test, and it was remarkable that neither the owner of the herd, nor the man who worked there previously, nor myself could have placed the first few cows in their proper order as producers. In fact, the cow we placed No. 1 should have been No. 44, and our No. 2 was nineteenth on the list; of the two cows which were pointed out by the previous tenant as the top of the herd, one was seventeenth from the top, and the other one, which was recommended as a show milker, was in fifty-seventh place."

Such instances, pointed out the speaker, showed how useless it was to speak of a cow's ability except as proven by her test.

Answers to Correspondents.

Fencing Act Regulations.

Correspondent (Mount Walker, via Rosewood)—

Your letter was unsigned, otherwise you would have received a reply by post. No pamphlet dealing with the regulations of the Fencing Act has been published. Kindly state your difficulty fully, and an effort will be made to obtain the information you desire. It would be better, perhaps, if you consulted a local solicitor, who would probably be familiar with local circumstances and could offer you the best advice.

Tanning Marsupial Skins.

R.A.R. (The Summit)—

See notes on tanning marsupial and other skins on another page in this issue.

To several correspondents—Officers of the Dairy Branch advise as follows:—

Proved Dairy Sire.

The proof is in the production recorded by the daughters of a dairy sire. A record of an increase in the butter-fat production by daughters over their dams is the all-important factor in determining the value of a dairy bull. The pedigree of the dairy sire should be carefully examined and the production records of the females analysed before you interest yourself in the many aristocratic names that are included in some pedigrees, and which may be of little assistance to a breeder in the selection of a dairy sire to head his herd.

Use of a Young Bull.

Do not use the young bull until he is eighteen months old, when he can be bred to eight or ten females during the ensuing period of six months. When he reaches the age of two years, the number of females can be increased to fifteen.

Feeding Value of Corn Cobs and Cotton Hulls.

"Inquirer" (Brisbane)—

Cotton seed hulls have little feeding value and are not easily digested, but add bulk to a ration.

Ground corn cobs consist mostly of crude fibre, which is not easily digested. The nutritive value is relatively small. The ground maize and cob can be used in compiling a balanced ration. The cob fibre increases the bulk of the ration.

Selected from outward correspondence of Mr. C. T. White, F.L.S., Government Botanist.

Monkey Nut.

E.C. (Upper Mudgeeraba)—

The specimen is *Hicksbeachia pinnatifolia*, a nut tree closely allied to the Queensland Nut and moderately common in south-eastern Queensland and north-eastern New South Wales. The only local name we have heard applied to it in southern Queensland is Monkey Nut, but this is not very suitable. The name Red Nut or Rose Nut has been suggested for it.

It is an ornamental tree, but though the nuts are eaten they contain slight traces of a prussic acid yielding glucoside and, in consequence, might easily cause death though no cases have come under our notice. Nevertheless the danger is there.

We do not think the timber has any commercial value as we have never seen a large tree. So far as observed the trees are of somewhat palm-like growth about 20 feet high with a stem a few inches in diameter. We do not know if it would propagate from cuttings. However, it is worth while trying, though it is easily propagated from seed. Though ornamental it is scarcely big enough and leafy enough to be termed a shade tree.

Hexham Scent.

F.P.B. (Brisbane)—

The specimen is the Melilot or Hexham Scent (*Melilotus parviflora*). This plant resembles lucerne in some ways, and some years ago was boomed as a fodder under the name of King Island Melilot. It has some value for poor, sandy country where other leguminous fodders such as lucerne and clovers will not thrive. On richer ground it grows very strong, but stock seem to reject it. It is unsuited for dairy cattle as it gives a bad taint to milk and cream.

Tree Tobacco.

T.P. (Pickanjinnie)—

The specimen is the Tree Tobacco (*Nicotiana glauca*), a native of South America, now a naturalised weed in parts of Australia. It has been accused of being poisonous to stock at odd times though no deaths from it have come under notice in Queensland. In South Africa, however, it is fairly definitely stated that the green leaves are poisonous to ostriches. The plant has no commercial value as a tobacco.

Scrub Poison Tree.

A.A. (Upper Ulam, C.Q.).—

Your specimen is from the Scrub Poison Tree (*Excæcaria Dallachyana*). The milky sap of this tree causes extreme irritation if it reaches the eye. The green and milky parts of the tree are reputed to be poisonous to cattle. However, I think it is rather doubtful if the quantity of sap adhering to an axe head would be sufficient to cause the death of several animals. In dry times when green feed is very scarce stock may be tempted to eat the green parts of this plant, and poisoning may result.

A Common Vine.

M.D.O'D. (Gympie)—

The specimen is *Kennedya rubicunda*, a very common vine in coastal Queensland and not known to possess any harmful properties. It is sometimes called Sturt's Pea, but this name really belongs to a different plant, a native of the drier parts of Australia.

Swamp Grass *(Poa Aquatica).*

W.F.N.S. (Townsville)—

The specimen is not *Poa aquatica*, but is *Hymenachne amplexicaulis*, a native grass found in damp situations. We were very pleased to receive the specimen, as we have only had it twice before—once from the Barron River and once from the neighbourhood of Mackay. In addition to North Queensland, the grass is widely spread over the East Indies as far north as the Philippine Islands. For wet situations it should be valuable, though we have little information in regard to its fodder value. We do not think there is any chance of *Poa aquatica* doing well in any part of North Queensland, as conditions there are altogether too tropical. On the whole, we do not think that water plants of temperate regions can stand the continual warm temperature experienced in the waters of the tropics.

Leopard Tree. Western Rosewood. *(Botanical Study.)*

M.H. (Theodore)—

The specimens have been determined as follows:—

1. Leopard Tree, *Flindersia Strzleckiana*. The leaves of this tree make quite good fodder for stock, and are largely used in parts of Central Queensland in times of drought.
2. *Heterodendron oleæfolium*, commonly called Western Rosewood. This tree is also good fodder for stock, but contains a prussic-acid-yielding glucoside, and if eaten in quantity by stock, particularly on an empty stomach, may cause death. It is widely spread over the Australian States, and some trouble has been experienced with it in New South Wales. However, we have had no experience of its causing losses among stock in Queensland, though when tested the leaves often give a positive reaction for the poisonous glucoside.

We would be very pleased to name and report on any specimens you care to send from time to time. Each specimen should be numbered and a duplicate kept, so that names can be returned corresponding to numbers.

Specimens of insects should be forwarded to the Government Entomologist, Department of Agriculture and Stock, Brisbane, and he will give you full particulars.

There is no book dealing with Australian plants comparable with Leach's Australian bird book. There are several ordinary text-books of botany explaining terms, &c., such as Brewster and Le Plastrier's "Botany for Australian Secondary Schools," Dendy and Lucas's "Text Book of Botany," and our own "Elementary Text Book of Australian Forest Botany" (C. T. White). The "Queensland Flora," by the late F. M. Bailey, price 30s. per set of six volumes, contains descriptions of most Queensland plants, and, though somewhat technical, if you ever intended to take up seriously the study of Queensland plants, it would be as well for you to have the series.

A North Queensland Vine.

E.C.D. (Townsville)—

The specimen forwarded is *Faradaya splendida*, a native of North Queensland, and one of the most beautiful of our native climbers. The genus *Faradaya* commemorates M. Faraday, the well-known chemist, and consists of three or four species—one in Queensland, the others in Papua and the islands of the Pacific. This vine was used, and perhaps in some places still is, for poisoning fish by the aborigines. Dilute infusions of the plant used experimentally were found to be particularly potent. The active principle is a saponin.

Cress, Stagger Weed, Shepherd's Purse.

I.H. (Blackbutt)—

The specimens have been determined as follows:—

1. *Capsella Bursa-pastoris.* Shepherd's Purse.
2. *Senebiera didyma.* Bitter Cress or Water Cress. Both the above are common European weeds now naturalised in most warm temperate countries. Both plants, particularly No. 2, taint milk rather badly, otherwise they are quite useful fodders.
3. *Stachys arvensis.* Stagger Weed or Wild Mint. This plant has been definitely proved harmful to working horses or travelling stock, causing severe staggers or shivers. Ordinary paddock stock, however, seem unaffected by the plant, and the animals have to be excited for the symptoms to be produced. It is generally regarded as quite a useful fodder for dairy cattle.

Disposal of Brumbies.

H.S.—

Section 7 of "*The Diseases in Stock Amendment Act of* 1930" provides for the destruction, sale, or disposal of worthless, abandoned, or decrepit horses, commonly known as "brumbies." This section also provides for certain preliminary action, including advertising, before a muster can be made.

Salting and Pickling Meat.

H.A.P. (Flaxton)—

1. The carcase should be allowed to hang overnight, so that the meat shall be well set and all the animal heat gone out of it.
2. *Dry Salting.*—Thoroughly rub a quantity of dry salt into the meat; the following morning turn and rerub a further quantity, and repeat for a couple of days. This will tend to force out and effectually get rid of the blood, &c.
3. *Formula for Pickle.*—To every 10 gallons of water add 15 lb. of salt, 2 oz. of saltpetre, and if a sweet pickle is desired add one 2 lb. tin of treacle (this is for every 100 lb. of meat). Boil all the ingredients together, remove any scum or impurities which may arise, and when cold pour it over the meat, every part of which must be covered.

In every case the strength of pickle should be closely watched and maintained; 80 to 90 degrees on the salinometer (brine tester) is the most effective strength.

N.B.—Remember that pickle becomes reduced in strength during curing process on account of the meat taking up some of the salt, &c.; therefore, if the pickle is to be used again for curing purposes, it must be reboiled (every third day), not forgetting to remove all scum, &c., and finally brought up to its former strength by adding the necessary ingredients—that is, salt. Pickle for pumping purposes should always be kept separate.

Feterita as Fodder.

W.S. (Oakey)—

Feterita is grown for grain purposes, and is not of much value as fodder. Like all members of the sorghum family, it cannot be fed with safety when at an immature stage. When frosted it would be of very little value as stock food. It cannot be compared with Sudan grass or any of the panicum as a fodder.

You would be well advised if you want to grow sorghum to try saccaline or Sudan grass, the latter being very suitable for your district. Cultivation required is only the same as that for crops such as maize. Land should be well worked up to a depth of 8 or 9 inches.

Sorghum should be sown in drills 3 feet 6 inches apart. It is easier to harvest, and will not lodge so readily when sown in this way. The quantity of seed required is from 4 to 5 lb. an acre.

Sudan grass can be sown in drills about 2 feet 6 inches apart, or broadcast; 3 to 4 lb. an acre in drills and about 12 lb. broadcast.

Nut grass cannot be eradicated if the area is badly infested. If only small patches are prevalent these can be destroyed by digging a hole 2 to 3 feet deep and greater in circumference than that of the nut grass patch and filling the hole with wood burn. The heat thrown off will destroy any nuts which have not been removed during digging.

Usually when lucerne is fit to cut the crop is roughly two-thirds in flower. A fresh growth will also be noticed at the base of the plant. When this occurs the lucerne should be cut.

General Notes.

Staff Changes and Appointments.

The resignation of Mr. William Maggs, Inspector under the Diseases in Plants Acts, Stanthorpe, has been accepted, as tendered.

The Shire Clerk at Waterford, Mr. William Laughlin, has been appointed as Honorary Inspector of Stock.

Acting Sergeant D. MacDonald, of Mitchell, has been appointed also an Inspector under the Slaughtering Act.

Mr. E. R. Behne, Acting Assistant Technologist, has been appointed Assistant Technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

A New Brooder Stove—Ten Hours Heat for Twopence.

A new departure in equipment that would appear to offer advantages to poultry farmers is the "Etna" sawdust stove. It was originally intended for house-warming purposes, but practical poultrymen quickly saw that it could be suitably adapted for use as a colony brooder stove. A trial was carried out in New South Wales by "Scout" of "Poultry," who makes the following statement in that journal:—

"The stove was placed on a concrete floor in a very large cellar, much colder than the rooms in which we usually breed. The circular edge of the hover was 6 inches from the floor all round, and the hover is 4 feet wide. The stove burns sawdust. An iron bucket container is used, which, when filled with sawdust, is placed within the stove. A wooden centre core or pin is fitted in position in the centre of the bucket, fitting into a hole at the bottom. Sawdust is then put into the bucket and pressed around the core with the hands. When full the centre core is lifted out, and now you have a bucket of sawdust with a hole down the centre, as if moulded.

"Under the stove is a small kindling box or draw chamber; pull this out and put in it a piece of rag with a little kerosene or methylated spirit on it; light it and push back the box and the stove lights, and you do not touch it again for from eight to twelve hours, according to the draught you permit to pass through the ventilator, which can be regulated. The burned sawdust leaves nothing but a small quantity of fine ash. The only smoke visible is for a short time in the early stages while the stove is lighting up. The flue carries this away.

"In the test case under review the stove was lighted up at a quarter to 10 o'clock, and at 10 a.m. the temperature was 65 degrees, at 10.20 a.m. 90, at 12.45 p.m. 100, at 2.45 p.m. 106, at 3.15 p.m. 100, at 4.45 p.m. 98, at 7.30 p.m. 95, at 11 p.m. 94. So that the stove burned for thirteen hours with ample heat, this temperature was taken about 6 inches from the inside of the hover edge."

The manufacturers, E. Sachs and Co., Pty., Ltd., advise that in many places sawdust can be obtained for nothing, at other places for 6d. per bag, so, apart from the small initial cost of purchasing the stove, the up-keep is very small.

There is very little change in temperature over the whole period that the stove is alight. It is very much cheaper to run, and sawdust is a very much cheaper form of fuel than kerosene or any other similar fuel.

After brooding is finished the stove can be used in the kitchen, or for that matter anywhere in the house, and the top plate can be used to fry, boil, or cook anything that can normally be cooked on the top of an ordinary stove. The top of the stove can be used for boiling the water used to make the mash, and it can also be used to warm up the room where incubation is taking place, thus reducing the amount of fuel necessary to keep the incubator at the correct temperature.

Sawdust is the best fuel and lasts longest, but rice or wheat hulls, fine wood shavings, or other dry material can be used.

The stove has a cast-iron top and bottom, with heavy wrought iron sides. The inside container is of 22-gauge sheet steel, and the stove is constructed to last for many years. The flue can be carried through an opening in the roof or a wall. The heat in the stove can be varied by means of the control lever on the side at the bottom.

For continual use, such as for colony brooding, two inside containers are necessary, the one taken out being too hot to handle.

The "Etna" sawdust stove and cover can also be obtained from any poultry accessory suppliers, including the Poultry Farmers' Co-operate Society, Limited, from any of whom further particulars may be obtained.

Broom Millett Board.

The only nominations received at the Department of Agriculture and Stock in connection with the annual election of two members on the Broom Millet Board were from the present members, Messrs. Hans Niemeyer, Hatton Vale, Laidley, and Erich Max Schneider, Binjour Plateau. The necessary steps will be taken to reappoint these persons for a further term of one year as from the 1st November.

Pineapple Levy Regulations.

Executive approval has been given to an amendment of the Pineapple Levy Regulations issued under the Fruit Marketing Organisation Acts on the 18th August last. These regulations empower the Committee of Direction of Fruit Marketing to make a levy on all pineapples marketed for the year ending 19th August, 1933, the proceeds of such levy to be expended in the interests of the pineapple section of the fruitgrowing industry of Queensland.

No provision, however, was made in these regulations for a levy on pineapples when sold loose, and the amendments approved to-day provide that in instances where pineapples are sold loose the levy shall be at the rate of ½d. (with a minimum of 1d.) for twenty-four Smooth Leaf pineapples or forty-two Rough or Ripley pineapples as being equivalent to a case of fresh pineapples.

Deeds Better than Words.

Rear-Admiral Evans's faith in men:—"Throughout the Empire we have great lawyers and University chancellors who steer the community clear of the shoals of misunderstanding on which it is so easy for any of us to get wrecked.

"Merchant princes I admire only for their ability and drive. Very few of them come within my ideal series. I think we should pay more attention to bishops and heads of the churches than we do.

"We are told that teachers are better than admirals. If a review of our lives were to come up before the great lawyers, bishops, and University chancellors that come within my ideal series, the examples of the admiral's life would be better, perhaps, than the precept of the teacher's. I think deeds are better than words."

Referring to the trip in the thirty-two-year-old sailing vessel that took 128 days to voyage from England to New Zealand, when they were on their way to the relief of Scott, Rear-Admiral Evans said it was on shipboard, amid the fury of the elements, that men got down to realities.

"The worst blackguards away from the pubs and backwaters of the ports show qualities that are admirable, and kindle some kind of affection in their fellow-creatures," he said. "A gale does more than anything to tighten the bonds of sympathy and understanding in a little ship's company, and danger, hard times, and privations often bring out the best in men.

"Our discipline in the navy is a wonderful thing born of self-help and mutual support. And there is no reason why this discipline of the sea should not extend to the cities, because it is a fine thing built up by thousands of men over several thousand years."

During the time he had been in Australia, Admiral Evans said that his education had been going on as far as the Australian Navy was concerned, he added, and he felt sure that if one of the Australian cruisers was taken to the Mediterranean it would be placed in the front line for cleanliness, sea-going, and fighting efficiency, good looks, and, above all, good manners, upon which good character was founded. They had seen Australian sailors in the streets, and he did not think they could recall ever having seein one of them guilty of misbehaviour. He had come to Australia to serve the Royal Australian Navy, and he had also taken every opportunity to see as much of Australia as possible.

Rural Topics.

No More Heavy, Fat Pigs.

Discussing the altered conditions on world's markets recently, the Senior Instructor in Pig Raising in the Queensland Department of Agriculture and Stock says that there is, nowadays, no profitable market in any part of the world for the heavy, overfat pigs so popular in former years. There is practically no profitable market for very heavy pigs, though in colder countries and in the far north of England there is still a good outlet for such, but the demand there is readily satisfied from local sources, and it does not provide a sufficient opening for Australia's heavy baconers.

The trade in beef dripping, suet, mutton fat, and in margarine has been developing at the expense of the lard trade, while the world-wide demand for smaller and more attractive joints of meat and cuts of bacon has, for all time, killed the market for heavy, fat joints and fat meat. The great variety of canned goods now so much advertised has also filled a long-felt want for convenient, appetising, and nutritious lunch and sandwich meats, and has done away with the one-time popular "junk of bread and fat pork" meal. The world's appetite has changed—and apparently changed for keeps; hence the farmer must change his methods and bring himself more up to date.

Climatic conditions in this country certainly favour this changed demand and favour the small, meaty joint and attractively-prepared luncheon menus.

Grazing Sudan Grass—Warning to Dairy Farmers.

Owing to a number of mortalities occurring during the 1931-32 season in cattle from grazing on Sudan grass, the New South Wales Department of Agriculture advises farmers to grow Japanese millet instead of Sudan grass for dairy stock.

Considerable investigation has recently been carried out in New South Wales in regard to mortalities in cattle grazing on Sudan grass. As a result it appears that danger of prussic acid poisoning may exist under certain conditions when cattle are grazed on this crop. This danger appears to be greater in the younger stages of growth of a normal crop, and cattle are possibly more likely to suffer when first placed on the crop than when they are accustomed to it. Greatest danger of grazing the young growth of Sudan grass occurs with young shoots formed during a drought period, or on young growth resulting from rain following a dry spell. The conditions which govern the amount of prussic acid formed are not clearly understood, but it is evident that great variation exists in different crops.

So far no mortalities have been reported amongst sheep grazing on Sudan grass.

Pig Raising in the North.

Though situate on the faraway Atherton Tableland in North Queensland, Mr. C. W. Roseblade, of Yungaburra, keeps in touch with Southern interests, and is an active member of the A.I.S. Cattle Society. His interests also include pig raising, and for many years he has been keenly interested in the better stock movement. He introduced the G.O.S. breed of pig to the Tableland, but found that the popular Tamworth Berkshire and Tamworth Poland China were better types from the factory point of view. Nowadays Mr. Roseblade is also largely interested in pasture improvement, in which he co-operates with Departmental officers.

Impressed with the possibilities of pig raising, Mr. J. E. Foxwell, of Kureen, via Cairns, North Queensland, has been associated with the pig-raising business for many years. He recently owned a crossbred sow. Her first litter was eleven, next one twelve; she then had fourteen pigs on the morning of one of the Melbourne Cup races, and afterwards had several especially satisfactory litters. Her smallest litter was ten, while she had fifty-eight pigs in five litters, all sired by the same boar. The sow was a wonderful breeder, and equally good as a suckler, while also being of a very prolific type.

Progressive and determined to make a success of farming, Mr. Chas. Waters, of Butcher's Creek, North Queensland, has been specially interested in the Duroc Jersey breed of pig. His first purchase, Mooroombin Gerty, farrowed ten in her first litter, and won first prize at the Malanda Show. She produced ten in her second litter, and fifteen in her third family, but owing to an attack of illness was unable to rear her family, care that devolved on Mrs. Waters, whose ability with the handling of bottle-fed pigs needs no emphasis. Mr. Waters cures his own bacon, and has quite a good reputation locally for bacon and hams. His herd of Jerseys is the pride of the farm, while more recently he has added to his purebred stock a very fine lot of Columbian Wyandotte poultry. On the eve of my visit a native tiger cat had visited the poultry yard and sucked the lifeblood from a number of prize birds, but Mr. Waters is not deterred and still continues on. He says his father taught him that bad luck should mostly be referred to as bad management, and that the best of luck in life usually follows on improved methods of management, control, and dealing.

Lice in Livestock.

The desirability of cleaning up lice on farm animals before hot weather sets in is emphasised by the Instructors in Pig Raising in the Department of Agriculture and Stock, Brisbane. In humid climates lice and worms breed freely and multiply practically at every season of the year, but they spread more rapidly during the cooler months of the year when pigs lie abed longer and live more of their time indoors. During the summer time the pigs are out in the open most of the time, and when water is available they spend a good deal of their time in it, where, of course, the lice do not have the same chance. They also roll in mud and in this way destroy thousands of lice. An important precaution is to see that all the animals are treated, including sucking pigs, and that the pens, yards, and paddocks are regularly swept or raked and all rubbish gathered in heaps and burned.

For actual treatment of lice, a good, reliable mixture may be prepared by mixing together ½ pint of benzine, pint of kerosene, and 7 pints of fish oil. If the animals are reasonably clean and free from accumulations of mud, and if the oil is applied per medium of cloth, brush, or spray, all lice touched will be killed. Treatment should be repeated in three days and again at regular intervals. With care and attention there will be little difficulty in keeping the pigs and piggeries free of these blood-sucking parasites.

An Old Prayer.

Here is an interesting old prayer in verse, which dates from the eighteenth century at least. It is of English origin, but its author is unknown. It is as appropriate to-day as when it was written, as a petition for help in living a happy, healthy, and useful life here on earth:—

Give me a good digestion, Lord, and also something to digest.
Give me a healthy body, Lord, with sense enough to keep it at its best.
Give me a healthy mind, good Lord, to keep the good and pure in sight,
Which, seeing sin, is not appalled but finds a way to set it right.
Give me a mind that is not bound, that does not whimper, whine, or sigh.
Don't let me worry overmuch about the fussy thing called I.
Give me a sense of humour, Lord; give me the grace to see a joke,
To get some happiness out of life and pass it on to other folk.

Points in Pig Feeding.

In the feeding of pigs three cardinal points must be observed. The pigs must be of a type required for local and export markets, which indicates that they must have breeding and quality; they must be well fed from birth to maturity on foods that will result in profit, and they must be kept under conditions favourable to development and freedom from disease. In selection for marketing, only the best and most even pigs should be picked out and despatched, the balance remaining should then be transferred to the fattening yard and be pushed on to maturity.—E. J. Shelton, Senior Instructor in Pig Raising.

Pig Ailments.

A very frequent cause of cough in pigs is intestinal parasites, possibly also lung worms, for both these forms of parasitic life infest pigs and cause them to become unthrifty. This condition often persists until the animals are five or six months old, when they appear to develop sufficient resistant powers to be able to throw off the effects and gradually pick up strength again.

Kidney worms are also a prolific cause of trouble in pigs, particularly as they are deeply seated in the fat surrounding the kidneys and other organs and in parts of the body other than but including the kidney fat. Worms are very prevalent in pigs, especially in the more humid parts of the North and in seasons characterised by heavy rainfall.

In addition to specific treatment for worms, it is essential that pig pens, yards, and paddocks be thoroughly cleaned up and all rubbish burned to a cinder on the spot. The yards and pens, especially the floors, need to be thoroughly cleaned up and a strong disinfectant be sprayed over the walls and into the crevices in the floor.

Pasture Improvement in the North.

In the far North of Queensland, many progressive farmers are finding that pasture improvement work pays handsome dividends. Such a one is Mr. W. Hastie, of Eiswick Park, Atherton. Discussing paspalum, Mr. Hastie says that this wonder grass has come through a very severe winter with flying colours compared with all other local and introduced species. Of Kikuyu, he states it is a good grass and suitable for all kinds of stock, pigs and cattle doing especially well on it. Heavy frosts nipped the Kikuyu back as it did the panicum and other soft grasses, but immediately after winter and early spring rains the Kikuyu shot ahead and made wonderful growth. Of Russell River grass he has no good word to say, for he indicates that, whereas a few years ago it was boomed, and although largely self sown throughout the North, it is only good for about two months, and then dries off and will not stand winter conditions. Of Florida clover, he states it is growing wild, and once it enters it spoils a lucerne paddock, but pigs, and horses in particular, thrive on it, also bees. Its roots, 6 inches to 12 inches in the ground, provide great food for pigs. He adds that Townsville or wild lucerne is spreading in the North, and is already noticeable along the railway line around Atherton. Seed merchants in the North were recently advertising for seed for distribution purposes.

Wild Lucerne.

Wild lucerne, know in the North of Queensland as Townsville lucerne, is known by the botanic name of *Stylosanthis mucronata*. It is a native of tropical America, but is now widely spread as a naturalised alien in most tropical countries. Mr. C. T. White, Queensland Government Botanist, states that it has been established in North Queensland for a number of years, and has proved itself a valuable forage plant. An analysis made by the Agricultural Chemist showed it to approximate in food value to ordinary lucerne. As a general rule, stock prefer the plant when it is drying off or has been slightly wilted. It is not known to possess any poisonous properties, but, like other succulent forage, may easily cause bloat if eaten in any quantity, particularly on an empty stomach. Care should therefore be exercised in using it as a stock food.

Rural School Club Movement.

That the Home Project Movement in Queensland is creating widespread interest, and is proving of considerable value in the education of the farm girls and boys, is emphasised by the figures for the last year. In 1931, thirty pig clubs, with total membership of 153, were registered.

Other project clubs (including calf, poultry, agricultural, milk testing, and vocational) numbered 361, with a total membership of 3,027. Results generally were considered highly satisfactory, especially considering the unfavourable weather experienced during the year in many of the districts in which clubs have been formed.

Molasses as a Medicine for Pigs.

When visiting the farm of Mr. J. W. Whinfield, of Yungaburra, North Queensland, recently, and in discussing the use of molasses as a pig food, Mr. Whinfield mentioned that on his farm much success had followed the use of molasses, not only as an addition to other less nutritious pig foods, but as a medicine for ridding the pigs of stomach and intestinal worms. He stated that, due to the regular use of a proportion of molasses, his pigs are now quite free of intestinal parasites and have grown and developed very satisfactorily. He has found that the provision of roomy pig paddocks in which there is an abundance of paspalum, kikuyu, and prairie grass and clovers has been of great advantage, while his crops of sweet potatoes, corn, and cow cane have enabled him to supplement the supplies of skim milk and maintain a larger herd of pigs than would have otherwise been possible.

The First Law in Dairying.

So closely is hygiene related to quality in milk products, the habit of cleanliness should be the first law in dairying, and the fact that the farmer is supplying the raw milk market should be no reason for laxity in this connection if he recognises his obligations to the consumer. The following simple rules for hygienic milking are laid down in a departmental publication, which admits, however, that although they have been preached for many years and involve in practice little extra time and trouble, they are still far from generally observed.

The cow having been bailed or tied up, the milker should wipe the udder with a damp cloth; this is preferable to brushing, which only causes the dirt to float in the atmosphere and subsequently drop into the milk bucket. A separate cloth should be used by each milker, and should be kept thoroughly clean and sweet—a smelling cloth is a source of contamination. After the milking of each cow the milker should wash his hands in clean water and dry them; if this is not done there may be bacteria in the liquid on the hands that will gain access to the milk in the bucket. Where gravitation water is not available, a good plan is to have, say, two oil-drums, into each of which is fixed a small tap. These drums should be fixed to the posts or walls and filled up with water, a system of running water thus being installed. Very often one finds basins of water used, but as this is probably not changed during the whole milking operation, it becomes a thick soup, containing myriads of organisms, and therefore a source of contamination instead of benefit.

Dry milking versus wet milking is often a debated point, but the practice of drawing a little milk into the bucket and dipping the fingers therein is undoubtedly most insanitary. A good plan is to touch each teat with a little vaseline, which prevents friction and also prevents cracks on the teats.—A. and P. Notes, Department of Agriculture, N.S.W.

Cheap Oils are Expensive.

A note of warning to those motorists who have changed from some well-known brand of oil to a so-called "cheap" make in an endeavour to reduce running costs is worth while. That such an action is unwise and likely to defeat its object is certain. The actual saving in outlay for lubricating oil can, at most, be a matter of shillings per annum. The additional engine wear and higher petrol and oil consumption consequent upon the change will more than eat up the apparent saving. Instead of saving, the motorists may eventually be many pounds out of pocket. Serious risk of actual breakdown is ever present, and in the event of such misfortune an expenditure of several pounds would have to be made. Take as an instance the burning out of a big-end bearing, as the result of using a poor quality lubricating oil. Such a mishap would, in most cases, involve towing to the nearest garage, replacement of the bearing liners, and a fresh fill of oil, and would cost anything from £3 to £5, no allowance being made for consequent delays. A job of this nature would completely offset the saving of difference of cost between a good and poor quality oil over a period of some years.

The importance of quality in engine oil is fully realised by motor manufacturers, who invariably advise the use of the highest quality lubricants in their products. Where all factors are under definite control, as in the tests carried out by the well-known makers of lubricants, the greater economy of quality oils is proved every day. The discerning motorist will readily appreciate that "cheap" oils are "expensive" in the long run, the initial saving being completely offset by subsequent losses. Real economy as far as the lubrication of the engine is concerned consists of using a high quality oil such as Mobiloil in the manner specified by the maker of the car or of the oil.

Litter Weighing Nearly 1½ Tons.

According to Mr. W. J. Schwab, of the Animal Husbandry Extension Staff, Purdue University, Adon Mosser, of Adams County, won the Hoosier ton litter contest for 1931 with fourteen pigs that weighed 3,420 lb. when six months of age. Second and third in the contest were litters entered by Erwin F. Fuelling, of Allen County. One of these litters, thirteen pigs in number, weighed 2,892 lb., the other, twelve pigs weighed 2,832 lb. at 180 days of age. Three hundred and twenty farmers had litters entered for the contest. Of these sixty-four were qualified litters for gold medals with litters weighing 2,000 lb. or more at six months of age. Thirty litters qualified for silver medals by reaching weights between 1,800 and 2,000 lb.; ten litters qualified for bronze medals by reaching weights of from 1,600 to 1,800 lb.—"Hoard's Dairyman."

Potato Land.

Analysing in the course of a recent wireless address the facts that the potato-growing possibilities of New South Wales are as yet far from fully developed, and that on the average acre yield the return for the labour expended must in many cases approximate less than the basic wage, the special agricultural instructor engaged with vegetable production stated that three main factors were operating against the growth and welfare of the industry. The first was the use of inferior seed, the second was the practice of continual cropping without due regard to the maintenance of the organic content of the soil, and the third was inferior grading of the product.

With regard to the two firstmentioned, it was pointed out that the "good old days" of potato-growing, when the crop was raised on virgin land, at its maximum in regard to fertility, and the disease problem was practically non-existent, were past. The need for increasing the yield in order to lower the unit cost of production, on the other hand, was never more urgent than at present. A smaller area, better farmed, should be the individual grower's motto.

Weakness of One-crop Farming.

It would perhaps be wise if potato-growing were considered more in the light of a mixed farming undertaking, particularly in conjunction with stockraising, rather than as a one-crop farming venture. Occasional use of the land for fodder and grazing crops (particularly clover) would be found of great advantage in bringing about the production of higher yields of better quality tubers. The maintenance of a satisfactory organic content in the soil was a matter of prime importance in potato areas. There came a time on every farm when no new land was available, and ultimately every grower would be faced with the task of maintaining the fertility of his older lands.

The success of the potato crop on virgin areas could be largely attributed to the organic matter which they contained, brought about by the turning under of leaves, grass sod, &c. Such material, when it had decomposed, imparted to the soil a desirable texture, and also improved its water-holding capacity. On areas which had been continually cropped, without attention to green manuring or the application of farm manure, the organic content quickly became depleted, and packing of the soil, particularly after rain, became apparent. Soil in such a condition would not produce a satisfactory yield, especially if compaction took place shortly after planting.

A suitable rotation in Tableland districts would be hay or grain, followed by clover or peas, and then by potatoes.

In coastal areas, where dairying was carried on, ample animal manure was available for maintaining the proper balance of organic matter in the soil, and where floods were experienced the alluvial deposits were beneficial in this respect.

An Effective Rotation.

The advantage of maintaining the organic content of potato land is demonstrated by the achievement of Messrs. Conlon Bros., of Exeter, N.S.W., who have won the Southern District Championship potato-growing competition for the last two years. These growers attach much importance to green manuring. Their practice is to sow a crop of peas in the spring, pickings of these being generally completed by November, when the land is sown to Japanese millet. The millet does well during the summer months, and, besides acting as a smother crop for weeds, provides a large volume of greenstuff for turning under in the autumn. A winter fallow enables the soil to be brought into excellent condition in time for the planting of the potato crop. Where livestock figure in the grower's programme, the millet crop could be utilised as feed.—A. and P. Notes, N.S.W. Dept. of Agriculture.

The Bee's Big Job.

A single pound of honey represents the life work of 300 bees. If it were possible for a single bee to produce a pound of honey, she would have to work 365 days a year for eight years. To gather this much nectar she would have to travel 75,000 miles or three times around the world.

Pigs as Swimmers.

There is a widespread superstition that pigs cannot swim because they cut their throats with their sharp front hoofs. Men have been heard to declare that they have seen pigs swimming with a trail of blood behind them due to the injury described. A correspondent of the "Farmer and Stockbreeder" not only contradicts this theory but gives it as his experience that pigs not only are good swimmers but are the only farm animals that will swim for pleasure. He writes:—"When farming at Godstone I had a large deep pond in which in the hot weather the pigs made a regular practice of jumping in and swimming across to an easy landing place at the other side. They would then walk round and repeat the process. I have watched them doing this for an hour on end. Where I am now I have river meadows where I have kept pigs. The river is 15 feet to 20 feet wide and 5 feet to 8 feet deep, but it is no boundary for the pigs. During the recent hot weather they all started swimming and generally landed on the opposite bank. The Senior Instructor in Pig Raising, Mr. Shelton, believes pigs to be good swimmers, and would not risk a good crop of potatoes on the other side of the river if the pigs once "sensed" them. He has not heard of any racial suicide in pigs through indulgence in the natatorial art.

Correspondence Courses in Pig Raising.

After having perused the series of agricultural correspondence lessons, the Minister for Agriculture and Stock (Mr. F. W. Bulcock) thinks the course an admirable one. He said recently that he appreciated its value, particularly to young men who, through lack of finance and opportunity, were unable to benefit by a course at an agricultural college.

Though at present in its infancy and largely experimental, he said, the series of correspondence lessons in pig raising had been taken up enthusiastically by a number of junior farmers. One of the correspondence course students had written to say that, due in no small measure to the experience gained through this course of lessons, he had been placed in charge of an important stud of pigs. There were, to the instructor's knowledge, hundreds of young men who, through lack of finance and opportunity, were unable to benefit by a course at an agricultural college. Many more were situated at a great distance from central training schools, while others, graduates of the Home Projects Scheme, leaving or having left schools, would be prospective students of practical correspondence courses. The scheme, therefore, had a very fine objective, and he expressed his appreciation of the instructors' work.

The World's Wool—Empire Marketing Board Survey.

The leading position of Australia among the producers of the world's wool is clearly brought out in the wool survey which has just been issued by the Empire Marketing Board. The survey is a work of over 230 pages, published by H.M. Stationery Office, London, and priced at 2s. It estimates, country by country, the sheep population, and wool crop of the world. Australia, with over 103,000,000 sheep, is only equalled or surpassed by Russia. There are between 700,000,000 and 800,000,000 sheep in the world, a third of them in the British Empire. A census of the world production of wool shows Australia as the largest raw wool producer. Since 1924 Australia has provided a quarter of the world's wool, while the rest of the British Empire produces another quarter. The export trade and the trend of prices are next studied, and the survey also includes an account of the lesser animal fibres—mohair, cashmere, camel hair, alpaca, &c.

The survey concludes that a large part of the price fall since the war has been due to the rise in the value of money, but adds that, generally speaking, wool prices have fluctuated more rapidly than the general commodity index. People economise on woollen garments and make them last longer. Demand is elastic, but the supply of wool is inelastic, so increased demand should show itself at once in the price. No large stocks have been allowed to accumulate through efforts to maintain prices.

Russian wool is almost entirely carpet wool, and the Russians import finer wools. The United States imports carpet wools. Neither of these great producing areas is likely to become an important exporter of wool in the near future.

Tractor Farming.

Mr. G. A. Wallace, of Weja, read an interesting paper, from which the subjoined notes are taken detailing his experiences with tractors at the annual conference of the Dowling Sub-district Council of the Agricultural Bureau of New South Wales:—

As a means of reducing the costs of production incidental to wheat-growing, tractor-farming appealed to me five years ago. Realising that an expensive tractor, if unsuitable, would represent a heavy loss on outlay and depreciation, and not wishing to burden myself with the risk, a light tractor was purchased. The experience gained proved that certain operations could be performed expeditiously and with kerosene as a fuel, and the cost of working compared very favourably with horse-drawn teams. The drawback to the light tractor was that it could only accomplish the work of six horses, and on certain classes of work it was not altogether suitable, while for cropping a large area it was necessary to use a second team.

Several years' experience convinced me that a more powerful engine would serve my purpose and enable me to discard the second team. Due consideration was then given to the choice of a suitable engine strong enough for the work it was desired to perform, and as regards the class of fuel used. During the previous years kerosene as a fuel had provided a working basis as to costs per acre on certain operations, but I decided, on the point of economy, that an engine using a cheap heavy-grade fuel would do the work more cheaply than one using kerosene.

The tractor purchased easily does the work of a twelve-horse team, but its use has meant careful reorganisation of the cultural implements. Two combines, one 14-run and one 17-run, were sold and replaced with a 20-run, which means that there is a reduction of outlay and that only one machine has to be kept in repair instead of two.

Using semi-crude oil as fuel, which costs landed 1s. 0½d. per gallon against 1s. 8d. per gallon for kerosene, shows a very distinct saving. I have used only one drum of kerosene in two years, and I have been unable to notice any difference in the working of the engine between the two fuels, the semi-crude oil going just as far and giving as much power. In fact, I prefer the oil and am sure it is far better for the engine, as it is not so harsh. Ten hours' consumption of lubricating oil is about 1 gallon; the used oil is added daily to the fuel and does not have any detrimental effect. At times I have used waste sump oil at the rate of 1 gallon to 4 gallons of fuel, and I found the mixture quite suitable.

Sowing 800 acres with a 20-run combine, half sown dry and the other after rain, worked out as follows:—

	£	s.	d.
Fuel (300 gallons at 1s. 0½d.)	17	4	0
Oil	5	8	3
Grease	1	0	0
Petrol	0	17	6
	£24	9	9

The cost per acre was thus 7.35d.

Forty-five acres is the average daily area sown, and only one man is required to take out seed, superphosphate, &c., and drive the tractor. The one tractor does all the seeding and fallowing, and no labour at all is employed during these two periods.

The total cost for repairs for more than two years' work over 8,000 acres, as well as belt work, has been £13 made up as follows:—Piston rings, £1 5s.; repairs to magneto, £4; SK.F. bearing, £1; grease gun, £3; pulley, 6s.; spark plugs, 9s.; steering gear, £3; repairs to front axle, 10s. Repairs to magneto should have been gratis, as it was faulty at the start and has been free from trouble for eighteen months, and the steering gear trouble was caused by inexperience. The cost of repairs per acre was thus ¾d. The engine is pulled down at present, and the repairs required to carry on for the next 1,000 acres are two piston rings at 9s. and lathe work £1.

The saving in labour, approximately £80 yearly, more than covers the estimated cost of annual repairs, which I originally put down at £30.

When operating a tractor the best results are obtained by running it as near to boiling point as possible. Some makers claim that their engine uses practically no water in the radiator, and, if so, it is doubtful if maximum results are obtained from the fuel, and it is worth trying out the engine under a higher temperature, which can be obtained by partially or fully covering the radiator. In my case it means two hours longer run out of a tank of fuel—an increase of 20 per cent.

To obviate the necessity of using a screen, except during very cold weather, the fan blades on the tractor I am using were shortened, but when doing this care must be taken to see that it is not overdone and the engine allowed to become too hot. An engine equipped with a water jet has an advantage, when fuel of a detonating nature is used, as the water prevents pre-ignition and minimises the formation of carbon. What carbon is formed is of a soft nature and easily disposed of. The amount of water used is not very large, and usually works out at about one drop to every eight revolutions of the engine.

I carry out all running repairs, pistons being drawn every 2 tons of fuel, carbon cleaned off, and the valves ground in. I find that it is far better to purchase tools for repair work than to pay mechanics to do the ordinary work. With a little study of the instruction book and ordinary care, the operator should be able to keep the engine in a high state of efficiency, as during rush periods valuable time would be lost waiting for an outside mechanic to do the work.

In summing up I would like to mention that I have not referred to the cost of working with horses, as I do not wish to enter into that at present. For years I used horses, and experience gained with the tractor has firmly convinced me that in my own particular case the tractor is by far the better proposition. The work can be done on time whether the weather is hot or cold, and a big advantage with the tractor is that when you cease work you are definitely finished.

The Preparation of a Good Seed-bed.

Mr. H. C. Stening, Chief Instructor of Agriculture, gave the following address on seed-bed preparation at the annual conference of the Dowling Sub-district Council of the Agricultural Bureau of New South Wales:—

Many advantages result from fallowing, but it is not generally recognised that perhaps the most important is the production of a good seed-bed, and this should be the aim of the cultural operations. In the first place, a good seed-bed can be defined as soil which is free from weeds and growth of any kind, with a reasonably level surface, and possessing a surface mulch that is loose and dry to a uniform depth of 2 inches super-imposed upon a sub-surface layer which is finely pulverised, firmly compacted, and well charged with moisture. This sub-surface soil should be porous but not loose, firm but not consolidated, and air pockets and buried clods must be absent. It should be level on top and form a union with the unploughed soil. This condition increases the water-holding capacity of the soil, as well as its capillarity. It places the seed-bed in the best possible condition for the germination of the seed and the development of plant roots, and an even depth of sowing is permitted in moist, compacted soil, thus ensuring rapid and uniform germination, resulting in an even and vigorous crop. This rapid germination is of much greater importance than is generally realised, as it ensures a good start to the crop, which is half the battle in the production of high yields, and it assists the crop in resisting the ravages of weeds, fungous and insect pests.

In the case of fungous diseases, such as bunt and flag smut, the wheat plant is infected at the seedling stage, during the period from the beginning of germination to the point when the first green leaf is ready to appear. It stands to reason that the shorter this period is, or, in other words, the quicker the very early growth the greater chance there is of the crop escaping infection. If seed is in the ground for any length of time before germinating, there is a danger of it being attacked by wireworms, and it is usually at the young seedling stage that most damage is done by the wheat root grub, cutworms, and a new insect pest, the pea mite, which has made its appearance in some of the southern border districts this season. A crop which makes rapid growth in its early stages reduces the depredations of these insect pests to a minimum.

The methods which should be employed for the preparation of an ideal seed-bed will vary according to the nature of the soil and the rainfall of the district. The aim should be to provide for the complete compaction of the sub-surface soil before the sowing period, and the first essential is to commence fallowing early. As a general rule, the ploughing should start immediately sowing operations are completed, and every opportunity should be taken to proceed with the work when the land is in a suitable condition. An endeavour should be made to complete ploughing by the end of July.

Heavy soils which have a tendency to set should be ploughed comparatively deep, whereas light, sandy soils and those of a self-mulching nature, which are difficult to compact, require shallow ploughing, or in some cases a cultivation with the scarifier is sufficient. As rains are the most effective agent in compacting the soil, it follows that the less rain that is likely to fall on the fallow, the more shallow should the ploughing be.

Generally, the early-ploughed land may be allowed to remain in the comb during the winter months, but in the early spring there should be no delay in creating a soil mulch. A wide sweep of the harrows is invaluable for performing the first operation of forming a mulch with a minimum of delay, pulverising the soil and facilitating the subsequent operations with the cultivator. At the earliest opportunity, the harrowing should be followed with a cultivation to the full depth of the ploughing with a spring-tooth cultivator, which exerts a sifting action on the soil, combing the clods to the surface and allowing the fine soil to fall to the bottom and form a compacted layer below the surface.

The loose, dry mulch should be preserved to a depth of 3 inches up to harvest time and be reduced to a depth of 2 inches after harvest. For these shallow cultivations between harvest time and sowing period, the rigid-tine scarifier is the most satisfactory implement, for it is most effective in cultivating to a uniform shallow depth and in destroying weeds. Furthermore, it exerts a compressing action on the seed-bed, leaving a level top to the compacted surface.

Bacteria Detrimental to Dairying—Simple Precautions that Prevent Contamination.

There are many ways in which milk can become affected by organisms harmful to it, but much can be done by very simple precautions. This fact was strikingly illustrated by a case quoted recently in the "Agricultural Gazette" of New South Wales.

During the check grading of milk quality at a cheese factory, writes an officer of the Dairy Branch of the New South Wales Department, a batch of cheese proved to be badly infected with gas-producing bacteria, and the source of contamination was traced by means of the Wisconsin curd test to one supplier's milk. The usual corrective methods advocated for adoption on the farm failed to remedy matters, even when machine-milking was temporarily suspended to determine whether infection was coming from that source. As the trouble persisted, the officer concerned decided to submit the milk from each cow in the farmer's herd to the curd test, with the result that out of forty samples tested twelve cows only proved to be giving infected milk.

Observation of the cows' movements during the day revealed that they fed on the flats during the morning and from midday on they camped in one particular spot, under a tree on the hillside. This camping ground surrounding the tree had practically become a manure heap. Intestinal organisms, usually responsible for gassy curds, were evidently carried by the cows in the dust which adhered to their coats, udders, and in the ducts of the teats. Careful washing of the udders and stripping from each teat the first few drops of milk before attaching the machines to the cows proved successful in eliminating the trouble.

Similar sources of milk contamination by intestinal organisms which produce fermentation detrimental to cheese-making frequently occur, and, could be easily prevented if every dairy farmer adopted the simple practice of cleaning and wiping each cow's udder with a cloth wrung out of water containing some odourless germicide, followed by withdrawing and rejecting the first ductful of milk from the cow's udder before commencing to milk the cows by machines or hand.

In the case referred to, the additional precaution was taken of preventing the cows from resting on the camping ground for a few days until the surroundings were cleaned up, with the result that when a later visit was made by the dairy instructor a vigorous growth of grass had appeared.

When Dipping Sheep.

A convenient way of ascertaining the capacity of the bath when dipping sheep is to measure water into it from a tank of known capacity. First run into the bath, say, 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities, and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

FACTS ABOUT WHEAT.

In the year 1879, that is within the lifetime of many now living, the modern roller mill process of milling wheat was perfected. In this process the kernel is not ground, but is broken between rollers. The germ, bran, and coarse grades of flour are then mechanically separated. That part of the kernel, which has physical properties which make it crush between rollers so finely that it will pass through bolting cloth, is marketed as white flour. As a result of milling we obtain the different materials in the following proportions:—

	Per cent.
White flour	70
Sharps or middlings	14
Bran	14
Germ	1½ to 2

All the milling products except white flour are sold as "offal" and used to feed fowls and other animals.

The Staff of Life.

As a consequence of this the bread we eat is a very different food from the bread which was eaten by our forefathers. This is a very serious matter, for bread has long been considered the staff of life. Wheat has always been the king of grains, and is still the conquering cereal. At the present time we live very largely on white bread and other foods made from white flour. The whole wheat and genuine wholemeal flour are very rich in a substance absolutely necessary for life and health, known as Vitamin B. This vitamin is distributed in very different proportions in the products derived from the wheat grain. If we take the contents of Vitamin B in the germ to be 100 per cent., then that in the middlings in 50, in the bran 33, in the flour 0.

White bread and everything made of white flour contains very little or no Vitamin B, consequently a large number of people in this country are living on a diet that is deficient in Vitamin B, though it is not completely absent. For this reason they are poorly nourished, and easy subjects for disease. Constipation among them is almost universal. On this condition whole industries flourish, yet the evil grows no less, for none of these supposed remedies goes to its root; they are merely palliatives which sometimes give temporary relief. Fortunately it is now possible to obtain preparations of wheat embryo, and a heaped teaspoonful daily will, if persevered with, cure all whose bowels have not been so atrophied of muscular tissues that they cannot recover. There are two of these preparations (Bemax and Vita B), both good, but both expensive. Of bran there are also two good, but expensive preparations, but ordinary cooking bran, which can be obtained from your grocer, is just as good. This he sells for chicken food at 1½d. per lb. Taken fresh from a newly opened bag it may be quite good. But not being meant for human food it is not guaranteed to be clean. It may have lain on the floor and been contaminated by dogs, cats, rats, and other kinds of dirt. Your grocer can obtain for you clean bran direct from the miller for 3d. per lb., and this is within the reach of the poorest. When there is a large demand for it, no doubt clean bran will be procurable at half the price. The right quantity to take is a heaped tablespoonful daily mixed with any sort of food. It is best uncooked, but may be cooked in domestic biscuits, scones, puddings, and cakes. Nursing mothers should take two heaped tablespoonfuls. Those who can afford it may take wheat embryo in addition to the bran, but that is not necessary.

LAUNDRY TALES.

IT would be interesting to study the development of laundry processes, and so learn how much we benefit to-day by an understanding of that development. Dr. Weeks, writing on education, said "the purpose of education is to substitute learning by understanding for learning by experience." In that way we benefit by the experience of others and so save much time and energy. It is so with laundry work, which it is necessary for every housewife to know something about. It really makes the ordinary routine of household tasks much more interesting if we understand the scientific reasons why we adopt particular methods for our work.

The primitive worker knew nothing of soaps and soda as an aid to removing dirt, but depended on the action of running water and kneading and pounding. These methods are used in some countries to-day, thus demonstrating their lack of education. The washing is done in a stream usually, and the wet clothes are laid on a rock or board and pounded until the dirt is dislodged. These rough boards and stones were the first washing boards. Sometimes the worker uses a scrubbing brush to clean the clothes. Needless to say these methods are very bad for the material. Drying the clothes is done beside the stream spread on stones and bushes. The Chinese run bamboo poles through the legs and sleeves of the garments, and a careful worker will move the pole from one leg or sleeve to the other during the process of drying, by way of shaping the garment, which probably will not be ironed.

Housewifery Wisdom.

The wise housewife will study carefully the question of fabrics and so simplify her laundry problems. It is not generally realised what it is which constitutes the real difference between cotton and woollen materials. Cottons and linens are vegetable fibres, and are much tougher than materials of wool and silk, which are animal fibres. The vegetable fibres have a greater resistance to chemicals, friction, and heat, consequently soap may be used freely on them, rubbing will not injure them, and they may be boiled and starched and ironed, because the fibres are tough enough to allow this treatment. Slight degrees of scorch may be washed from either of these fabrics, or removed by laying the garment in the sunshine. If it is badly scorched, wet the garment first before laying it in the sunshine.

Wool and silk, the animal fibres, are sensitive to chemicals, to friction, and to heat. An understanding of their nature helps tremendously to successful cleansing. Woollen material seen under a microscope seems to have tiny overlapping scales. If the cloth is rubbed when wet, or put into water which is very hot, or ironed with a hot iron, these scales interlock, shortening the fibre, thus causing shrinkage. Silk does not shrink, but soap and heat discolours and injures the silk. Always use lukewarm water when washing wool or silk. The soap should be good and applied in solution; it should not be rubbed directly on to wool and silk. This soap solution can be made in any quantity and kept for use when needed. To make it, cut 1 lb. of good soap into shreds and add 4 quarts of cold water, and boil gently till thoroughly dissolved.

Washing Woollens.

For washing woollens have water of a tepid temperature, add enough soap solution to make good suds; wash the garments by a squeezing motion, and when the water is soiled change to another which is soapy and of the same heat as the first. To remove persistent spots of dirt rub some soap solution directly on the spot. Don't do any more lifting or pulling than necessary, especially with the knitted type of garment. A little borax in the last rinsing water will clear up the white woollens. Rinse all soapy water well out with plenty of clean tepid water. In the absence of a wringer woollens should be squeezed dry—do not wring by twisting. Knitted garments, such as sweaters or coats, should be laid on a pad in the sun to dry. The pad should be made of several thicknesses of bath towels, a folded sheet, or any absorbent material. A number of woollen garments should never be put into the water at one time. The washing of one should be completed, rinsed, and hung to dry as quickly as possible. Flannels should never be allowed to lie about after being washed, because they shrink, harden, and darken in colour if not immediately hung to dry. If the garments require ironing be sure and take them in before they are thoroughly dry. Fold them together evenly, so that they are ready for ironing. If they are just crumpled up anyhow, you have unnecessary creases, which make more labour when finishing off. However carefully the woollens have been washed it is necessary in order to prevent shrinkage and discolouration to pay the same careful attention to the ironing of the garment. The ironing of woollens is more like pressing than like regular ironing, as the fibre scorches so easily, and the heavy seams glaze under the pressure of the iron. The most necessary

thing is to study the heat of the iron, because, if wool is once scorched, it cannot be remedied; consequently, be sure the iron is not very hot. Many fine flannels are greatly improved if ironed on the wrong side. When ironing woollen garments on the right side, especially frocks or trousers, it is necessary to use a clean white cloth fairly well damped between the iron and material. If done without a cloth the face of the iron will leave glossy marks. Some very fine woollen materials, used for blouses and children's frocks, have a much better appearance if they are not hung out to dry. They require washing in the same careful way, need a thorough rinsing, and if there is no wringer a good shaking is useful to get as much moisture out of them as possible. If they are rolled in a clean towel for a short time and ironed on the wrong side, the result will be very satisfactory. When drying a woollen cap it is a good idea to fill the crown with a clean cloth, so that some of the moisture is absorbed and the correct shape of the cap is retained.

Soap and Civilisation.

Soap is considered to-day as an essential in every civilised community, and it is difficult to imagine how we could do without it. It has been said that "the civilisation of a nation is known by its soap bill," and we realise the truth of that saying when we read of the laundry methods of primitive people. Three things are noticeable when studying these methods—there are heaps and heaps of clothes to be washed, they depend on running cold water, and the extreme hardships of the work. The washing of the clothes is made a kind of festive occasion in some countries. Special seasons are set apart, generally, when the women are not busy working in the fields, or when the weather is suitable. Consequently the washing accumulates. All primitive washing is done in cold water, which, of course, makes their labours so much harder. In some countries, like China, the scarcity of fuel makes it almost impossible for the poor women to have hot water. I was looking at some pictures of women washing along the streams, and I realised how much labour and energy were required to work in that kneeling and bending position. The Italian women have a kind of kneeling box made, which they place in shallow water, thus getting a little closer to the water without getting wet.

After thinking a little of the difficulties which have been overcome, we can settle down to our own laundry work with a light heart, knowing how much we are going to benefit by education and the experience of others.

General Hints.

A few general hints on the usual weekly washing would probably be very helpful to some housewives who are not experienced in laundry work. Even when one does not do the actual work oneself, it is very necessary to know the best methods and so be able to direct others. It is most impotrant to have the clothes carefully sorted, so that fine cotton and linen articles are not washed with silk and woollen ones.

If there are any stains it is always advisable to remove them before washing. To remove ink and rust marks, which are quite an everyday occurrence, dissolve a small portion of oxalic acid in some boiling water and dip the stained part of the garment into it, when it will quickly disappear. If the article is of silk or coloured material, allow the solution to get fairly cool before applying. If the stains are on woollen garments, equal parts of citric acid and cream of tartar are very effective. Moisten the spot with warm water, and rub the powder well in, and when the stain is removed rinse well. For white cotton goods a little soda should be added to the first rinsing water to neutralise the acid, and for flannel and coloured garments the first rinsing water should contain a little soap.

When looking over the table linen, if you discover stains of tea, wine, fruit, medicine, and mildew, you will find this solution very useful for removing them: Pour 1 pint of boiling water on to two tablespoons of chloride of lime and a small lump of washing soda, stirring carefully till the lumps are dissolved. The mixture must stand till cool, and then be bottled and kept handy for use. When a stain will not come out with ordinary washing, apply a little of this solution on the spot before putting into the copper. Great care must be taken when using this solution that it does not come in contact with woollen or coloured garments.

Turpentine is very useful for removing tar and paint. Put a few drops of turpentine on the spot, and gently rub with a soft, clean cloth, commencing at the outer edge, and gradually working to the centre of the stain.

If fine or lacy garments need boiling in the copper with other clothes, it is wise to put them into a bag first, in order to protect them from the poking and lifting, when they could so easily be torn.

Have the copper water cold when putting in the clothes, and when once boiling allow it to boil for ten minutes. Clothes will go yellow if boiled for too long a time. A thorough rinsing is most important, and be very careful about the blue. Soft, spongy materials absorb the blue very readily, consequently use a very diluted blue water for them, as too much blue will permanently discolour the clothes.

When making the boiled starch add a few shreds of white wax, and the results will be better if the clothes are starched when the starch is still warm.

—E.S. in the "Sydney Morning Herald."

Farm Notes for November.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and if the soil is deficient in lime a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes it appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of

the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

CLIMATOLOGICAL TABLE—AUGUST, 1932.

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.	Min.	Max.	Min.		
	In.	Deg.	Deg.	Deg.	Date.	Deg.	Date.	Points.	
Coastal.									
Cooktown	30·07	79	65	83	30	55	10	72	6
Herberton	..	70	47	83	12	34	9	132	12
Rockhampton	30·16	77	53	86	31	40	2	11	3
Brisbane	30·19	71	50	80	31	41	16	38	3
Darling Downs.									
Dalby	30·19	70	40	80	11	26	17	40	2
Stanthorpe	..	63	32	73	25, 26	19	16	50	6
Toowoomba	..	64	42	76	11	28	16	78	2
Mid-interior.									
Georgetown	30·05	83	52	90	12, 31	39	9	Nil	..
Longreach	30·15	77	47	90	30	37	8, 1, 2	Nil	..
Mitchell	30·18	71	37	82	30	25	17	7	1
Western.									
Burketown	30·07	82	57	92	31	46	2	Nil	..
Boulia	30·12	78	50	91	29	39	15	Nil	..
Thargomindah	30·15	72	45	84	25	35	2	7	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING AUGUST, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of Years' Records.	Aug., 1932.	Aug., 1931.		Aug.	No. of Years' Records.	Aug., 1932.	Aug., 1931
North Coast.					*South Coast*—continued—				
	In.		In.	In.		In.		In.	In.
Atherton	0·80	31	2·08	0·77	Nambour	1·86	36	0·90	1·65
Cairns	1·69	50	3·55	1·15	Nanango	1·33	50	0·08	0·49
Cardwell	1·25	60	1·01	0·52	Rockhampton ..	0·95	45	0·11	0·20
Cooktown	1·24	56	0·72	0·66	Woodford	1·73	45	0·19	1·67
Herberton	0·62	46	1·32	0·61					
Ingham	1·42	40	1·41	0·23					
Innisfail	4·93	51	4·10	2·57					
Mossman Mill ..	1·21	19	2·54	1·10	*Darling Downs.*				
Townsville	0·51	61	0	0·10					
					Dalby	1·22	62	0·40	0·27
					Emu Vale	1·14	36	0·12	0·05
Central Coast.					Jimbour	1·18	44	0·17	0·30
					Miles	1·14	47	0·11	0·06
Ayr	0·57	45	0	0	Stanthorpe ..	1·80	59	0·50	0·72
Bowen	0·64	61	0·17	0·11	Toowoomba ..	1·67	60	0·78	0·38
Charters Towers ..	0·55	50	0	0·01	Warwick	1·49	67	0·15	0·23
Mackay	1·04	61	0·48	0·18					
Proserpine	1·29	29	0·80	0·22					
St. Lawrence ..	0·83	61	0	0·32					
					Maranoa.				
South Coast.									
					Roma	0·94	58	0·05	0·02
Biggenden	1·08	33	0·22	0·18					
Bundaberg	1·30	49	0·23	0·90					
Brisbane	2·01	81	0·38	0·90	*State Farms, &c.*				
Caboolture	1·56	45	0·27	1·02					
Childers	1·23	37	0·19	0·94	Bungeworgorai ..	0·79	18	0·05	0
Crohamhurst ..	2·23	39	0·97	2·95	Gatton College ..	1·15	33	0·60	0·46
Esk	1·52	45	0	0·66	Gindie	0·67	33	0	0·54
Gayndah	1·16	61	0	0·23	Hermitage	1·26	26	..	0·15
Gympie	1·74	62	1·24	0·62	Kairi	0·83	18	1·34	0·68
Kilkivan	1·47	53	0·40	0·39	Mackay Sugar Experiment Station	0·90	35	0·35	0·04
Maryborough ..	1·71	60	0·67	2·87					

J. H. HARTSHORN, Acting 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.

	October, 1932.		November, 1932.		Oct., 1932.	Nov., 1932.
	Rises.	Sets.	Rises.	Sets.	MOONRISE.	MOONRISE.
					a.m.	a.m.
1	5·36	5·48	5·6	6·6	5·52	6·43
2	5·35	5·48	5·5	6·7	6·27	7·45
3	5·34	5·49	5·4	6·8	7·11	8·52
4	5·33	5·50	5·3	6·8	7·59	9·55
5	5·32	5·50	5·2	6·9	8·55	11·0
						p.m.
6	5·31	5·51	5·2	6·10	9·57	12·2
7	5·29	5·51	5·1	6·11	11·2	12·59
					p.m.	
8	5·28	5·52	5·0	6·12	12·6	1·55
9	5·27	5·52	5·0	6·13	1·10	2·47
10	5·26	5·53	4·59	6·13	2·7	3·40
11	5·25	5·53	4·59	6·14	3·5	4·33
12	5·24	5·54	4·58	6·15	3·59	5·27
13	5·23	5·54	4·58	6·16	4·52	6·23
14	5·22	5·55	4·57	6·16	5·43	7·17
15	5·21	5·55	4·57	6·17	6·40	8·12
16	5·20	5·56	4·56	6·18	7·35	9·4
17	5·19	5·56	4·56	6·19	8·29	9·55
18	5·18	5·57	4·56	6·20	9·23	10·42
19	5·17	5·58	4·55	6·21	10·17	11·28
20	5·16	5·58	4·55	6·22	11·10	12·0
21	5·15	5·59	4·55	6·23	11·59	..
					a.m.	a.m.
22	5·14	5·59	4·54	6·23	..	12·35
23	5·13	6·0	4·54	6·24	12·46	1·6
24	5·12	6·1	4·53	6·25	1·27	1·38
25	5·12	6·1	4·53	6·25	2·4	2·13
26	5·11	6·2	4·53	6·26	2·37	2·48
27	5·10	6·3	4·53	6·27	3·10	3·30
28	5·9	6·3	4·52	6·27	3·44	4·24
29	5·8	6·4	4·52	6·28	4·20	5·23
30	5·7	6·5	4·52	6·29	4·59	6·30
31	5·6	6·6	..	..	5·47	..

Phases of the Moon, Occulations, &c.

7 Oct.	☾ First Quarter	6	5 a.m.
14 ,,	○ Full Moon	11	18 p.m.
23 ,,	☽ Last Quarter	3	14 a.m.
30 ,,	● New Moon	12	56 a.m.

Perigee, 2nd October, at 3.18 a.m.
Apogee, 17th October, at 4.6 p.m.
Perigee, 31st October, at 12.18 p.m.

The Moon will be in Virgo on 1st and 2nd October, in Libra till the 4th, in Orphincus on the 5th, Sagittarius till the 8th, Capricornus till the 10th, Aquarius till the 13th, Pisces till the 15th, Aries till the 17th, Taurus till the 20th, Gemini till 22nd, Cancer till 24th, Leo till 27th, Virgo till the 29th, and in Libra till the 31st.

Mercury sets 5 minutes after the Sun on the 1st and 49 minutes after it on the 15th.

Venus rises at 3.24 a.m. on the 1st and at 3.20 a.m. on the 15th.

Mars rises at 2.34 a.m. on the 1st and at 2.8 a.m. on the 15th.

Jupiter rises at 4.23 a.m. on the 1st and at 3.37 a.m. on the 15th.

Saturn rises at 12.29 p.m. and sets at 2.1 a.m. on the 1st; on the 15th it rises at 11.37 a.m. and sets at 1.5 a.m.

Mercury will be in Virgo and Libra during October; Venus, in Leo, will pass into Virgo on the 26th; Mars will pass from Cancer into Leo and will be near Regulus, the brightest star in the Sickle, at the end of the month; Jupiter, in Leo, will reach the border line between Leo and Virgo by the 31st; Saturn will be in Capricornus, moving slowly eastward.

An hour before sunrise on the 20th it will be interesting to look for the planets Venus and Jupiter which will apparently be remarkably close together in the constellation Leo.

Mars will be in conjunction with the Moon on the 24th at 4 p.m., when it will form an interesting daylight spectacle for those using telescope or binoculars. The Moon, being in the last Quarter will be only half illuminated. Two days later almost the same circumstances will accompany the conjunction, at 4 p.m., of Jupiter and the Moon. The conjunction of Venus and the Moon, at 4 a.m. on the 27th, will also be worth observing.

The Southern Cross will reach position XII. at midday on the 1st, at 11 a.m. on the 15th, and at 10 a.m. on the 31st, and its lowest position VI. at midnight, and an hour earlier at 11 p.m. on the 15th, and at 10 p.m. on the 31st.

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5 Nov.	☾ First Quarter	4	50 p.m.
13 ,,	○ Full Moon	5	28 p.m.
21 ,,	☽ Last Quarter	5	57 p.m.
28 ,,	● New Moon	10	43 a.m.

Apogee, 13th November at 8·6 p.m.
Perigee, 28th November at 12·36 a.m.

The occultation of Landa Aquarii, magnitude 3·8, will occur about 9 p.m. or later, according to the position of the observer. A telescope or binoculars will be required on account of the brightness of the Moon, making the star less distinct.

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.