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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The cause of "bunchy top" in bananas has been definitely fixed by an investigatory committee which, in a very valuable report published in extenso, suggests preliminary measures for combating this disease. Agriculture in Queensland is reviewed by Mr. Quodling, who also has a note on the process of pickling wheat with carbonate of copper. Mr. Shelton discusses further phases of pig marketing in the State. A valuable paper on soil acidity is contributed by Mr. von Steiglitz, while Mr. Brünnich supplies practical "fertiliser don'ts" for farmers. Methods of destroying insect and fungus pests are compared by Mr. Benson. Wheat crop prospects and the world's cotton position are reviewed. A short preliminary note on goats is another useful feature. The Clydesdale horse is interestingly treated by Mr. Hunter. A short note on Queensland trees by Mr. White and Mr. Francis is among the most valuable of regular Journal features. Among very useful reprints are notes on the profitable feeding of iodine to swine, the science of cookery, and fallowing—the basis of good farming. In addition is much practical and seasonable information on other matters in which readers are especially concerned.

Fruit Marketing.

Any effort to deal effectively with the organisation of fruit marketing is beset, as experience has shown, with many difficulties. A perishable product, fruit presents selling problems quite different from those of other soil products. With a view to improving the conditions of the industry by widening the scope of the Committee of Direction, the Minister for Agriculture and Stock (Hon. W. Forgan Smith) submitted to Parliament last month an amending measure which set out some important new principles, the chief of which was the extension of the power of the Committee beyond

the limits laid down by the High Court of Australia as defined in the principal Act. The amending Act also gives the Committee greater powers in the direction of arranging financial accommodation and other necessary functional activities. A very important clause enables any thirty fruitgrowers affected by any direction of the Committee to demand a poll before that direction shall have legislative or legal effect. Upon a poll being demanded it must be held and a two-thirds majority of those entitled to vote must be obtained before the direction in question can become legally effective. The sound principle is laid down that the person most concerned—the grower—shall have the final say as to whether compulsion may be exercised at the discretion of the Committee in respect to the marketing, or handling otherwise, of a particular commodity or not. Another important clause covers the conferring of property in a commodity. Under this provision the Committee of Direction may take the initiative. Where it is proposed to acquire property in a commodity, powers are given similar to those contained in the Primary Products Pools Act. First of all, a direction must be given by the Committee, and that must be approved by a vote under the conditions to which reference has been made. After that is done, if for any purpose property is desired in a commodity, the Committee must apply to the Minister for an Order in Council granting powers of acquisition. If an Order is issued, then that will be subject to the vote of the growers on exactly the same terms and under the same conditions as are provided in the Primary Products Pools Act. The amending measure should prove satisfactory to all sections of the fruitgrowing industry for, in these days, there are very few who do not believe in regulated, scientific marketing. It will establish conjointly with the principal Act a fruit marketing organisation which, if used with common sense and discretion, will do much to improve conditions in the industry, and encourage those engaged in a calling which is of vital importance to the State.

The Wheat Pool.

Last month the Minister (Hon. W. Forgan Smith) succeeded in passing through Parliament a measure to amend the Wheat Pool Act. Under the new legislation the Wheat Pool Board is given similar powers in respect to the building of reserves, effecting its own insurance, and other special purposes approved by wheatgrowers, as those given to boards constituted under the Primary Products Pools Act. Provision is also made for growers, if desired, to come within the ambit of that Act, for it is thought that as problems of marketing are similar in nearly all forms of primary industry, the Primary Products Pools Act contains all essentials in respect to the special circumstances of any phase of farming. The conditions that formed the basis of special wheat pool legislation have now disappeared, and for convenience of administration generally, it is desired to have all pool boards in Queensland operating under the same powers, under the same conditions, and under the same Act. The Wheat Pool Act was the first of its kind introduced in Queensland, and it had its genesis to a certain extent as a result of the Federal pool which was established in 1917. Queensland was not given any representation upon that pool. Later on a deputation of wheat farmers was introduced by the then leader of the Opposition asking the Government to introduce a Wheat Pool Bill in this State and to confer certain powers upon it. The Government fully considered the matter, with the result that the Wheat Pool Act was passed for a specific period; but power was taken under the Act by Order in Council to extend the operations of the Act from time to time as circumstances or public policy demanded. From then till the present day the wheat pool has been continued as a result of votes taken among the wheatgrowers themselves. On the last occasion something approaching 90 per cent. of the wheat farmers who voted decided for a continuation of the pool.

It may be fairly claimed that one result of this form of regulated marketing is that wheat cultivation has been extended in Queensland. In 1915, for example, the area under crop was 93,703 acres; in 1920 it had increased to 177,320 acres; and in 1924 it had again increased to 189,145 acres; so that it will be seen that the administration of a measure of this kind, which provides facilities for marketing by the growers concerned, has resulted in increased cropping. Growers under the pool will have the opportunity, if they so desire, to take a vote as to whether they shall come under the Primary Products Pools Act or not. If the vote results in an affirmative vote of at least two-thirds of those taking part in the poll, then the wheat pool will be brought under the Primary Products Pools Acts, all its assets and liabilities being continued under the new board. In other words, there will be a continuity of operations by the board, and no gap or interruption will take place in the general control of its business. If growers decide not to come under the Primary Products Pools Act but desire to remain under their own Act with all the powers that are contained therein, that is, of course, their own business. No one could be averse from that decision if made, and the old Act will continue as at present with the addition of the provisions of the amending measure under review.

Cotton Seed Beds—Value of Early Preparation.

Emphasis was laid by the Cotton Specialist (Mr. W. G. Wells) in a recent Press statement on the value of the early preparation of seed beds in the cultivation of cotton which he made following an inspection of the Callide Research Station located at Biloela. An excellent demonstration of the value of the early preparation of the seed bed was observed at the research station in a series of plots which had grown cotton last season. The last season's crop on these plots was ploughed out, raked up, and burned in the latter part of June, when there was a fair sprinkling of unopened and opened bolls showing in the tops of the plants and on the fruiting branches of the large vegetative branches. It was decided at the time that while the light top crop of bolls might contain cotton of some value, the early ploughing of the soil and the early preparation of the seed bed would more than compensate for the small loss incurred by the destruction of the crop. This plot received one good ploughing of a depth of 7 in. in the last week of June following a rainfall of 270 points on the 19th, and 78 points on the 20th, a total of 348 points. This rain was badly needed, as the soil had been so dry as to prohibit a good ploughing being made. The plots were disced and harrowed following the ploughing. The rainfall after these operations was as follows:—4th July, 25 points; 11th July, 58 points; 28th July, 13 points; 29th August, 29 points; 30th August, 10 points; 16th September, 137 points; 17th September, 52 points; total, 3.24 in.

The plots were harrowed thoroughly after each precipitation of any note, so that by the time of planting, which occurred on 22nd September, a well-settled, springy seed bed had been prepared. A good strike was obtained, and cultivation was effected as soon as the rows were discernible. When inspected on 27th October, the plants averaged 6 to 8 in. in height, and were standing up well under droughty conditions. An examination of the soils at the time of the inspection of the plants showed that, while the surface soils were very dry to the depth of 2 to 3 in., from that point on there was ample moisture, and the subsoils at about a depth of 7 in. were in excellent condition. In contrast to this plot was a piece of newly-cleared country which had been ploughed for the first time in August, and then cross-ploughed in September, and disced and harrowed after the rains in the middle of that month. The seed bed in this plot was of a very open nature, with little moisture to a depth of 6 in. A heavy rain would be necessary before this seed bed would have settled sufficiently to offer any assurance that a crop of cotton could withstand a drought of any degree.

The same results had been obtained by the growers in the various cotton areas of the Central Queensland district. The field officer of the Cotton Section for this district stated on 2nd November that it was pleasing now to find that these men who prepared their seed bed early had been rewarded with a good strike of cotton. Although the last fall of rain of any consequence was on 14th September, the moisture conserved in the early prepared fields had been sufficient to maintain a healthy growth in the young plant, and the subsoil in these fields is still thoroughly moist. On the later prepared fields the stands were not so satisfactory, and the plants were droughty and unthrifty.

Mr. Wells pointed out that some criticisms of the quality of the seed supplied to the growers this season were met with, but undoubtedly most of the trouble experienced on this point this season had been from planting too deeply in the cold seed beds. Under the cold night temperatures of this spring, it was very necessary to plant at a shallow depth, especially if the surface soils were well moistened, as the soil temperature had risen so slowly that much of the seed had rotted if planted at a greater depth than 2 in.

It had been brought to attention that some of the growers in the Southern and inland districts of a higher altitude were contemplating abandoning planting cotton this season owing to the lateness of the rains. It was pointed out that there had been no definite tests made in these areas as to what results might be obtained from November plantings. Results obtained last season at the Monal Creek Farm in the Upper Burnett, where 7.2 deg. of frosts were received on 21st April, indicated that profitable yields might be expected from November-planted Durango cotton when 1,120 lb. of seed cotton were obtained in a time of planting experiment.

It was admitted that early planting was preferable, as much heavier yields might be obtained, but it was considered advisable for the growers to test out the Durango variety on their own soils, if only with a small test plot, before definitely deciding against November planting.

BUNCHY TOP IN BANANAS.

CAUSE AND NATURE OF DISEASE.

REPORT OF INVESTIGATION COMMITTEE.

The Bunchy Top Control Board, consisting of Sir George Knibbs (representing the Commonwealth Government), Mr. G. Valder (Under Secretary for Agriculture, New South Wales), and Mr. E. Graham (Under Secretary for Agriculture and Stock, Queensland) has received from the Supervisor of the Bunchy Top Investigation (Dr. Goddard) this valuable Report dealing with Bunchy Top disease. The Investigation Committee consisting of Professor E. J. Goddard, D.Sc., M.A. (Supervisor), Mr. C. J. P. Magee, B.Sc. Agr., Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist), considers that the time has now arrived when, in the interests of banana-growers, a definite statement should be made as to the cause of Bunchy Top disease in bananas, and at least preliminary suggestions put forward as to the means of combating the disease. The subject of report, as widely recognised, is one of first importance to the industry, and the results of the investigation as set out hereunder will be welcomed by banana-growers throughout the State.

CAUSE AND NATURE OF DISEASE.

It has been definitely proved that Bunchy Top in bananas is a disease transmitted by the common dark banana aphid—*Pentalonia nigronervosa*. The intimate association of these insects with the disease was proved by observational and experimental work as early as January and February of the present year, but it was considered not to be in the interest of the investigation or of the banana-grower that any official statement should be made earlier than at the present time. It is very easy to form opinions as to the nature of such a disease, but the scientific investigator concerned with such a disease as Bunchy Top, on which much effort has been expended in various parts of the world, must prove his statements to the hilt, and any official communication should be as complete as possible. The preliminary evidence of the experimental transmission of the disease by means of aphides was obtained in January and February of this year at the Laboratory, Tweed Heads, and at the Queensland University, but it was necessary that these experiments should be confirmed under glasshouse conditions—which were available only in April, 1925. Growth of the plants under winter conditions had delayed the suitable time for experiments, but now the final proof is available. The evidence in support of this statement is briefly as follows:—Forty healthy plants from Bribie Island, free from any insects, were planted in tubs in the glasshouse—twenty in each half of the glasshouse, which is divided by a wall into two insect-proof sections. In the case of one set of twenty plants aphides from affected plants were transferred to the individual plants, and of these every plant has now developed the symptoms of Bunchy Top within a period of less than one month since the transference of the aphides. It is noteworthy that not one of the other set of twenty plants has developed any signs of Bunchy Top. This final proof of the transmission of the disease has become available only during the past week.

The foregoing remarks should serve alone to justify the delay in the official publication of the discoveries made by the investigation. These results, we are aware, have become more or less known unofficially throughout the affected area, but there are further very definite reasons why no official blessing has been given to statements which have made their way into the Press. It is one of the main objects of such an investigation to proceed further even than elucidating that a certain insect transmits the disease, and to elaborate some means of controlling the disease. In facing such a problem we have been concerned with determining whether the disease can be

transmitted by any other insect, and whether the disease can be transmitted from banana plants to other species of plants, such as hemp, canna, &c., by aphides or other insects. All these facts have a bearing on the possible methods of control of the disease.

A Virus Disease.

The evidence now available justifies us in regarding the disease as a virus disease transmitted, at least, by the dark banana aphis—*Pentalonia nigronervosa*. In some virus diseases there is a marked effect in the phloem—that part of the plant which serves for the transference of food material from the leaves to other parts of the plant. Detailed examination of this part of plants affected with Bunchy Top, as well as of associated tissues, has revealed a most interesting and unique pathological condition, the details of which will be of much interest to the scientific world when they have been described in scientific language. It is unnecessary to discuss these changes at this stage beyond stating that the representatives of vessels known as sieve tubes, serving normally for the transportation of food material, have undergone a peculiar alteration in certain regions of the phloem of the leaves of affected plants. This condition has bearing in some interesting way on the broken green streaks so characteristic of affected plants, and serving for the early detection of the disease. Perhaps the most significant aspect of these conditions in the phloem is the corroborative evidence they lend to the interpretation that Bunchy Top is a virus disease—that is, a disease due to an ultra-microscopic organism.

We have definite evidence that Bunchy Top is transmitted by the banana aphis—*Pentalonia nigronervosa*. As this species of aphis is widespread in banana plantations of Northern Queensland, where as yet no Bunchy Top has been reported, there is reason to believe that in Northern New South Wales and South-Eastern Queensland this insect is carrying some factor which induces the disease. Reasoning by analogy and taking as an instance other aphis-transmitted diseases, such as some of the degeneration diseases of the common potato, it would seem that Bunchy Top falls in the category of so-called virus diseases. This class includes those transmissible or infectious diseases which are perpetuated indefinitely by vegetative growth and reproduction, and of which no cause has yet been identified and demonstrated—except in the recent cancer investigations, where specially improvised apparatus was used. The name "virus" is the name given to this "unknown" cause. The virus, which by some pathologists is supposed to be of the nature of an ultra-microscopic organism, seems to be associated with the plant juice or sap. This class of disease can in many cases be quite readily transmitted from diseased to healthy individuals by direct inoculation of sap. In the case of other virus diseases, it is necessary that the inoculum be introduced into a particular region of the vascular system of the plant. There are some virus diseases which are transmitted only by means of aphides and by grafting, and in the case of these it has been shown that the aphis inserts the proboscis into the region of the phloem. Bunchy Top would appear to belong to this latter group.

It would be premature to conclude definitely that the disease cannot be transmitted by direct inoculation of sap, but the early out-of-doors experiments made in 1924, and more recent experiments made with sap inoculation in the glasshouse at the same time as the successful experiments with aphis-infection, have as yet failed to give results. The excessive development of chlorophyllous tissue, together with the dwarfing of the plant and rosetting of the leaves, support the idea of the virus nature of the disease. The absence of symptoms from foliage that has attained full growth before the introduction of the virus is also a characteristic of these infectious diseases. In the case of Bunchy Top plants, the first symptom of the disease is the appearance of broken dark-green streaks along the secondary veins of the leaf blade. This symptom does not later appear in leaves which were thrown earlier and had attained maturity. Further evidence is the fact that eyes removed from a rank Bunchy Top stool, surface-sterilised and planted in sterilised soil under glasshouse conditions, have in all cases produced Bunchy Top plants. Internal examination of such eyes reveals no organism, under microscopic or cultural tests, on which suspicion could lie.

Cause of Disease Definitely Established.

It should be stated that among the various theories which were previously put forward to explain the cause of Bunchy Top, there was that which postulated that aphides were the cause of the disease. This theory was put forward by Mr. J. Marks, of Terranora, in 1922, and has had some following on the part of other planters in

various parts of the affected areas. The position in this respect, when the present Investigation Committee undertook duties, was that nothing had been proved or disproved, and an open mind was displayed in respect to this and the other theories as to the cause of the disease. It can now be definitely stated that the cause of the disease is no longer a matter of opinion, and that its nature has been definitely established.

CONTROL MEASURES.

A knowledge of the nature of the disease and its mode of distribution enables us at this stage to make definite recommendations to growers in lightly affected areas; and the value of such has been to some extent attested in the field. It is to be understood, however, that there still remains ahead of the Invstigation Committee a considerable amount of work involving the elucidation of certain aspects which may have an important bearing on the matter of control. As examples of such we might refer to the necessity for a knowledge of—

(*a*) Details of the life-history of the aphides;

(*b*) Number of generations of aphides through which the virus persists;

(*c*) Liability of other plants, such as Manilla hemp, canna, arrowroot, &c., to the disease;

(*d*) Habits of the dark banana aphis in respect of other possible host plants, &c., &c.

Progress is being made in the investigation of such, but it is quite premature to attempt at this stage to lay down final recommendations applicable to the entire affected area. It is for the reason that we feel that valuable recommendations can be made for the lightly affected areas, and that certain unjustifiable semi-official statements have recently been made in the Press, that an attempt is here made to set out the exact position in the present state of our knowledge.

The disease is spread by the transference of affected suckers and by means of aphides. The carriage of the disease to new or lightly affected areas can be largely avoided by the elimination of the first method by growers, who should understand that any plantation which has ever developed the disease in any part is to be regarded as dangerous in practice. The distribution of the disease by means of aphides is facilitated by the presence of one or a few affected plants in a plantation and by the proximity of affected plantations. Winds may assist the aphides to traverse fairly wide zones, but we feel that the adoption of the following recommendations will enable growers in lightly affected areas to combat the disease by making conscientious efforts to cope with the methods of natural distribution.

Recommendations to Growers in Lightly Affected Areas.

(1) Secure suckers only from areas in which Bunchy Top has not yet been recorded. Such areas are available only in Queensland, some distance north of the Brisbane River. No reliance should be placed on any apparently healthy plants in any plantations in which Bunchy Top has ever appeared, as it may happen that the disease may be about to develop in such.

(2) Carry out at least a weekly examination of each plant in each stool, paying careful attention to the last leaf in each plant, and observing whether there is any trace of the characteristic broken dark streaks in the leaf blade. A definite day at least each each week should be set aside for this purpose.

(3) Do not plant out more suckers than can be satisfactorily dealt with in such a weekly inspection.

(4) Deal at once with any affected stool as follows:—

(*a*) Spray the whole stool thoroughly, as well as the surrounding soil, with Black Leaf 40, in order to kill any aphides present.

(*b*) Dig out the stool complete, even if only part is affected, and cut all parts of the plants into slices with a cane knife or suitable implement. (There is no necessity, nor is it advisable, to carry away such material, which can be left to die in the plantation. (A very conscientious grower might well give an additional spraying to the cut-up material.)

(5) We would most strongly dissuade growers from following the advice rendered by sellers of certain poisons, whose value, as advertised, consists in the fact that they kill off only those parts of a stool which have been treated. As in most cases most followers will develop the disease, this method is really aiding the distribution of the disease.

Success in fighting the disease lies in the earliest detection of diseased stools and their immediate destruction. It is appreciated that there is in many plantations a great difficulty in removing stools by digging-out, owing to the presence of boulders. In such cases it would be excusable to cut down the stools after spraying them, and then to poison each individual plant. For such poisoning, the butt of each individual plant could be treated with kerosene, until such time as a specific and cheap poison can be recommended by the Investigation Committee. Poisoning should not be reverted to unless digging-out is an impossibility.

(6) Growers should encourage their neighbours to follow the above procedure as diligently as themselves, since without such help every assistance is being rendered towards gradually transforming areas now lightly affected into heavily affected areas.

(7) As information is not yet available as to the number of generations of the aphides through which the virus can persist, and the aphides are to be found in abundance in the soil, growers cannot be recommended to plant suckers in holes from which affected stools have been removed. It is premature to make definite suggestions at this tage as to any effective means of treating such holes to the extent of ensuring safe planting in them.

(8) There are good cultural reasons why banana plants should be set out in rows 12 feet by 12 feet, and the adoption of this method of planting should offer at least some advantage in possibly withdrawing one means of ready distribution of aphides.

Heavily Affected Areas.

While the Investigation Committee feels that there are ready means of keeping the disease under control in lightly affected areas, the case is otherwise in heavily affected areas.

It will be appreciated that in combating Bunchy Top, two lines of attack are suggested—

(1) Removal of the source of inoculum—namely, affected plants; and

(2) Some method of dealing with the vector or carrier—namely, the aphides.

Of these two the most satisfactory would be the complete removal of the source of inoculum, and it is because this is practicable in lightly affected areas that it is possible to suggest definite recommendations as outlined above. This is not immediately practicable in the heavily affected areas, where there are so many deserted and heavily affected plantations in close proximity. This condition directs attention to the possibilities of dealing with the aphides. There are certain plantations where it is alleged that control is, at least, effected by spraying with Black Leaf 40. The Investigation Committee is not in a position to substantiate this conclusion at this stage, but final judgment on the matter should be rendered in the final report of the Investigation Committee, which should be available about the end of the present year.

A very considerable amount of time has been devoted to spraying and dusting on the experimental plots at Cobaki, but we do not look forward with great optimism to this as a practical method of control at this stage. However, final judgment is withheld for the present.

Some partial control by means of spraying would appear to be suggested in the experiments conducted by Mr. J. Marks at Terranora in 1922 with kerosene emulsion, and the experiments which are being carried out by Mr. H. Legg at Upper Burringbar with Black Leaf 40, but it cannot be emphasised too strongly that we cannot recommend this as a practical control measure in areas where the supply of virus is so readily available in deserted plantations.

While recognising that isolation may play its part, and that growers differ so much in respect of thoroughness, the Investigation Committee would at the present stage dissuade growers from planting bananas within heavily affected areas. Further discussion of this matter must be left over to the final report, as it would be premature in the present state of our knowledge to express any further opinions in this connection.

Lastly, in view of the fact that Queensland, north of the Brisbane River (with the exception of Brookfield), has so far escaped the disease, and as along the Richmond River in New South Wales there are many localities free, or practically free, from the disease, the transportation of suckers to any of these areas from the affected

zone should be effectively prohibited. Regulations in this connection do exist in Queensland, but no harm can accrue from emphasising the absolute necessity for the observance of the regulation.

Resistant Stocks—Negative Results.

It may be stated that the committee holds out little hope of any success in the attempt to secure resistant plants. A number of carefully selected plants were brought from Fiji, but most of them had to be destroyed owing to the presence of beetle borer. Eyes from some have been planted at St. Helena, but this experiment is now viewed with general interest rather than with any anticipation as to the economic possibilities. Our experience with apparently resistant plants within the affected area offers no prospects of conquering the disease along the line of resistant stock. The same criticism applies to the consideration of any variety other than the Cavendish banana.

HISTORY OF THE PRESENT INVESTIGATION.

The Investigation Committee, consisting of Professor E. J. Goddard (Supervisor), Mr. C. J. Magee, B.Sc., Agr. (Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist), undertook the responsibilities of the investigation of Bunchy Top in May, 1924, on the recommendation of a commission which represented the Commonwealth Government and the New South Wales and Queensland Governments.

A considerable amount of work had previously been devoted to the problem by scientific workers in Australia as well as in Fiji—where the disease had been present for practically forty years—Philippines, Ceylon, and Egypt, but no definite cause could be proved. Certainly it had been suggested by some that the disease was caused by eel-worms—in Fiji, Philippines, Queensland, and Egypt—while various others had suggested that the causal agent was a fungus, chemical deficiency of the soil, deterioration of the banana stock, climatic factors, aphids, &c. There was no substantive evidence to strengthen the claims of these opinions, and as the ravages of the disease along the Northern Rivers of New South Wales and in South-eastern Queensland were so intense, it became clear that any attempt to solve the problem would have to be made by scientific investigators working on the spot. Only in this way would it be possible to determine the actual cause. The Investigation Committee determined to keep the question quite open and to refuse to eliminate any suggested probability or to refuse to consider any probable cause which might arise, unless conclusive evidence compelled.

Work at Tweed Heads.

A laboratory was founded at Tweed Heads, and experimental plots were leased at Cobaki from Messrs. T. Pilgrim and McAlister. The investigation work at the laboratory was attended to by Mr. C. J. Magee, and the horticultural work at the plots were under the care of Mr. H. Collard. In the interval, awaiting the planting season, Mr. Collard was sent to Fiji to gather first-hand information as to the history of the disease in those islands, its present status, and the possibility of securing resistant or immune stock.

Attempts to isolate any constant fungal or bacterial agent from the various parts of affected plants were unsuccessful, and after a period of six months, during which visits were constantly made to various parts of the affected area, noting the behaviour of plants in deserted plantations as well as the initial and early stages of infestation in other plantations, it seemed highly probable, in view of discoveries mentioned later, that the trouble would not be attributed to any such agent. Nevertheless, further work was anticipated along pathological lines, since some casual agents—*e.g.*, bacteria—are very refractory and do not readily respond to cultural experiments. The details of the pathological procedure will find their place in a complete final and scientific report.

Meanwhile the investigation was also devoting attention to the matter of nematodes or eel-worms, since these were found to be abundant in all plantations, and their presence readily indicated by the almost constant presence of galls on the roots of affected and apparently non-affected plants. Plants from Northern Queensland were planted in tanks filled with steam-sterilised soil at the laboratory, with a view to settling the possible effect of soil factors—*e.g.*, nematodes, parasitic fungi, and bacteria—in a purely preliminary manner. It soon became apparent that such experiments, if they were to be of any scientific value, would have to be carried out under such conditions of control as obtain in a properly equipped glass house. This development and the necessity for such a glass house for the purposes of other

experiments which were to be tried out, compelled the supervisor to request the erection of such a glass house; the cost of the erection of this building was considered to be insignificant for scientific purposes where the national loss due to the disease was so great.

The investigation had for some time been desirous of enclosing plants in muslin or cheese-cloth nets, with a view to conducting preliminary experiments as to the transmission of the disease by insects to healthy plants grown in sterilised soil, but there was reason to believe that for out-door work in this area such nets would not be successful on account of violent winds. Such experimental work was delayed largely by the determination to postpone the same at that stage until a glass house was available.

Keeping in view the possibility that the disease might be of the Mosaic type of virus disease, attempts were made to produce the disease in healthy plants from Northern Queensland grown in sterilised soil, and inoculated with the sap of affected plants. There was no evidence manifested for the transmission of the disease in the material used in these preliminary experiments, but it was recognised that further work along these lines should be carried out when the glass house was available. Similarly, no results were obtained by inoculating sterilised soil with three species of fungi which were isolated from the roots of some specimens of plants affected with Bunchy Top. Further, the association over a long period of diseased and healthy plants in sterilised soil and in the same pot, out-of-doors, so that the roots were in intimate association, failed to produce the disease in the healthy plant (an experiment which has since been repeated with several plants under glass house conditions with the same results). Meanwhile, considerable work was accomplished on the experimental plots.

One of these with excellent soil had previously been affected with Bunchy Top, and after being leased has been thoroughly ploughed (part of it had rested for a period of several months) prior to the planting of the same by the Investigation Committee in October, 1924. The plants were selected from various areas—some were plants which appeared to have stood out against the disease in affected plantations, some which appeared to have shown some signs of healthy constitution taken from a deserted plantation, healthy plants from Bribie Island and Bracalba (Queensland), and three species of wild bananas from the neighbourhood of Cairns. The objects in this experiment were to determine the possibilities of resistance in local stocks, the possibilities of recovery from the disease, to make an intensive study of the incidence of the disease in originally undoubtedly healthy plants, and to determine the possible effects of cultural treatment in upholding resistance in healthy plants, and the possible resistance of wild stock to the disease.

Another plot on virgin land which had grown lantana for eight years was cleared and planted with healthy stock from Bracalba. It was considered that, if soil factors such as physical and chemical constitution, bacteria, fungi, or nematodes played the major role in the direct production of the disease, it was possible that the plants on the plot of virgin land would stand out in contrast to those on the other plot which had carried Bunchy Top plants.

The early outbreak of disease in the plot of virgin land in January, 1925, and its rapid development throughout that plot within a few weeks, contrasted with the very slight development of the disease on the other plot, came as a surprise, and led to an intensive study of the conditions prevailing in this plot. It was noticed that aphides were particularly abundant on this plot, an abundance possibly to be attributed to the topography of this lower plot being responsible for the bringing about of conditions more favourable for the aphides.

At once aphides were transferred from affected plants to healthy plants in sterilised soil placed under nets in the grounds of the laboratory, and the disease made its appearance in these experimental plants in about three weeks. The experiments were repeated by transferring aphides from affected to healthy Bracalba plants grown under nets in the University grounds at Brisbane, where the disease appeared in several plants in twelve days. Thus a definite lead was established to the investigation, and at once preparations made for following up these results in the glass house, arrangements for the construction of which had then been completed. The success of the later experiments has been set out above. The Supervisor welcomes the opportunity of stating that the results obtained are largely due to the outstanding ability and enthusiasm of the Assistant Plant Pathologist, Mr. Magee, and the keenness, diligence, and practical ability of the Horticulturist, Mr. H. Collard. To them he owes everything in the accomplishment of that portion of the task now completed.

Photo.: Poulsen Studios.] PLATE 116.—AGRICULTURAL BANK, QUEENSLAND—INSPECTION STAFF, 1925.

Front Row (from left): A. D. Soares, J. Smith, A. P. Deshon (Assistant Manager), A. H. Smith (Manager), W. R. Heathwood, A. C. Palmer (Senior Clerk), C. H. Thrupp.

Second Row: S. Stevens, A. H. T. Bedford, C. S. Ross, E. W. Everett, P. J. Richards, W. B. Smith.

Back Row: O. Byrne, V. T. Barkla, E. W. Wanstall, K. Hunter, P. J. O'Donnell, G. H. B. Watson, R. J. Calder, J. P. G. Toft.

Insets: A. Harrison, W. S. Robinson. *Absent:* F. W. Haynes.

AGRICULTURE IN QUEENSLAND.

By H. C. QUODLING, Director of Agriculture.*

Maize.

Last July and for a few successive months, a superabundant crop was harvested. The average yield per acre proved to be higher than for any previous season in the history of the State. On the Darling Downs, where maize yields are very often irregular, it was not uncommon to find large fields averaging 60 bushels per acre. Returns from other districts were also good, and those on the Atherton Tableland constituted a record.

The most disquieting factors were the lack of demand and the absolutely low market price for the grain. Southern States also had abundant crops, and it was brought home in only two realistic a way to producers that the motor was effectively usurping the horse as a means of transport. Shipment overseas was the only possible method of relieving market congestion, and luckily maize was in short supply. The net prices realised furnished shippers with a small margin of profit, enabling them to handle an appreciable quantity of grain. The largest individual shipment was a parcel of 5,000 tons of Atherton-grown maize from Cairns. In Southern Queensland 2,185,176 bushels were inspected and passed for export. Judging by reports, the grain carried well and opened up satisfactorily.

Season 1924-25.

Throughout the whole of planting season, the maizegrower found his position to be most unsatisfactory; there remained a big carry-over from last crop, and prices for the grain were about on a par with the cost of production. As a consequence a lesser area was put under crop. On the Atherton Tableland, where the maize storage silos of 9,000 tons capacity were put into commission for the first time, the Pool Board had to cope with an extraordinary situation, with a crop exceeding 18,000 tons. This year, a lesser area was cropped, with a consequential reduction in output, which will probably run into a few thousand tons for this district alone.

In Southern Queensland, more particularly on the Downs and in parts of the Burnett district, much loss—70 to 80 per cent.—was occasioned to standing crops by a plague of mice. Stacks of cobs awaiting the thresher, and bagged grain, have also been taken toll of. These causes were contributory to an improvement now taking place in the price of maize.

Seed Maize Improvement.

The officer responsible for the technical work involved in the improvement in type and yield of grain, Assistant Agricultural Instructor C. McKeon, has demonstrated the value of its application in the field, and the method of selection and propagation of high-yielding strains for subsequent sale to growers is undoubtedly exercising a marked improvement in the quality and cropping capacity of Queensland-grown grain.

Maize Reaper-Thresher.

The recently invented maize reaper-thresher, to which attention was drawn in last year's report, proved most suitable for the work for which it was designed. Manufacturing was taken up by the Eclipse Windmill Company, Toowoomba. The work performed by the machine proved most satisfactory, and several are now in use in different parts of the Downs. The invention ranks with other notable efforts of Australians, and promises to have a far-reaching effect in reducing the cost of production of maize. A practical grower at Cambooya who purchased one of the machines supplied figures respecting harvesting costs after allowing for fuel, wages, horses, interest on capital value, and depreciation, and these showed that the complete harvesting and bagging of the grain in the field cost 2½d. per bushel.

Wheat.

With a view to a first-hand study of the problems of the industry, an itinerary covering a survey of the principal wheat-producing districts was made last harvest. Evidence was available, generally, of the fact that growers are keeping up to date in the matter of labour-saving cultural and harvesting machinery, and that the time is not far distant when an appreciable increase in the area under crop may be anticipated.

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* Taken from the Annual Report of the Under Secretary for Agriculture and Stock (Mr. E. Graham) to the Minister for presentation to Parliament.

In many localities wheat serves the dual purpose of a fodder and grain crop, and works in with sheep and dairying.

The existence of an established marketing organisation—the Wheat Pool—on which growers have direct representation, has engendered a spirit of confidence and optimism in the industry not present before the Pool was formed.

Figures respecting last season's returns have not been made available yet by the Government Statistician; those supplied by the Wheat Board show that an area of 177,779 acres was under crop for a yield of 2,600,000 bushels.

Prices appear to have been satisfactory, as overseas markets, although showing the influence on many occasions of American speculation, have generally been good. Some fair-sized parcels, shipped after harvest by the Pool Board, approximating 772,000 bushels, found a ready market. Had last season not been marred by continuous rains immediately prior to and during the harvest, inducing rust and an inevitable bleaching and sprouting of a proportion of the grain in the ear, there was every indication of an exceptionally heavy average yield. In some localities, late frosts in October also caught a number of crops on low-lying ground whilst they were flowering, and even up to the period when the grain was in the thick milk stage.

The amount of energy put into the preparation of the seed-bed for the 1925 crop, and the utilisation of additional land for wheat, foreshadows a pronounced increase this year in the aggregate area. Owing to the lack in the autumn of rain, the sowing of slow-maturing varieties grown for feeding off at first by dairy cattle, had to be abandoned. Light general rains, however, fell early in June and in time for the main planting season. Sowing has since been energetically carried out. Mice took levy of the seed wheat held for sowing, and caused much loss; even after the seed was drilled in their depredations continued. Some fields will, in consequence, be patchy, and in places a thin stand is inevitable. Notwithstanding this initial set-back, an optimistic view is warranted respecting the improved position of the wheat industry generally.

Wheat Experiment Work.

The data obtained were the result of the work of officers of the Field Branch, set out in detail in the reports of Agricultural Instructor A. E. Gibson and Assistant Agricultural Instructor C. S. Clydesdale, and proved invaluable in determining the better types of wheat to persevere with in the all-important work of selecting suitable varieties for the several districts where wheat is commercially grown. The inspection of the various wheat plots made just before harvest time, according to arrangement with the manager of the Roma State Farm, proved most helpful in permitting observation work on the large number of new cross-bred wheats produced by that officer, which were under trial at a number of different centres. As the season was generally conducive to rust, certain resistant strains were selected for further propagation. It is gratifying to note that some of the more recently fixed strains of wheat show great promise.

As the results obtained by the establishment of wheat experiment plots in different districts have been most encouraging, plans were made this year to extend the scheme to take in the following places:—Inglewood, Pratten, Hermitage, Allora, Kaimkillenbun, Jandowae, Pittsworth, Southbrook, and Murgon. Increased areas of promising varieties gradually worked up from single-row tests have been planted, and a comprehensive series of tests is being carried out at several of the more important centres.

Canary Seed.

During the season considerable improvement was shown in production and price, 955 tons being produced, the estimated value of which was £33,425. Now that a pool is operating, market control is possible. The season before last canary seed was low in price, and the carry-over stocks too heavy to induce extensive planting.

It is now satisfactory to be able to record a more healthy condition of the industry.

English Potatoes.

Apart from the very big trading connection of Southern ports with those north of Brisbane, importations recorded in Brisbane by sea and rail from 1st July, 1923, to 30th June, 1924, totalled 356,798 bags, with an estimated value at £8 per ton of £219,568; similarly, for the corresponding months of 1924-25, 234,364 bags valued at £144,224. Those figures are sufficient to indicate that potato-growers here are, in the aggregate, losing large sums of money through not catering for requirements. Generally there are two distinct planting seasons—spring and autumn. The quality of Queensland-grown tubers is, in the main, good, and it is difficult to assign a reason for the anomalous position disclosed.

The Department has made a practice of introducing potato varieties that have proved popular in the South to different districts, testing them in the field, and subsequently ensuring that the better kinds are brought into cultivation.

In the North, the Instructor in Agriculture is endeavouring to initiate a system of maintaining a continuity of seed supplies between the coastal and tableland districts, in order to obviate the heavy expense now incurred by the purchase of Southern seed.

Onions.

Insufficient attention is paid to this crop in Queensland, as undoubtedly a good market exists. As with English potatoes, appreciable quantities of onions are brought from the South. The Brisbane trade from Southern States by sea and rail reached a total of 55,818 bags from 1st July, 1923, to 30th June, 1924; and for a similar period in 1924-25, 40,808 bags.

Oats.

During the season it was noted that more attention was paid to this crop for making hay, particularly in the Toowoomba and Southbrook districts. Wet weather had an effect on the quality of the product. In anything like normal seasons there is no apparent reason why greater quantities of oaten hay and chaff should not be grown to take the place of Southern fodder and keep more money in the pockets of Queensland farmers.

Barley.

The high yielding capacity of malting barley, and the ready market at hand at the Toowoomba malthouse, should make this crop more popular with Downs farmers. Similarly to wheat, which ripened at the same time as last season's barley crop, the grain was affected generally by too much wet weather, which caused its discolouration, and, in consequence, a slightly reduced price. There was evidence in the barley fields of too great a degree of smut and of weeds introduced with Southern-grown seed, disabilities which call for preventive measures.

Cape and skinless barley were found to be popular among dairy farmers, who used these varieties to a considerable extent for grazing off to make up for the deficiency of natural pastures, so much in evidence on small holdings stocked beyond all reasonable limit. On areas (particularly on the Darling Downs) coming under this latter category, the practice of lightly working soil surfaces in paddocks for drilling in barley for grazing off is well worthy of adoption.

Lucerne.

Prices for anything approaching prime cured hay, and chaff cut from this quality of hay, have been generally good. The recovery of lucerne fields, and the good crops obtained during the spring of last year, could not have afforded more convincing evidence of the value of this plant. Ample scope exists for its increased cultivation, and dairymen and stock-raisers generally would be well advised to work systematically towards the fullest possible extension of their individual lucerne areas.

Tobacco.

The pipe tobacco industry remains in a parlous state, largely for the want of suitable flue curing houses, manufacturers having practically issued an ultimatum to growers that the flue-cured leaf is the only kind they are prepared to buy. The industry is worth putting on a good footing, as this kind of tobacco thrives well on the soils of the Inglewood and Texas districts, where leaf of prime quality is grown. Expert knowledge is essential for the resuscitation and reconstruction of the industry on modern lines, and the appointment of a qualified instructor is recommended.

In the North, particularly in the Bowen district, the growing of cigar tobacco is carried on in a small way. Here also much scope exists for the extension of this branch and the establishment of central depôts for the classification and treatment of the leaf. Australia imports large quantities of leaf, and the building up of the pipe, cigar, and cigarette tobacco industry is a matter of very great importance to the State.

Cassava.

The steps taken by the Honourable the Minister to establish cassava as a crop for the production of power alcohol, and the introduction during the approaching spring of large consignments of cuttings from Java, for planting up an area of

about 300 acres in the Mackay district so that supplies of cassava may be available for manufacturing purposes at the Plane Creek mill, should do much to start this industry on a sound footing. A commercial crop of this character, supplementary to sugar, should be invaluable in advancing agriculture in the North.

Upland Rice.

The importation of samples of different varieties was followed up by the establishment in different districts of small experiment plots, under the supervision of the Northern Instructor in Agriculture, who has reported favourably in respect to certain kinds. Next season larger areas will be propagated of these latter, with a view to extension work under field conditions. Upland rice comes under the category of a white man's crop, as it can be dealt with by modern labour-saving machinery. Certain parts of the North produce excellent rice of this description, and it is hoped to make the crop more popular.

Renovation of Old Paspalum Pastures.

Dairymen who developed scrub lands some years ago, and planted paspalum, have found their pastures unresponsive and of a lesser carrying capacity than formerly. The same thing happened in New South Wales, throughout the Northern Rivers districts. The primary reason for the deterioration is the "matting" of the grass roots and a consequential reduction in plant vitality. Were it possible to break up the sod by ploughing, all would be well, and a new lease of life for the grass would result, providing the soil was naturally rich; however, the presence of stumps and roots, and at times the steepness of hillsides, does not always permit of this being done. With a view to the completion of data respecting the resuscitation of this kind of pasture, also the improvement in its nutritive qualities, two experiment plots were established on the North Coast—one at Maleny, on a deep rich, red, volcanic soil, and the second at Cooroy, on the characteristic clay loam resting on a clay subsoil. Full particulars of the plots and of the fertilisers used, both on ploughed and unploughed land, are given in the report of Assistant Instructor in Agriculture, C. S. Clydesdale, the officer deputed to carry out the tests.

Some indication of the stock-carrying capacity of the Maleny district may be gauged from the tonnage of grass cut from the experiment plots.

On 12th December, 1924, one-half of the plots was ploughed and harrowed, the remaining half being harrowed only, the treatment with fertilisers being the same for each series, these being applied ten days later.

A cutting of grass was taken from the hurdled area on each of the sixteen plots on 25th February, 1925, the heaviest yield being from Plot 8, one of the ploughed and fertilised plots, which gave a return of 4.63 tons per acre. On 15th April, the four months' growth of grass on the uncut portion of the different plots was weighed. In this instance the tonnage on Plot 8 was 7.03 tons per acre. This latter figure, however, was exceeded by two of the unploughed fertiliser plots—6A and 7A—which gave the high returns of 8.79 and 8.12 tons of grass per acre.

As the Agricultural Chemist, Mr. J. C. Brünnich, is engaged in the analytical work on the soil, and on the grass as it is cut from each respective plot, valuable information should be forthcoming at the conclusion of the tests.

During the approaching season it is purposed to establish additional experiment plots of this description on the Atherton Tableland, where paspalum pastures are also less productive than formerly.

State Clydesdale Stallions.

Owing to the demand for the services of the six horses originally purchased, it was found necessary to send out two additional sires belonging to the Department. The districts participating in this way were: Wallumbilla-Roma; Chinchilla; Crow's Nest; Cunningham-Pratten; Laidley; Beaudesert (two horses); and Mary Valley. The aggregate number of mares receiving service was 455.

"Fabric's Heir," used in the Crow's Nest district, died before the season was finished, as the result of a twisted bowel.

"Baron Again" developed stringhalt, and was gelded in June this year.

Arrangements for the examination and approval of mares for the 1925 season are well in hand. An early start was necessary to permit of Mr. Veterinary Surgeon McGown taking up his duties as chairman of the recently established Stallion Board for Southern Queensland, which starts to function on 1st July.

STATE FARMS.

Roma.

The manager of the farm stated in his annual report that "the 1924 season will long be remembered as one in which growers had an unenviable experience. Prospects were not good from the very first, and absence of rains delayed the seasonable germinating period for nearly two months. After the rains in the middle of July, exceptionally favourable conditions for growth were experienced which induced rust. Continuous rains followed, and the combination was disastrous through lodgment of crops, the heavier yielding varieties proving very difficult to harvest. In the generality of cases, the grain was discoloured, and a proportion was damaged through sprouting in the ear."

It was evident that, from the standpoint of an experimentalist, much valuable data was forthcoming, as it was possible to promptly arrive at a decision respecting the ability or otherwise of certain varieties to resist rust.

"Florence," the variety so much in favour throughout the wheat-growing districts, also a number of commonly grown wheats, were badly attacked by rust. Several of the Roma crossbred wheats stood up, however, to the visitation, and matured good-quality grain. This result furnished proof that in breeding and selection work it was possible to transmit the character of rust resistance through one parent, even when, on occasion, the other parent plant used in making the cross was susceptible to rust. Two rust-resisting wheats employed in this way as individual parent plants—Warren a bread wheat, and Cretan a macaroni wheat—gave excellent results. Similarly, it was shown in other crosses, notably those where Cretan was crossed with the well-known Comeback wheat and bred back again to Cretan, that the rust-resisting quality of the Cretan parent was perpetuated. Many other examples of the combination of desirable unit characters were forthcoming, including another group of Cretan with Bunge and Gluyas, which gave great promise.

Research work of this character will be given practical expression by the propagation of certain of these new wheats, in order that growers may have the assurance of a return in rusty seasons, a circumstance of very great significance in the stabilisation of this important industry.

The season's work directed towards the breeding and testing of varieties and the raising of pure strains of seed for distribution and sale were actively pushed on with; 12 inches of rain, however, in October militated against both the quality and yield of grain.

The wheat-planting scheme for this year is now practically finished, 30th June, with the exception of about 30 acres to be planted with quick-maturing varieties early in July. All the earlier sown wheat was above ground and well ahead of last year's crop in this latter respect.

Plant improvement work and the propagation of selected varieties were continued in respect to several crops—cotton, peanuts from Java, Sudan grass, cowpeas, field peas, and sweet potatoes (forty varieties). In the citrus orchard, a number of unprofitable trees were removed, and the land turned to account for experimental crops. Olive trees in the avenue and plantations did well, Hardy's Mammoth proving to be the heaviest bearer.

Certain varieties of grapes proved resistant to black spot, which was generally in evidence on account of the wet season, viz.—Madeline Royal, Ferdinand de Lesseps, Muscat Hamburg, Doradilla, and Belas Blanc.

With a few exceptions, the date palms imported from Algeria failed to strike. Deglet Noir seedlings have been planted instead.

Gindie.

For the six months ended in February this year, the rainfall was well above the average, and proved to be one of the best seasons experienced for several years. From March to June the reaction set in; March proved to be very hot, with only 38 points of rain; April was without rain altogether; and 37 points fell in May. Luckily, a little over an inch of rain fell in June, consequently during the last four months under review the natural grasses on the Downs country dried out; however, those on the better sheltered timber country retained some nutriment, enabling the stock to hold their condition. It is gratifying to note a general improvement taking place in the quality and kinds of grasses on the property. Mitchell, Red Flinders, and some of the best of the blue grasses are now showing up prominently in places.

The three studs maintained here—beef Shorthorn cattle and Clydesdale and Suffolk Punch horses—have all made satisfactory progress. The manager stated in his report that "in every case buyers who made purchases expressed their satisfaction at being able to procure animals of good quality, capable of improving their herds; also that the quality of the farm stock is slowly but surely improving, and

that no doubt was felt about the prospects of the institution as far as the production of the much-sought-after type of sire was concerned. Inquiries for herd bulls were frequent, and this was attributed largely to the fact that nothing but young animals of good conformation, constitution, and type had been sold as sires.'' The addition of a yearling bull to the stud, sired by Sir Anthony Hordern's four-thousand-guinea bull ''Masterkey,'' was a decided acquisition, and should do much to continue the improvement work undertaken. Although a high price had been paid for the young bull, his breeding and type were of the best, and should ultimately exercise a most beneficial effect on the quality of the district's beef cattle.

The farm stock had received a good advertisement by winning a number of prizes at different shows, a bull bred on the place now having three championships and one reserve championship to his credit at Rockhampton, and an additional distinction of being the sire of three first prize winners at the recent show at the same city.

A special effort was made during the season to grow and conserve as much fodder as possible. Two silos, each of 110 tons capacity, were filled, and about 50 tons of hay stored. The outstanding crop for bulky fodder was Sudan grass, portions of the field yielding up to 15 tons of green stuff per acre, exclusive of a second cutting.

The June rains permitted the sowing of wheat on fallowed land, and the seed sown had germinated well.

Kairi.

The manager, in his annual report, stated that weather conditions throughout were all that could be desired; a mild winter was being experienced and there was every prospect of a favourable spring. Progress was made during the year by slightly extending the cultivation area. One hundred acres were cropped with maize for grain and for silage, and, in addition to minor crops, four acres were under sweet potatoes and arrowroot, and six acres under sugar-cane. Supplies of cane were made available for planting purposes, in accord with the scheme for renewing the vitality of certain varieties of cane by temporarily changing their habitat to the more temperate climate of the tableland.

Both the Jersey and Milking Shorthorn studs had made good progress. The demand for Jerseys was well maintained, and the progeny of the latest addition to the stud—''Retford Prometheus''—were most promising.

In the swine section the farm had met the demand for stud pigs. The establishment of a bacon factory at Floreat Siding, near Mareeba, had promoted greater confidence in the industry, which was expanding. To meet the demand for a leaner class of bacon a boar and three sows of the Tamworth breed were installed, so that pure-bred animals might be bred for sale. Additional sties and runs were added to accommodate the latter breed.

Although the services of a Suffolk Punch stallion had been availed of, the type of mare offering did not warrant keeping a valuable horse for breeding purposes.

Evidence was noted of a desire on the part of farmers for more experiment work with crops and pastures. If this were undertaken two additional hands would be required.

Warren.

The principal growing season during the summer months was marked at intervals by excessively hot weather, which exercised an injurious effect on all grain and seed crops. When arranging the fodder crop trials, ample provision was made for supplies for filling the two 110-ton silos. Sudan grass gave extraordinary yields, particularly on alluvial land, and demonstrated its producing capacity, although to a lesser degree, on poorer types of soil.

The extension of cultivation land was consistently followed up, and this permitted of the growing of rotation crops on areas which had been consistently cropped since the initiation of the farm.

Special attention was paid during the year to the testing of a variety of crops likely to fit into a cultivation scheme to meet the requirements of a mixed farm.

Fertiliser and spacing experiments were carried out with Durango cotton. Although growth was checked through want of rain at a critical period, when the plants shed an appreciable portion of their ''squares,'' the quality of the lint was generally good. The class of season favoured ample feeding space for the plants. Special attention was given throughout to the maintenance of a soil mulch by constant cultivation.

The Ayrshire stud was well maintained, and the system of ''line breeding'' has shown how effective it is in breeding to type and for production. The young stock sired by the Victorian-bred bull, which gave such a good account of himself in the Melbourne Exhibition, show every indication of deep milking qualities.

The Berkshire pig section has been improved in the matter of additional stud pigs and accommodation. The addition of new strains and, more recently, the purchase of a prize winner at the Royal Easter Show in Sydney, will permit of carrying on breeding for some time to come. It is gratifying to note that the farm-bred pigs are so much sought after. This stud has undoubtedly exercised a very great improvement in the type of the district's pigs, and was drawn upon also for stud boars for the Kairi State farm stud in North Queensland.

In what may be termed the educational section, good support has been forthcoming from senior pupils of the Stanwell State School. The regular weekly classes in saddlery, blacksmithing, and in elementary agriculture have been fully availed of. Education imparted in this way should not be without its influence, both on the pupil and on his parents.

So far, the cochineal insect introduced to a patch of pear growing along the bank of Stony Creek has not made much advance in destroying the pear. Probably, when fresh colonies of insects are bred, a more pronounced result may be forthcoming.

Home Hill.

During the year irrigation experiments were carried out, embracing different methods of applying water to sugar-cane. Careful records of cost of production were kept, including cultivation, harvesting, stabling and water rates, and cost of applying water.

Three plots, each an acre and a quarter in area, were ratooned with the following results:—

Plot A—Cultivated and irrigated according to prevailing district methods, yielded 22.7 tons per acre. Cost of production, 35s. 7d. per ton.

Plot B—Cultivated similarly to Plot A but watered regularly down the rows, yielded 25.9 tons per acre. Cost of production, 34s. 10d. per ton.

Plot C—Under the Hawaiian system, yielded 42.3 tons per acre. Cost of production, 29s. 10d. per ton.

On two other plots of plant cane, each .65 of an acre in area, the results were not so satisfactory, owing to the difficulty of accurately regulating the supply of water. In this series of 82 rows in each of the 2 plots, 41 were fertilised at the rate of 650 lb. per acre (Howe's mixture), and the remaining rows unfertilised.

Plot D—Grown and irrigated according to local custom, the fertiliser plot yielded at the rate of 32.6 tons per acre, whilst the unfertilised portion yielded 31.9 tons per acre.

Plot E—Grown and treated under the Hawaiian system, the yields were 24.6 tons from the fertilised plot and 34.9 tons from the unfertilised portion.

Further tests with the ratooned cane are being carried out.

Field Crops—Sugar-cane.—28¼ acres were harvested for a return of 759 tons 19 cwt. 2 qr., averaging 26.9 tons per acre, 6 tons per acre above the average for the district. Plant cane yielded 31.3 tons and ratooned cane 21 tons respectively per acre.

Experiences so far point to the possibility of the Hawaiian system superseding the ordinary local methods of applying water.

Cotton.—Monthly planting trials (October to January) and a series of sixteen spacing tests were carried out in accordance with plans provided by the cotton specialist. The plant thrives well in the district, provided there is sufficient moisture in the soil, a factor now under control by means of irrigation.

Ratoon cotton tests were also carried out. Generally speaking, crop yields were not heavy, and the price of seed cotton is insufficient to make this crop a payable one under existing conditions.

Lucerne.—Half of the area of 2¾ acres laid down two years ago was worked up and designed for a shorter flow of water. This has permitted of better control, and the second sowing shows better promise.

Sweet Potatoes.—Upwards of 2½ acres were planted with different varieties. Trials in small plots gave the following returns in tons per acre:—Director, 25.45; Home Hill, 16.95; Giant Gindie, 14.72; Ruby, 14.15; Vitamine, 12.36; Mammoth Cattle, 12.24; and Seedling No. 1, 10.2.

Mammoth Cattle and Ruby proved to be the better table kinds. Prices were too low to pay even for digging, and use was made of a quantity for feeding to horses.

Miscellaneous Crops.—An assortment of crops was tried out in the experimental grounds, comprising:—Rice (9 varieties); velvet beans (3 varieties); cowpeas (3 varieties); taro (7 varieties); peanuts (4 varieties); yams (2 varieties); Adley (Job's Tears); horse and green grain; chick and pigeon peas; Japanese clover; Gingellic oil; and Soya beans. Selections were made of the more suitable varieties for further propagation. Generally speaking, the results were encouraging. Further tests are necessary to determine whether certain of the products will be of economic value.

Hermitage.

Owing principally to the late planting season for maize in 1923, and the rains in June, 1924, harvesting was not completed until well into August. The crop, however, of Funk's Yellow Dent grown from departmental seed was an excellent one and yielded sixty bushels to the acre. Owing to the low price, a few hundred bags were threshed and the balance stored on the cob. This stored supply suffered much damage from the plague of mice, and was recently threshed; the advantage of holding on, and the realisation of an extra shilling per bushel, were discounted by the amount of grain eaten and damaged by mice.

The cropping scheme carried out with wheat was based on tests with a number of departmental varieties, grown to determine their value for cropping on the heavier types of soil common to this portion of the Downs, and for raising seed for further extension of those kinds which showed superiority in field characteristics over existing varieties. Crops generally were seriously affected by continuous wet weather just prior to and during the wet harvest. Rust did a good deal of damage. Strictly from an experimental standpoint, the loss was timely, as it clearly showed the superiority of certain of the Roma crossbred wheats, particularly those in which Warren was one of the parents, this variety being very rust-resistant.

The farm was used for the reception, storage, and grading of several hundred bushels of wheat from the departmental experiment plots. Later on, owing to the alarming progress made by the mice plague, this wheat was railed to Brisbane prior to sale to farmers.

Summer Crops.—Liberal sowings were made of saccaline and feterita, the former to provide green fodder for ensilage. We now have upwards of 150 tons on hand in silo and stack.

Phalaris Minor.—The wet season proved favourable to this grass, several acres having been prepared and planted on the 17th and 18th July, 1924. Four months afterwards the crop was cut with reaper and binder; the weight of cured hay taken from a measured acre and put over the weighbridge was 1 ton 15 cwt. 2 qr. From seeding to harvesting 1,233 points of rain were recorded. Although an annual, this grass has proved its value for grazing off and for withstanding hard winter conditions and heavy frosts. In these respects it proved superior to oats and barley. Much interest was taken in this crop and a quantity of seed was sold.

Crossbred Sheep.—The flock of between two and three hundred, maintained on the farm, has done well. Lambs sired by Lincoln rams invariably made high prices. To correct the coarseness associated with Lincoln crossbreds, six fine-woolled merino rams of good size and constitution were purchased.

QUEENSLAND TREES.

By C. T. WHITE, Government Botanist, and W. D. FRANCIS, Assistant Botanist.

The Australian Olive (*Olea paniculata*) is a fairly common tree of Eastern Australian rain forests or "scrubs." It attains a height of about 100 ft., and a stem diameter of about 2 ft. The stem in the large trees is sometimes flanged, as shown in the picture accompanying this article. The bark is brown or grey in colour, often wrinkled longitudinally and with small warts arranged in rows in the wrinkles. The sapwood is white when first cut, but after being exposed to the air for ten or fifteen minutes it turns pink. The timber is light in colour, fairly hard and heavy and closely grained, and should be useful for cabinet work. The Australian geographical range of the species extends from the Hunter River in New South Wales to the Atherton Tableland in North Queensland. It is also found in New Caledonia and Lord Howe Island.

Photo: W. D. Francis.]

PLATE 117.—THE AUSTRALIAN OLIVE (*Olea paniculata*).
A tree in the Kin Kin rain forests.

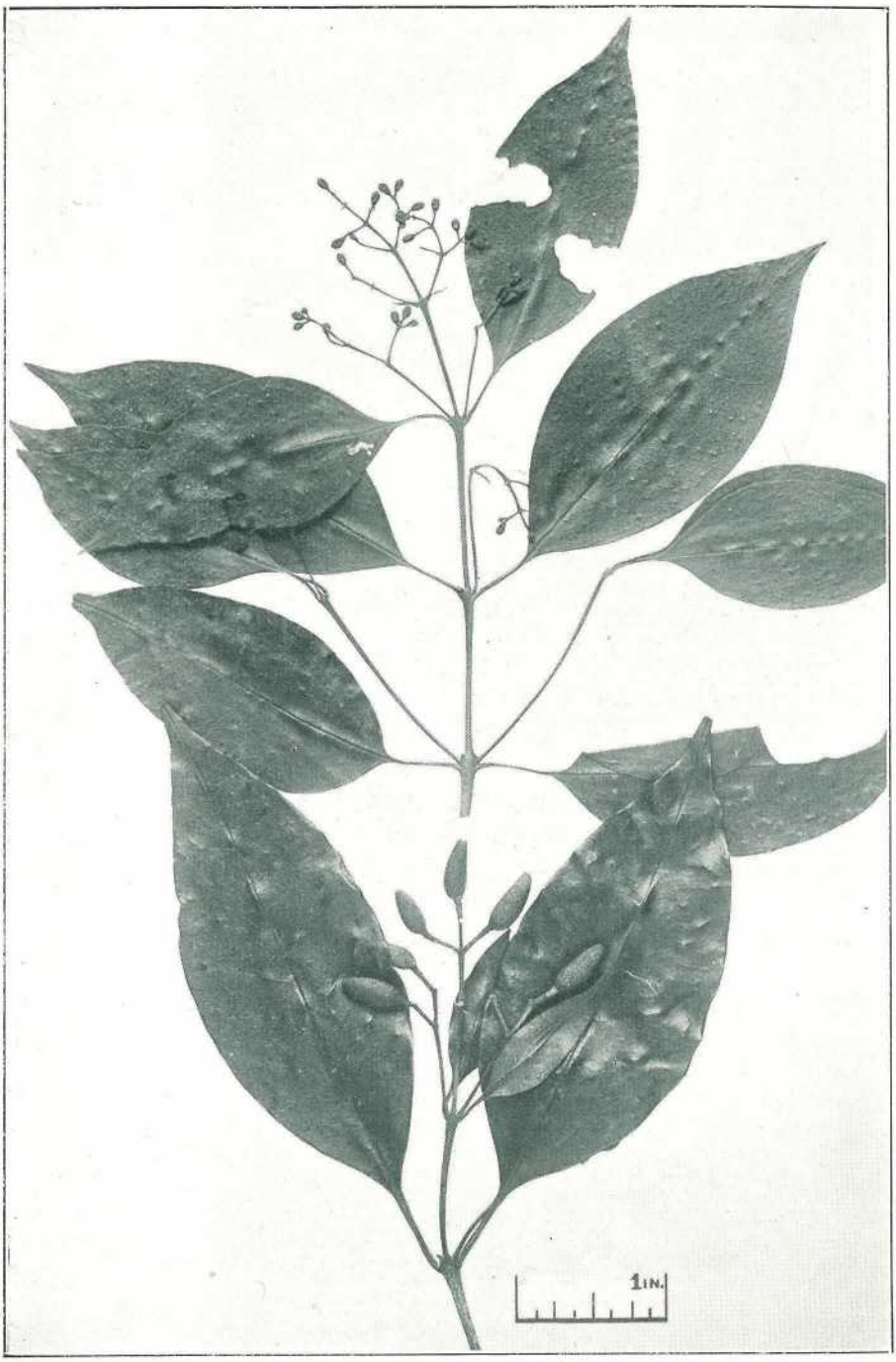


Photo.: Dept. Agriculture and Stock.]

PLATE 118.—AUSTRALIAN OLIVE—SHOOTS BEARING FLOWERS AND DRY FRUITS.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (22nd October, 1925) from Mr. W. Cottrell-Dormer, who is investigating cane pests and diseases:—

MOSSMAN.

Diseases.

Leaf Scald.—Leaf Scald is undoubtedly the most serious disease of the Mossman district, and most farms situated within a radius of about 7 miles of the town are more or less infected by it. Especially is this the case where Clark's Seedling is grown since this is a very susceptible variety to this disease. This is rather a good time of the year for the detection of Leaf Scald since it is now showing mostly in what has been named, by Mr. D. S. North, of the C.S.R. Co., the "wilting stage" of the disease; at this stage of the infection certain canes, and particularly Clark's Seedling, are seen to gradually develop dead streaks in their leaves similar to those caused by Gumming Disease and then suddenly to wilt, as though from a grub attack, and die. A very noticeable feature of stools killed in this manner is that the dead leaves are of a peculiar dark colour, which is really quite different from the appearance of stools killed in other ways, and that these leaves tend to curl and crinkle a great deal. Thus, when Clark's Seedling is mature, it is generally sufficient, when one is searching for Leaf Scald, to look over the field from some prominences—say, from horseback or from the tops of a fence posts—when the dark, dead leaves of severely affected stools will at once be noticed. Many of the fields of Clark's Seedling inspected by me on this occasion showed a big percentage of these dark-leaved stools which signifies that Leaf Scald is causing appreciable, though probably avoidable, loss.

I have said that this loss is probably avoidable. We have not sufficient data on the subject of cane diseases in the North to state definitely that this loss actually is avoidable, but this is no reason why growers should not follow out the measures prescribed from time to time by the Bureau. It is evident, since Leaf Scald is an incurable disease, that no amount of careful cultivation or fertilising will alone rid a farm of Leaf Scald—it is also necessary that clean, healthy seed be planted in place of the old infected material. Most of the farmers about Mossman would be well advised to select some small block of land in as isolated a position as can be practically handled and plant up some healthy Clark's Seedling in readiness for next year's planting season. No Clark's Seedling within 7 miles (stress) radius of Mossman can safely be used for this purpose without a special inspection by an officer of the Bureau, but plenty of good, healthy cane is available about Ferndale and the Upper Mowbray, *i.e.*, the 14-Mile; and since the mill management has expressed its desire to foster all work of this nature, no serious trouble should be encountered in arranging for the purchase of plants. This is a system of planting which should be kept up for two or three years, or until all of the old stock has been replaced.

Leaf Stripe.—This disease is now in a more or less dormant stage in this district; it is to be seen mainly in what is known as the leaf-splitting stage; many infected stools have died earlier in the year, and only a few remain which are sufficiently badly attacked to show this leaf-splitting stage. It is impossible, therefore, at this time of year to form even an approximate estimate of the extent of the infection.. Many fields, which were found to be rather badly infected on my last visit during the summer months, now—beyond some split and curled up leaf shreds, which droop from certain rather deformed sticks, and a few dead stools here and there—show but little trace of this serious disease. Such is the way of this insidious enemy—each one of those harmless-looking, curled, dropping leaf shreds contains many hard shelled spores which are waiting for the warm, damp, wet season to return, when they will germinate and infect fresh plants. Thus the grower who thinks to himself that after all he has not fared too badly with this disease, since there is so little evidence of its presence, is enjoying a false sense of security. It is almost invariably the case, at least in the North, that the ratoon from this infected cane suffers far more severely than the previous crop, and even now some fields of ratoon B.147 may be seen which are hardly worth harvesting.

Leaf Stripe disease appears to be at its worst in the Saltwater area. Growers here should aim at giving their land more fallowing than they have been in the habit of doing. A cane which seems to be showing great resistance to Leaf Stripe and is doing quite well in the Saltwater area is Q. 813.

(I am indebted to Mr. D. S. North for much valuable information on the subject of diseases of sugar-cane.)

Foot Rot.—Foot Rot, or Root Rot, a fungus disease of young plant cane, is causing appreciable damage in some fields about Mossman, and in one case, where a count was made of 1,000 young shoots, 62 were found to be severely affected by the disease. Where Foot Rot was observed it was invariably noticed that the young cane had been covered too soon after striking, probably on account of the prolonged dry weather. It has been found in the southern districts that this early covering of young plant cane predisposes the plants to this disease.

Insect Pests.

Grubs.—Taken on the whole, grubs have not done serious damage in the district this year; however, one or two farms on the Upper Cassowary and one at Whynabeel Creek have suffered rather badly.

Borers.—Both Beetle Borer and Moth Borer are to be found about the Mossman district, but neither is responsible for appreciable losses. An examination of a few sticks attacked by the Beetle Borer at Whynabeel Creek revealed the presence of many Tachinid fly pupæ. These flies were originally liberated here by the Hawaiian Entomologists, and have evidently done good work.

Wire Worms.—The Wire Worm, a slender brown creature attaining a length of about 1 in., is probably the most important insect pest here, and apparently does damage to cane all the year round. This insect attacks the eyes and young shoots of young plant cane and effectively prevents stooling, and often germination, of the cane, thus causing very poor strikes. When the "misses" are "supplied," it frequently happens that the fresh plants are again attacked and killed, and it is often necessary to plant these "misses" three or four times before success is attained. I would therefore suggest that crude naphthalene powder or vapourite be used when planting "misses." A little of the powder, say, one tablespoonful, should be mixed with the soil where the fresh plant is to be placed. It must be understood, however, that this is merely a suggestion, and to the best of my knowledge has not yet been tried against this species of wire worm.

Rats.—Rats are now doing very severe damage to many fields, one farmer having estimated his loss in a crop of 1,000 tons at 300 tons. This is merely loss in tonnage and does not account for the higher cutting rates which obtain in rat-eaten cane. A bulletin on "The Field Rat in Hawaii and its Control," by C. E. Pemberton, of the Experiment Station of the Hawaiian Sugar Planters' Association, is being forwarded on loan to the mill management, as I understand that the latter intends starting a campaign against the rat pest.

Wallabies.—Mr. J. S. D. Crees stated having had success in poisoning this cane pest by the use of poisoned figs. The fruit of the wild forest fig-tree is partly slit and a little strychnine inserted into the opening formed. These poisoned baits are then strewn along wallaby "pads" leading into the cane paddocks.

BABINDA.

Since much of what has been said above also applies to this district, I shall but briefly enumerate the diseases and pests observed here.

Diseases.

Leaf Scald.—This disease is causing serious damage to crops of Clark's Seedling between Babinda and Fishery Creek; in fact, no single field of this variety was seen in these parts which was not well infected. None of the Clark's Seedling in the northern end of the Babinda area is suitable for a change of plants. Ample healthy cane can, however, be found about Kamma and Hambledon, and these are the sources whence "new" cane should be drawn, but growers should first arrange to have the cane they contemplate introducing examined and passed on the field before cutting by the Bureau's Laboratory at Meringa. Probably 100 per cent. of the few fields of Goru which remain in this district are also infected with Leaf Scald, while much of the Badila shows signs of the disease. The last-mentioned variety, however, does not appear to suffer severely unless physically weakened through some other cause, such as late cutting or grubs; the same applies, to a much less extent, to Goru. Healthy Badila may be obtained from the Bartle Frere Estate, where this variety is doing remarkably well on the red volcanic soil.

Since "knife infection" is a common occurrence with Leaf Scald, only knives which have been sterilised in boiling water should be used for cutting plants from material which has been introduced as healthy stock.

It should be noticed that I have specified certain places as a source of plants from the Cairns district, and laid down the condition that they should be passed by the Bureau while still standing uncut in the field before being used. It is evident, therefore, that the indiscriminate introduction of plants from other districts which has obtained in the past is not being advocated. On the contrary, I must again remind growers that this is a most foolish and dangerous practice, as has often been stressed by the Bureau.

Pests.

Grubs have been responsible for much loss of cane this year in the Merriwinni, Palma, McDonnell's Creek, and other localities. Several of the growers have been personally advised by the Bureau.

Beetle Borers, according to the general opinion of growers, are on the decrease, while the Tachnid fly parasite of this pest is, if anything, increasing in numbers.

Wire Worms, Moth Borers, and White Ants have done slight damage in parts.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (19th October, 1925) from the Acting Entomologists at Meringa (Messrs. Burns and Mungomery):—

"Chlorocide" *versus* Cane Grubs.

A small consignment of Chlorocide "A" was recently received from a Southern firm with the request that experiments should be conducted against the common cane grubs. This fumigant, which at present is being tried in America against the common peach-borer, is a cream-coloured powder, somewhat moist, with a characteristic odour of almonds which on continued exposure to the atmosphere becomes much drier, and changes to a whitish colour. The manufacturers exhibit a caution notice on each tin warning users of Chlorocide against allowing it to come in contact with the skin owing to the toxic properties which it possesses.

As hitherto little was known concerning its insecticidal properties, various amounts of Chlorocide were tried in a series of laboratory experiments, the actual quantities being 30, 20, and 15 grain doses in small cages each holding about 10 cubic inches of soil, four cages being used with the 30-grain doses, three cages with 20-grain, and three cages with the 15-grain doses respectively. These cages were set up on 2nd July, 1925, and in the bottom of each cage one third stage grub of *Lepidoderma albohirtum* was placed. Each dose of Chlorocide was wrapped up in a cloth container and placed about half an inch below the top of the soil, and in the centre of each cage. Inspection of these cages on the following day revealed the fact that only one grub was in a sickly condition, whilst the remainder showed increased activity which seemed to indicate that the Chlorocide had some irritating effect on their epidermal tissues.

On looking at the cages on the second day after administering the doses, all the grubs were found to be in a more or less sickly condition, and on 6th July, 1925, seven out of the eleven grubs were dead with the remainder very sickly, whilst on the 7th all the grubs were dead, representing a mortality of 100 per cent. over a period of five days. The doses of 15 grains proved equally as effective as the larger doses of 20 and 30 grains in this instance.

From the fact that these grubs under the effects of Chlorocide, did not suffer any paralysis immediately, it occurred to us that grubs not under confined conditions might be able to burrow away from the doses of this fumigant. Accordingly, experimenting was continued on these lines and a cage was constructed which gave conditions as near to actual field conditions as possible, and the grubs had the opportunity of moving about 6 inches away from the fumigant in a lateral direction, and about 4 inches in depth. After allowing the grubs to remain in this cage for two days, they were found to have moved towards the gauze openings through which fresh unpolluted air was permeating. Another similar experiment under moister soil conditions confirmed this, and the grubs lived on under these conditions for two weeks apparently unharmed.

Another series of experiments was conducted to find out the minimum time necessary to confine grubs in actual contact with Chlorocide to ensure death of the grub. In the case of grubs confined with 10 grains of Chlorocide in a 9-inch test tube, then covered with soil, it was found that they had to remain from thirty to forty-eight hours, whilst those confined for three, six, and in one case up to twenty-four hours, revived.

The results of these two latter experiments proved somewhat disappointing after the results and mortality obtained in the first series of experiments; however, it can be readily understood when viewed in the light of the slow evaporation of Chlorocide as compared with other fumigants such as paradichlor.

Owing to the fact that this fumigant has just recently been put on the market, and arrived late in the feeding period of the grubs, no data has been able to be gathered concerning its effect on first and second stage grubs of *L. albohirtum*, but

it was thought advisable to report our experiences with this fumigant as far as we have gone, and we are of the opinion that Chlorocide, owing to its lasting and toxic properties, may prove a good deterrent against oviposition. However, a test plot under field conditions is to be laid out on some grub-infested land in the Cairns district during the coming season, and it is hoped that much valuable information relating to its effect on these notorious pests will be secured.

Grey-back Cane Beetle (*Lepidoderma albohirtum* Waterh.).

Large numbers of the pupæ of this beetle are at present hatching and the adult beetles are remaining in the pupal cells hardening and awaiting the first good soaking rains, which usually come in November, to enable them to escape from the soil. They are to be found at varying depths, the greater proportion unearthed for observation being at depths of from 9 to 24 inches, according to the nature of the subsoil.

Farmers would be well advised to note emergence of the beetles from the soil in their districts, so as to be able to ascertain the correct time following the flight of the beetles, to administer fumigants to the soil. Egg-laying commences about fifteen days after the beetles first appear, and continues over a period of several weeks, so that about six weeks after the beetles appear would catch the small grubs when feeding on the finer roots surrounding the stools, and thus give a better chance of coming within the reach of paradichlor. or fumigant applied, especially when it is applied to both sides of the rows of cane.

Many farmers leave fumigation until it is too late, and the prolonged rains of the "wet season" have set in, thus preventing a thorough penetration of fumes throughout the soil.

The Sugar-Cane Moth Borer (*Phragmatiphila truncata* Walk.)

This widely-spread pest of sugar-cane has been, and is, very prevalent throughout Northern canefields this season. Its depredations much resemble those of the beetle borer (*Rhabdocnemis obscurus* Bois.), and on this account it is frequently confused with the latter insect.

Infection of cane by this pest is generally worst in the cane plants adjoining headlands, and in young cane where trash has been left lying about. Young ratoons and shoots are usually the centre of attack, the tender central portion of the stems of these being eaten out, thus causing the central whorl to die, so forming "dead hearts."

Beetle borer attack is almost invariably confined to mature and almost mature cane sticks, and the boring may occur throughout the entire length of the stalks from the roots to the leaf sheaths.

The larvæ of the moth borer when fully grown vary from 1¼ to 1½ inches in length, and are cylindrical, tapering towards each extremity. The colour is generally (individuals vary very considerably) pinkish brown or light brown with numerous scattered dark-brown and pale-black spots mostly arranged in interrupted obscure lines running longitudinally on the body. These larvæ are voracious feeders and grow rapidly, the time occupied in the larval stage being only a few weeks on an average throughout the year.

Pupation takes place in a cell constructed by the larva inside the cane stem, usually just behind a leaf sheath or other part where the skin of the cane stem is soft, thus affording the moth an easy exit on emergence. The pupæ are brown, and are from ¾ to 1 inch in length.

The period occupied in this stage varies according to the season of the year, being much briefer in the warm months than in the winter time. From records kept from specimens bred at our Laboratory during the last month the average time spent in the pupal stage was from sixteen to seventeen days.

Breeding experiments from large quantities of material collected in the field from different farms around Gordonvale and Highleigh, have yielded one Hymenopterous parasite—a small black Braconid wasp, probably *Apanteles nonagriæ* Oliff, which is known to be a parasite of *P. truncata*. About 100 of these wasps have been bred out, as many as twenty individuals emerging from one borer larva. Parasitized larvæ as a rule do not "sicken" until nearly or fully grown (some when infected with dipterous parasites are even able to pupate), then the skin shrivels, shortly afterwards rupturing, and from it emerge a number of small cream-coloured maggot-like wasp larvæ which quickly enclose themselves each in small white cocoons clustered together around the shrivelled skin of their host. After five or six days' time the adult wasps emerge.

A dipterous parasite also attacks larvæ of *P. truncata*, but so far in breeding experiments this season none of these have been bred out.

FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (27th October, 1925) from the Southern Field Assistant, Mr. J. C. Murray:—

Childers.

Cutting here is proceeding smoothly. Good results are being obtained at the mills, although the tonnage per acre is not heavy.

Farming Operations.—Good work is at present being done by the growers here as regards cultivation. Mechanical tractors are coming into more general use. Greater care is taken in plant selection, also with fertilizers. Growers are increasingly realising the value of green manures. Deeper ploughing and more subsoiling are being practised more extensively.

Diseases.—Mosaic is now being controlled. Its incidence in the plant cane is becoming slight in the Childers district. With a few more seasons' careful plant selection it should be stamped out completely. Seeing that this complaint is so easy to recognise the farmers should not be long now in getting rid of it. An observer is first attracted by the general pallor of the stool. A close examination will show that the paleness is caused by a number of short, pale, irregular blotches in the leaf, caused by the disease gradually destroying the normal green tissue.

Gum is showing freely in the D. 1135, in fact, it would be difficult to get really healthy plants of this variety in the Isis district. Sound D. 1135 could be obtained from the country lying between Bundaberg and the Elliot River, by careful selection.

General.—It is often said that certain canes are of no use because they are too low in density. While there is a difference in the c.c.s. return of various approved varieties growing under the same conditions, if there is a marked difference between the test of a cane grown under field conditions and the average test obtained before distribution from the Sugar Experiment Station, growers can often look for the cause in the soils they are farming. Cane growing in contact with surplus moisture often results in a juice of poor quality.

Canes with light root systems such as Q. 813 and H.Q. 285 are best for low soils, and those such as D. 1135 and E.K. 28 for the higher lands.

Coming into use at present are a number of new and useful agricultural implements. Conspicuous amongst these are a supply planter, invented by a Childers grower, a rotary cultivator, and a special disc plough for trash.

Farmers are recommended never to plough in trash where gum has been present, but to burn. If they do plough in the trash, a lengthy fallow should follow. The practice of burning trash of gummed cane was recommended by Dr. Cobb as early as 1893, in his first investigations on the Clarence River, in New South Wales.

Maryborough.

Heavy crops are in evidence on the river and some good c.c.s. returns, particularly for the H.Q. 285 and Q. 813. Farmers are recommended to leave this latter cane, if possible, until the season has advanced a month or so from the start, before cutting. The same, as several times pointed out, applies to the M. 1900 Seedling. Farmers here would improve their holdings by growing leguminous crops for green manure.

The Mary River farmers are advised to be very careful in plant selection. Patches of cane are dying from gumming disease, notably the Meerah, hence the need for a careful survey of blocks that are taken for plants. Efficiency is being aimed at by the growers, but all efforts will be neutralised if they do not get healthy plants. The use of lime could be tried more on the Mary River than at present, either pulverised limestone or burnt lime.

Pialba.

Crops are fairly heavy and average sugar returns satisfactory. Growers are, however, handicapped by long haulage with horse teams.

Farming Operations.—A marked extension in green manuring was noticeable, growers employing cowpea and maize. Some of the areas prepared and planted after green manures, are of splendid texture and appearance, and reflect great credit on the farmer. Tractors are more frequently observed working and giving good results. Manures are being more generally used. Organic manures are more favoured by growers than the more highly concentrated mixtures. As many growers were inquiring about the value of various organic manures the following information is offered:—

Guano (average): 7 per cent. nitrogen, 11 per cent. phosphorous pentoxide, 2 per cent. potash.

Seaweed (of which there are huge quantities on the Pialba coast)—(Fresh): 80 per cent. water, 0.7 per cent. nitrogen, 0.3 per cent. to 2 per cent. potash, 0.1 per cent. phosphorous pentoxide.

Dried Blood: 11 per cent. nitrogen, 2 per cent. phosphorous pentoxide.

In using seaweed, not only is plant food material added to the soil, but the condition and texture of the soil is greatly improved by such a bulky, porous substance.

Diseases.—Major diseases are present, but the most serious one, Mosaic, is being controlled. Gumming is present and causing loss in places. Quite a number of freakish growths were noticed. The cane tried to arrow, then returned to a vegetative condition through, probably, climatic influence.

Mr. E. H. Osborn, Field Assistant, reports (26th October, 1925):—

Mossman.

Conditions were fairly dry, and in a marked contrast to the earlier portion of the year as the following rainfall figures show:—

	Mowbray.	Mossman.	Saltwater.
January	12.86	18.03	18.30
February	12.10	19.32	28.31
March	23.38	37.47	45.93
April	7.71	11.74	14.56
May	.3	.4	.85
June	2.59	3.51	4.30
July	.34	.35	.50
August	.65	.58	1.37
September to 21st	—	1.07	2.21
	59.66	92.11	116.43

Owing to so much continuous rain in the early portion of the year, without the usual intense heat, the cane did not make its expected growth—the ratoons particularly. Very heavy damage has also been caused through rats in most parts of the cane areas. In the Mossman district the proportion of broken ground, watercourses and gullies, with heavily grassed lands adjoining cane paddocks, provides ideal breeding places for rats, and without systematic poisoning being carried out by all growers, heavy losses must always follow. Pigs and grubs have also been responsible for more losses than usual. Taking these causes all through easily accounts for the reduced estimate of about 9 per cent.

Very little early planting was possible, but some 55 acres of D. 1135, B. 147 upon Rossi and Co.'s, and a 15-acre plot of D. 1135 of Mr. England's upon the syndicate's line all looked very healthy. In the Mowbray area the scanty rainfall in July, August, and September had caused the cane to dry up considerably, but even then some very good Badila was being harvested.

Diseases and Pests.—Leaf Scald (in the quick-wilting stage) was seen to be very prevalent, principally in the ratoons in H.Q. 426 (Clark's Seedling), Green Goru, and Q. 903; and to a smaller extent in the plant of these varieties. Leaf Stripe or Downy Mildew was particularly hard to find at this period of the year, but was noticed rather badly in M.Q. 1 (Mossman Seedling) and B. 147. Suspicious leaf markings in a couple of paddocks of H.Q. 426 made the writer suspect the presence of such, but up to the time of departing from the area these doubts were not confirmed. Wire worms were as usual doing some harm in the Cassowary area. The growers were advised to try fumigating with carbon bi-sulphide.

Now that the writer is leaving the far northern cane areas, he desires to express his deep appreciation of the help that has always been given him in execution of the work of the Bureau by the managers, cane inspectors, chemists, and staffs of the several mills; and also by the secretaries of the several associations in each district. Working under such conditions has been very agreeable, and it is with many regrets that the writer leaves the northern cane area and its pleasant associations for districts further south.

Mackay.

Despite some weeks of very dry weather, this district looked uncommonly well, all the mills cutting well up to estimates.

Racecourse in general was looking very well, the crops cutting up to the estimate. H.Q. 426, Q. 813, M. 1900, N.G. 15, and D. 1135 are amongst the principal canes grown hereabouts. Up to date the density of the three firstnamed varieties had been very good indeed, with the firstnamed variety slightly ahead.

In the Cattle Creek area there are some very fertile black loam flats adjoining the creek, carrying some very heavy Badila. One paddock of plant will probably cut over 45 tons per acre. Nearby a 15-acre paddock of young plant Badila also looked very pleasing indeed.

Slight effects of frost were noticed upon several low-lying paddocks, but with the exception of a certain browning of the leaves, practically very little damage was caused.

Farleigh was handling a very big crop and had about one-half through. The main canes grown are H.Q. 426, M. 1900, Q. 813, with D. 1135, Badila, and Malagache, the latter extensively on the Homebush area.

Good returns in density were being obtained from the first three canes just then. Of Q. 813 the following figures may be of interest as showing its standover qualities:—

Cane.	Of Sample.	c.c.s. (Average).	
Standover, Cheribon	4 ..	11.7	Taken practically about the same date.
Standover, D. 1135	1 ..	10.7	
Standover, N.G. 15 (Badila) ..	2 ..	12.2	
Standover, Uba	3 ..	11.1	
Standover, Q. 813	11 ..	13.1	

Pleystowe.—The density figures here also were very satisfactory. H.Q. 426, Q. 813, M. 1900, being the main contributory canes to such results. Some good returns were also being received from Malagache just then.

Marian Mill.—About one-half of the crop was also through in this area, for a very good c.c.s. Here again the best results were being obtained from H.Q. 426, Q. 813, and M. 1900. Some good returns were also coming from Malagache at this time.

Only a few farms were visited, but the writer was surprised and pleased to see such very good cane (especially M. 1900) in mainly an indifferent forest soil that had been under cane for some thirty odd years; moreover, a fair proportion of such lands are not too well drained.

Most of the M. 1900 showed numerous sticks of good length and weight, and several crops were seen that are cutting from 35 to 40 tons per acre, and from 15 to 16 c.c.s.

In several paddocks some very good Q. 813, both plant and ratoon, was noticed growing upon very poor country, one lot of second ratoons probably cutting at the rate of 18 tons per acre.

Several old growers in the locality say that the tonnage now cut per acre of these particular canes and H.Q. 426 is a long way ahead of that taken off when the ground was newer.

One of the helping factors is that most of the growers hereabouts are using very heavy dressings of a local earth lime; one well-known grower has used 125 tons in one year. Others use burnt lime, but all are quite satisfied of its benefits.

Many growers are green manuring with cowpea, and claim good results. Artificial fertilisers are also used, but most reliance is placed upon lime and green manure.

PROFITABLY FEEDING IODINE TO SWINE.

By JOHN M. EVVARD.*

The feeding of iodine in the form of potassium iodide to young growing swine in dry lot and on rape pasture has resulted—under Ames conditions where the college well water is very low in iodine (and where our experimental sheep flock has produced big necked or goitered lambs at birth in one year out of four, the last sixteen years), in three separate experiments, conducted in three different years—in increasing the average daily gain approximately 10 per cent. and likewise in decreasing the feed required for 100 lb. of gain 10 per cent. These are the findings of Professor Culbertson and the writer, and constitute part of the evidence backing up the reasons why we advocate the use of potassium iodide in the mineral mixture.

The pigs receiving potassium iodide made greater dimensional growth in height, in length, and in leg circumference. This shows that iodide feeding paid, and that its use was good insurance in that we cashed in on the premiums paid in taking out the iodide policy. But let's learn a little more about this iodide that we all must have, by studying the work of others.

When Courtois, in 1811, discovered iodine, he probably did not dream that within a little more than a century this halogen element would be proven essential for mammalian growth, the growth of animals which suckle young. Although iodine has long since been chemically classed by chemists along with fluorine, chlorine, manganese, and bromine, all constituents of the normal mammalian body, the real significance of iodide in animal nutrition did not find appreciation in scientific circles until the time of Baumann in 1895.

Iodine is now generally conceded to be one of the essential elements in mammalian (animals that suckle their young) nutrition and much effort is being made, particularly in goitrous regions to insure a supply of it in the foodstuffs or water, or both. McClendon has emphasised the use of iodine as a food material and studied its occurrence in the natural waters of all parts of the United States.

Baumann in 1895, almost thirty years ago, announced that iodine was a normal constituent of the thyroid gland, the double gland in the front part of the neck. In directing attention to this fact he gave the name iodothyrin to the world; this compound, for a number of years thereafter, being considered as the active principle of this ductless organ or gland.

The work of Picke and Pineles in 1909-10 and Kendall in 1919 made clear that iodothyrin is not the active principle it was once supposed to be, Kendall pointing out that it is not to be considered as "even a concentrated form of desiccated (dried) thyroid."

Kendall recently made a noted addition to the knowledge concerning the chemical nature of the active material of the thyroid gland. He isolated a substance which he named thyroxin or crystaline, iodine-containing compound, white, odourless, and tasteless.

Kendall, through biological experiments, determined that the isolated thyroxin does everything that desiccated (dried) thyroid does in the relief of cretinism and myxedema. Thyroxin has also been found to influence growth in a manner similar to desiccated (dried) thyroid. The iodine-containing thyroxin is of profound importance in regulating chemical reactions throughout the body.

The use of iodine by Marne and others, in the prevention and cure of simple goitre or throat enlargement, front portion, in school children, affords a striking illustration of the need of this element. The use of iodine in these experiments with children showed clearly that it was specific in the prevention of simple thyroid enlargement. The early experimental work was carried on at Akron, Ohio, which is in a goitre region.

The North American Indians and the inhabitants of Central America, as well as the Greeks and Romans, so Marne says, were strongly convinced that water was a causal factor in the development of simple goitre. A marked absolute decrease in the iodine store is noted in the developmental stage of all goitres in all animals. If most of the thyroid gland is removed before pregnancy or during its early stages, iodine meanwhile being excluded, the new-born will have enlarged thyroids; but on the other hand, if iodine is available, the young at birth will have normal thyroids. The ingestion of a milligram (but a very small part of a grain of which there are 7,000 in a pound) of iodine weekly by dogs prevents thyroid hyperplasis in the young pups. The thyroid has an extraordinary affinity for iodine, and if the iodine store is above 0.1 per cent. there is no disease.

* A prominent American authority on pig breeding and feeding and a well-known contributor to the "Chester White Journal."

Smith was the first to point out the value of iodine in the prevention of fetal anthyrosis when fed to pregnant swine. His studies on the composition of the feeds in the affected districts, from the iodine standpoint, indicated that the available iodine was lower than of similar samples from unaffected districts. The investigations were carried on in Montana. This significant comment was then made by Smith:—

"If more iodine were fed to the pregnant animals in large sections of this continent, especially during the winter months, the young that they produce would be more healthy and more vigorous and the large number of weak and defective young animals that are produced annually would be greatly reduced."

Smith later pointed out that pigs which are born in the early spring months of March and April are more frequently affected with fetal anthyrosis and hairlessness (the hairless pig malady) than if they are farrowed in May and June. He likewise emphasised that even in badly affected regions the fall litters are usually normal.

That there is a seasonal variation in the iodine content of the thyroid gland was clearly shown by Messrs. Seidell and Fenger. They found that the thyroids, as gathered bi-weekly from hogs, sheep, and cattle at a Chicago packing house, showed the lowest iodine content in the spring and the highest iodine percentages in the fall. This variation appears to correspond quite closely with the green pasturage season, indicating that these animals regain their iodine supply in large measure in the grazing months and lose it to a considerable extent in the pastureless months of winter.

Seidell and Fenger also found that swine thyroid showed the least iodine on 17th March, the percentage at that time in the dry matter being 0.133; the highest iodine content was noted on 1st September, when the iodine ran 0.531 per cent. The iodine in the thyroid gland of the average slaughtered pig at the "maximum iodine season" would be about 10 milligrams (a milligram is 1-1000th of a gram, and a gram is 1-453rd of a pound) as contrasted with a little over 2 milligrams (1-226,796th of a pound, or 1 part out of 226,796 parts in a pound) of iodine in the "minimum iodine season." A little iodine does wonders and often makes the difference between life and death.

On the basis of the figures given, it appears that the iodine determinations bear out the statement of Smith to the effect that fetal anthyrosis is more likely in the early spring than later. Our experience in the corn belt has been that swine litters of the fall farrow are very much less likely to be affected with the hairless pig malady than are the litters of early spring, the ones that come before green, leafy vegetation is available.

That the iodine carried by plant materials varies according to the parts of the plant, and that a good many plants or plant materials apparently do not carry iodine in measurable quantities are facts.

The iodine content of feeds, even when grown under similar, though not identical, conditions, seems to vary greatly. Forbes and Beegle speak of "the haphazard nature of its distribution"; and also emphasise that "in most cases, at least, it must be strictly an accidental constituent." That there are great variations in the iodine content in the same grain crop grown in adjoining fields has been shown, and on the whole the evidence as gathered emphasises the rarity and accidental nature of iodine as a feed constituent, particularly in regions where much simple goitre is found.

Goitre due to low Iodine Content of Drinking Water.

Drs. McClendon and Hathaway, of the University of Minnesota, have shown that there is a remarkable coincidence between goitre occurrence and the low iodine content of the drinking water. In the northern portions of the United States, there are from 1 to 22 parts of iodine per hundred billion parts of water, whereas in the south the iodine runs as high as 18 to 470 parts (in Texas), with a good many sections showing over 160 parts. Iowa, which is in a semi-goitrous region, is represented by two water analyses, one from Ames (wells 75 to 100 feet deep), showing 1.2 parts, and one from Iowa City (Iowa River), with 1.5 parts to the hundred billion parts of water. It appears from this study that the water at Ames, Iowa, yields but little of the nutritional iodine. The average human thryroid, according to McClendon and Hathaway, carries approximately 40 milligrams (1/11,340th part of a pound) of iodine. Dr. Kendall told me once upon a time that there was about as much iodine in the rest of the normal body as in the normal thyroid; this would make a total of 80 milligrams, or 1/5,670th of a pound in the body, this being equivalent to about 1 part in a 1,000,000 parts in a 176-lb. man.

In Wisconsin the hairless pig malady has been experimentally observed in association with enlargement of the thyroid gland by Hart and Steenbock, who found that the malady could be avoided by feeding iodide to the brood sow. The absence of the necessary amount of iodine in the ration of the pregnant sows interfered markedly with the fetal development, but the effects were much more noticeable from the standpoint of the vitality of the offspring than of the sows. Although the sows that gave birth to the hairless pigs showed thyroids that were enlarged from a normal of less than an ounce up to over four ounces, yet the sows in large measure maintained their apparent well-being. On the other hand, there was heavy mortality among the pigs when they came hairless.

The widespread use of iodide in certain sections of the North-west, as my good friend and old college mate, Dr. Welch, puts it, "is as universal as the use of blackleg vaccine" in cattle-raising. Significant comment is made by this investigator concerning the prevalence of goitre in live stock in States other than Montana; in speaking of the loss of live stock from hairless pigs, goitred and hairless lambs, calves, and foals, he says: "Correspondence with stockmen here and there in Minnesota and Wisconsin and in other Eastern States show that the trouble is by no means confined to the North-west States."

The allowance of one grain of potassium iodide a day, which was experimentally administered, was apparently more than actually required, the experiments indicating that the iodine might be fed during a much shorter part of the pregnancy period than formerly, if allowed early and still be effective in preventing trouble. The practical stockmen have not welcomed the idea of feeding less iodide, inasmuch as the expense is relatively small and they are satisfied with the results obtained with one grain a day dosage.

Even where goitre was not a factor it was found that the addition of a small amount of iodine to the ration of the mother animal tended to increase the iodine content of the thyroid of the young with increased vigour and rate of development.

Minimum Field Requirement hard to Estimate.

The minimum field requirement or allowance of iodine during the pregnancy period is difficult to estimate, inasmuch as the natural intake in the feed and water varies so widely, so Welch tells us. In feeding the pregnant sow he has used a minimum dosage of one-half grain potassium iodide per sow daily during the first sixty days of the gestation period with success, and judging from experience unpublished it is his belief that one-tenth of a grain per day over the same period is ample. On the other hand, numerous cases have been observed in which one grain per sow daily for the last thirty or forty days of the period of pregnancy has not succeeded in preventing goitre; hence the suggestion that iodine feeding, to secure greatest efficacy, had best be done in the early part of the gestation period.

Dr. Kalkus gives data to show that the gestation period of animals is sometimes increased because of goitrous conditions. His investigations demonstrated that cows, mares, ewes, sows, and does were protected against giving birth to goitred new-born if tincture of iodine, which carries about 10 per cent. of iodine, was applied at frequent intervals to the skin.

Check experiments carried on by Dr. Kalkus with does, female goats, demonstrated that two grains of potassium iodide given daily, or one-quarter teaspoonful of tincture of iodine poured on the skin of the back weekly, during gestation, acted as marked preventives of goitre in the new-born. In another experiment, one-quarter teaspoonful of tincture of iodine poured on the skin, either weekly or every two weeks, resulted in normal offspring, whereas the check lot of does not receiving any applied or fed iodide showed some goitrous new-born.

This work in the State of Washington again demonstrated the possibility of absolutely controlling the development of goitre in new-born animals by the administration of iodine to the pregnant mother. Dr. Kalkus may be quoted in this respect: "These experiments were so highly successful that they solved our problem in goitrous districts, from a practical standpoint . . . . ."

Just how small a dosage of iodine is absolutely necessary to prevent goitre or hairlessness in pigs, new-born, has not yet been definitely determined, although the use of 1/50th to 1/25th of a pound of potassium iodide to a 100 lb. of mineral mixture as fed has proved O.K. under all conditions that we have studied.

Inasmuch as practically the whole northern half of the United States is a goitrous region, it would appear that the shortage of iodine is not necessarily restricted to certain localised areas. Furthermore, it would appear that even though the goitre is not manifest, nor recognised as such, there still may be a deficiency of iodine in the rations of the various farm animals.

PLATE 119.—A "BANDORA" GILT, WITH A LITTER OF 16 (13 RAISED).

MARKETING PIGS IN QUEENSLAND.—VI.

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

The marketing of his products is claiming much closer attention from the man on the land, and in this series Mr. Shelton describes how the farmers' pigs are handled at the selling end. In previous instalments several marketing systems with which Queenslanders are familiar were reviewed, and in the sixth article are many points of equal interest to the wide-awake pig-raiser. —Ed.

Of the eight bacon factories now operating in Queensland—viz., Foggitt Jones Ltd., Oxley; J. C. Hutton, Ltd.; Zillmere; the Queensland Co-operative Bacon Association, Ltd., Murarrie; the Darling Downs Co-operative Company, Ltd., at Willowburn; the North Queensland Co-operative Company, Ltd., at Floreat Siding, Mareeba (Atherton Tableland); the Warwick Bacon Company, at Warwick; Reeds, Ltd., at Maryborough; and Conaghan Bros., Ltd., at Rockhampton, the factory operating at Floreat Siding, Mareeba, is the most recently established.

North Queensland Co-operative Bacon Company.

This factory functions under the title of the North Queensland Co-operative Bacon Company, Ltd., and is truly co-operative in practice. It commenced operations in May, 1924, and for the first twelve months' run had a capital turnover of £25,020 5s. 5d. Extensions have already become necessary and the premises are being enlarged, which will give the factory the capacity to treat 450 pigs per week.

This company operates over the whole area included under the Atherton Tableland Pig Pool, which came into operation on 1st July, 1923. Prior to the inception of this pool the pig industry in the North was but poorly supported, and in general was in a very bad way; pigs were being sold for as low as 2d. per lb. in Mackay and Brisbane, and the prospects were anything but bright.

Both the compulsory pool and the recently established bacon factory have, however, saved the situation, and at date of writing (October, 1925) butchers throughout the area are buying porkers through the pool as chilled pork at 10¾d. per lb., while farmers are being paid 6½d. per lb. live weight for their pigs, which figure must not be confused with 8¼d. per lb. for dressed or estimated dressed weight pigs, as paid by the Southern Queensland factories for prime bacon pigs at this time.

For the year ended 30th June, 1925, being the second year of the pool's operations, 6,934 pigs were handled by the pool, for which growers were paid the aggregate sum of £20,145 11s. 9d. The nominal capital of the company is £50,000, representing 50,000 shares of £1 each.

The annual report, as read at the annual general meeting of shareholders on Tuesday, 29th September, 1925, is an interesting and instructive document, from which the following excerpts have been made for the benefit of readers generally. This report represents the statement of accounts for the year ending 30th June, 1925, being the end of the third financial year of the company's operations.

Factory Operations.—For the year under review the company's turnover was £25,020 5s. 5d. The turnover in the chilled pork and hams and bacon department was £21,444 16s. 5d., while that in the smallgoods and hides and tallow department reached £3,575 9s. The quality of the goods being turned out by the factory is of such high standard that practically the whole of the goods are finding a ready market.

Factory Extensions.—The capacity of the factory when completed in May, 1924, was 150 pigs per week. Before the season was over it was found that, owing to the large number of pigs coming forward, in addition to the rapid growth of the smallgoods business, more space was required. The board therefore decided to increase the factory capacity to 450 pigs per week.

The Government has granted a further loan of £4,500 for the work, and £2,000 has been subscribed by shareholders. The total cost of the extensions is estimated at £7,000.

Pig Pool.—The board is giving effect to the motion passed at the last annual meeting, whereby it was agreed that the Pig Pool Board absorb the business and operations of the company.

Share Capital.—During the year 2,060 new shares have been allotted, making a total of 15,421 shares subscribed to 30th June, 1925.

Profits.—After writing off depreciation to the extent of £500 10s. and writing £191 4s. 2d. off preliminary expenses, there is a profit of £635 16s. 8d.

The board recommends the payment of a dividend of 5 per cent. upon capital paid up to 30th June, 1925. This will absorb approximately £620, and the balance will be carried forward in the Appropriation Account.

Pig Pools.

The whole subject of pig pools will be dealt with more fully in future articles, sufficient to say here that the subject-matter is one that has recently received very careful attention at the hands of a special committee of investigation sitting at the Council of Agriculture, Brisbane. It is understood that the report of this committee is to be published for the benefit of interested producers.

Certain it is that, as far as North Queensland is concerned, the Pig Pool and the bacon factory has put new life into the industry and has placed it on a sound financial basis, but it must be remembered that they are in one sense an isolated community trading over an area that so far has not been affected by the Southern markets. Pig-raisers in Central and Southern Queensland are much nearer the

PLATE 120.—THE NORTH QUEENSLAND CO-OPERATIVE BACON FACTORY AT FLOREAT SIDING, NEAR MAREEBA, ATHERTON TABLELAND.

markets of the Greater Brisbane and metropolitan area and the markets of New South Wales, Victoria, &c., and this fact alone places several serious obstacles in the way of the formation and functioning of any pooling system in Southern Queensland.

The progress of the North Queensland pooling system is being watched very closely by pig-raisers throughout the Commonwealth, for some very excellent work is being done there and some remarkably good results are being obtained.

The bacon factory at Floreat Siding, Mareeba, is not actually situated upon the Atherton Tableland, but is within a few miles by rail of all the principal pig-raising centres there, and is thus centrally situated in a much drier and less humid atmosphere than is common on the higher altitudes on the Tableland. This factory is situate practically 1,000 miles due north of Brisbane, and is now connected by rail *viâ* Cairns with all the centres on the Great Northern Railway system of Queensland as well as through that system with the markets of the South, but they are finding abundant outlet for the sales of all their goods locally, and thus do not at present cater for Southern markets. As they are almost 2,000 miles nearer the markets of

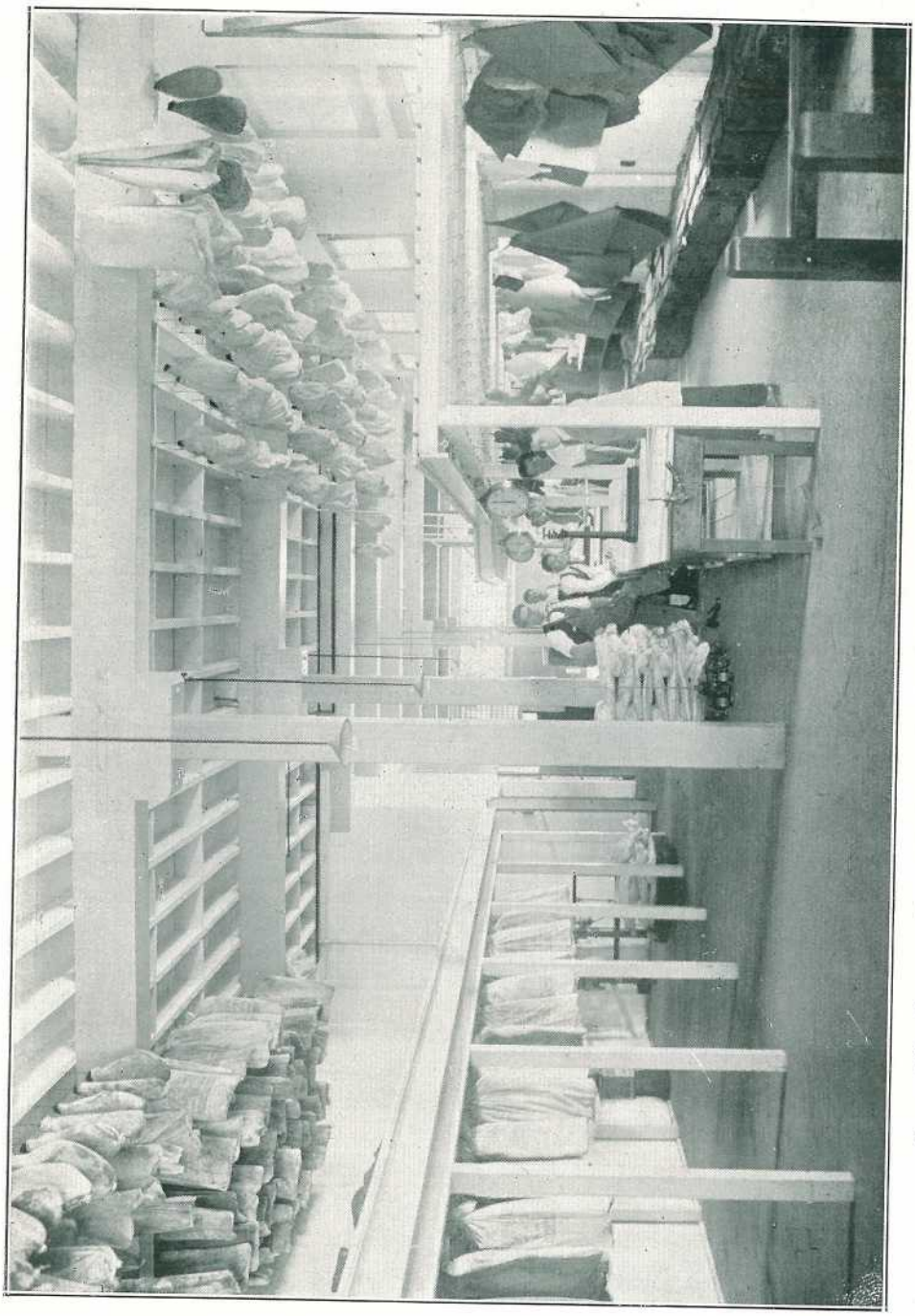


PLATE 121.—PACKING FLOOR J. C. HUTTON'S PROPRIETORY, LTD., BACON FACTORY, ZILLMERE.

the northern parts of Australia, New Guinea, and the markets *viâ* that route to the East, it is doubtful if they will for many years to come have any appreciable influence on Southern markets. Distance again largely prevents the Southern manufacturers catering for the North, nor does the pooling system encourage such. With it all, however, they occupy an influential position, and their success will mean much to the pig-raisers in other parts of Queensland and the Commonwealth.

The Darling Downs Co-Operative Bacon Co., Ltd.

Pig-raisers on the extensive area of agricultural country generally referred to as the Darling Downs and lying north, south, east, and west of Warwick and Toowoomba, the two principal railway centres on the main north-south railway system of Queensland, are provided for largely by the Darling Downs Co-operative Bacon Co., Ltd., with an extensive factory and plant at Willowburn, near Toowoomba. The following extracts from the twenty-third annual report presented to shareholders at the annual general meeting held at Toowoomba on Friday, 27th March, 1925, are interesting:—

Supplies.—During 1924 the pigs received at the factory totalled 35,989, or 3,302 less than last year. Had it not been for a fire the number of pigs sent in would easily have been a record, as 14,584 came along up to 30th June and 21,405 in the second half of the year: the weekly average during the first half of 1924 was 561, and during the second half 823, or a weekly average over the whole year of 692. The amount paid for these pigs with advance notes amounted to £133,394 11s. 8d., of which £94,278 2s. 5d. was paid to shareholders and £39,116 9s. 3d. to non-shareholders. It was decided to distribute a final payment to shareholders at the rate of 15 per cent. on the amounts already paid them for their pork, and £14,145 11s. 3d. was absorbed thereby. The total cost of pigs therefore amounted to £147,540 2s. 11d. It had been hoped that this year the factory would have been able to pay the amount of deferred payment to suppliers in actual cash, but after very careful deliberation it was decided that this would not be the wisest course to adopt. The factory decided, therefore, that for this year, at any rate, the distribution must be made in shares. The rapid growth of the business of the company will make it necessary for fairly large sums to be spent for the erection of further necessary buildings and extensions in the very near future. The solid grain which has been available for feeding purposes during the year caused many suppliers to misjudge the weight of their pigs and to hold them rather too long in the pens, with the result that they were on the heavy side when sent in. This adversely affected the price; but the price paid for every pig has been strictly in accordance with the schedules sent to agents from time to time. The actual weighing of every pig is carefully carried out. The absolute necessity of supplying pigs of just the right weights, which range from 95 lb. to 125 lb., was stressed.

Turnover.—Total sales in all departments for the year reached £143,889 5s. 6d., including sales of canned products, £15,682 15s. 10d., and pigs from the piggery, £1,121 13s. 3d. Sales of canned products are increasing very quickly.

Piggeries.—A large number of pigs passed through the piggeries, the big majority being received in the early half of the year, when the factory was out of action and prices were falling rapidly.

Stocks.—The value of stocks on hand and with various agents—General, £33,761 10s. 3d.; cannery, £3,366 2s.; and piggery, £526 3s. 8d.—was calculated with every care and on a conservative basis.

Share Capital.—The total capital paid up as at 31st December, 1924, was £47,336 15s. 2d. Seven hundred and fifty-four shares were allotted during the year, and the number of shares issued to the end of the period was 47,955.

Other Outlets for Downs Pig Raisers.

Other outlets for pigs produced on the Darling Downs and neighbouring districts are found in the Warwick Bacon Company, with a factory at Warwick, and direct trucking to the co-operative factory at Murarrie; Foggitt Jones Ltd., at Oxley; and J. C. Hutton, Ltd., at Zillmere.

The pig sales which are held regularly at Harristown, a suburb of Toowoomba, also provide an excellent outlet for many hundreds of store pigs and porkers during each year. It is at these saleyards that the proprietary buyers put their purchases "over the scales" prior to issuing receipt form, which is negotiable for cash on delivery at the company's bank. Buyers also occasionally visit the Downs from both the South and the North, this usually in search of good lines of store pigs for further fattening.

PICKLING WHEAT WITH CARBONATE OF COPPER.

H. C. QUODLING, Director of Agriculture.

Bunt or Stinking Smut, sometimes called "Ball Smut" to distinguish it from "Loose or Flying Smut," is the cause through its prevalence in the field and in harvested grain of a good deal of loss to wheatgrowers, which can be obviated by pickling all seed wheat prior to sowing.

Carbonate of copper, used by this Department for some years, has proved itself to be fully effective, and has much to recommend it for general use.

Points in Favour of the Process.

The germinating quality of the grain is not impaired, and the young plant is not subjected to the injury associated with the use of Bluestone (copper sulphate).

It obviates wetting the grain.

Less labour is required in the dry process of pickling.

Better yields are obtained.

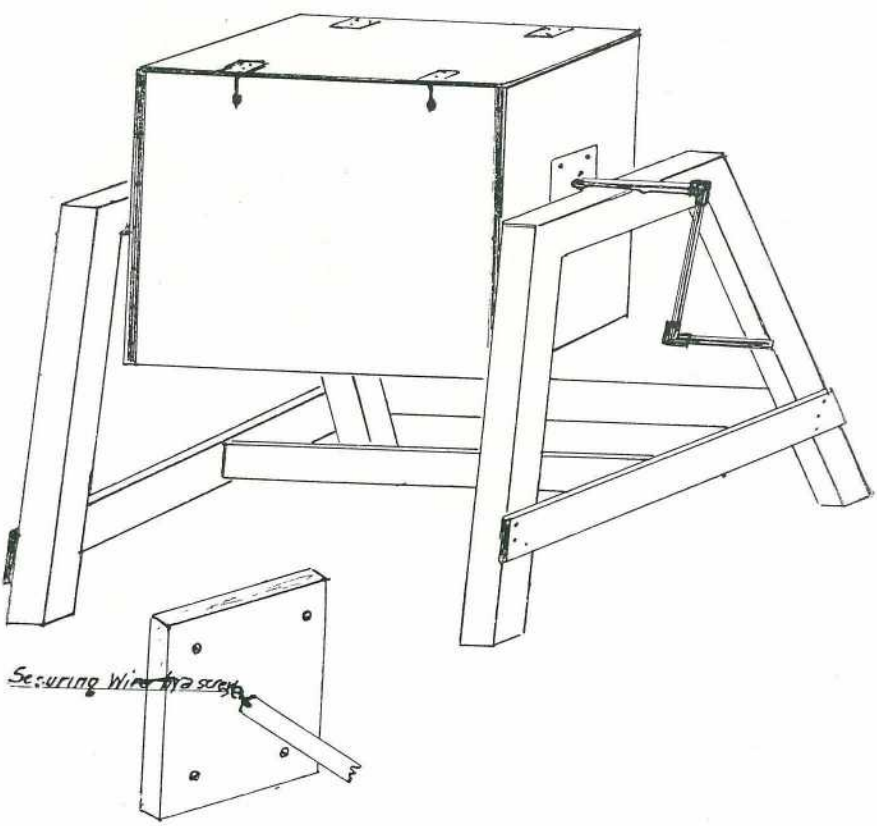
At harvest time, grain free from smut is assured.

The cost of the chemical works out at a fraction under a penny per bushel.

Grain may be treated, if necessary, several weeks before sowing.

Bunt or Stinking Smut.

This is caused by a fungus the spores of which, found commonly in the "crease" or in the "brush" of a grain of wheat, germinate about the same time as the grain itself germinates. In this way the fungus enters the tissues of the young wheat plant and ultimately finds its way into the ear, where the sooty-coloured mass of spores takes the place of the grain, giving rise to the name it commonly goes under, "Ball Smut."



The number of individual spores or seeds of the fungus found in one bail of smut is sufficient, theoretically, to infect all the grain in a three-bushel bag of wheat.

Individual spores are so minute as to escape detection. Obviously, the only way to ensure a clean sample of grain at harvest time is to pickle all seed wheat, irrespective of the fact that it may appear to be quite free from smut, even when a very close inspection is made. If smut balls are observed in the seed wheat (and their presence in wheat for sowing is to be avoided whenever possible), they should be removed by pouring the grain into a tubful of strong brine to permit of skimming off the balls of smut, which readily float; the grain then being spread out to dry on a tarpaulin, prior to treatment with carbonate of copper.

Method of Pickling.

Use ¾ oz. of copper carbonate for each bushel of grain; slightly less—say, ½ oz. per bushel—is sufficient where a suitable wheat pickling contrivance is used, but the use of the smaller quantity of copper carbonate is only recommended when the seed is known to be practically free from smut.

In the "Petrol Case Wheat Pickler" only half a bushel of seed wheat should be pickled at one operation. For rapid work, use a suitable measure both for the grain and the copper carbonate.

To pickle seed wheat and thoroughly blend the chemical with the grain, revolve the pickling box, say, twenty times, and then empty out and bag the grain direct from it.

Note.—Copper carbonate should not be put into the seed box of the drill in an attempt to mix it there, the fine dust shakes down, clogs up and will break the cog wheels.

The Petrol Case Seed Wheat Pickler.

Select a petrol case which has been constructed from sound timber and carefully remove the top, which is to be used as the lid. On the under side of the lid fit and nail two cross pieces 2 in. by ½ in., 2 in. from each end. Attach one pair of 1½ in. butt hinges, also two japanned hasps to fit tightly over D's, as shown in sketch.

Tack double strips of thick flannel on the under side of the lid where it comes in contact with the edges of the box, so that when it is closed, the joint between the lid and box will be quite dust-proof.

Strengthen the box by means of two bands of hoop iron fastened on the outside edges. Draw two diagonal lines on each end of the box and bore holes at the intersections to admit of the spindle passing right through the box. Prepare two pine blocks about 3 in. square out of ¾-in. material; these are to strengthen the ends of the box and allow for securing the spindle firmly in position to permit of rotating the box.

Bore both blocks with a similar sized auger bit to that used for boring the ends of the box. Place the blocks so that the grain of the wood is at right angles to that of the box and secure with four wood screws in each. Procure a piece of ¾-in. galvanized iron piping long enough to act as a spindle, one end of which should be threaded to carry a ¾-in. elbow. For the crank, procure two pieces of ¾-in. piping, each 9 in. in length; one will require threading at each end, whilst the other will only require threading at one end for the necessary elbow.

The method of attaching the spindle to the box is shown in the sketch.

Two holes are bored in the spindle the exact length of the box apart. Two pieces of No. 8 wire of the same diameter as the holes are driven through the spindle and secured to the wooden blocks either by driving staples over the wire, or what is a stronger and more effective job, bending the wire to form an eye and securing it in position with a screw.

The framework of the machine presents no difficulties, and may be constructed from 3 by 2 and 3 by 1 hardwood, but sufficient height must be allowed underneath to permit of the contents of the box being emptied directly into a bag.

Note.—Carbonate of copper forms the principal part of a number of proprietary compounds already on the market for pickling wheat.

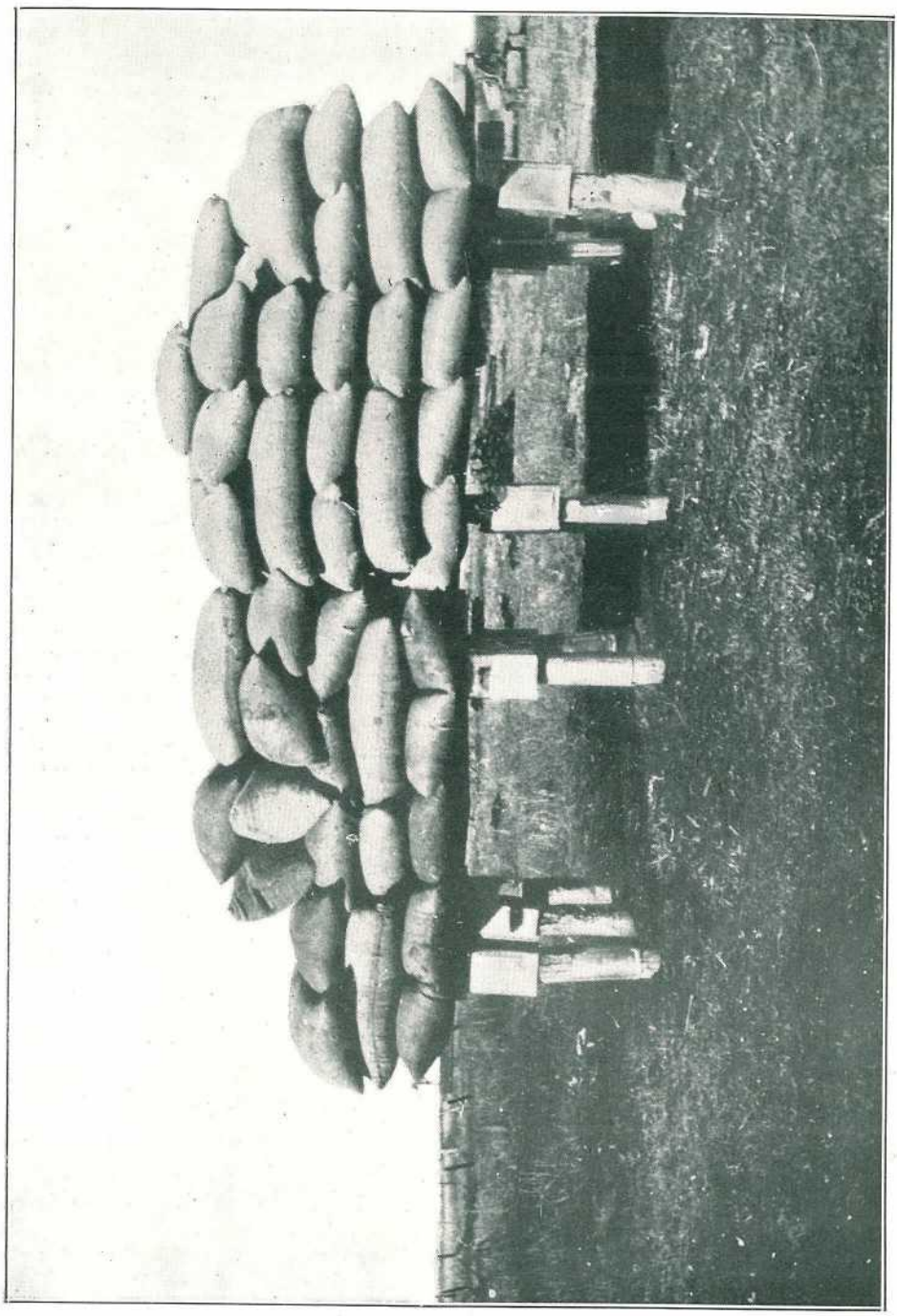


PLATE 122.—A COMMON SIGHT ON THE DOWNS—MOUSE-PROOF DUMP OF SEED WHEAT ON GEITZ BROS. FARM, ALLORA.

Answers to Correspondents.

Overfat Sow.

J.F.T. (Marlborough)—

Reference to Berkshire sow which has failed to breed successfully: In all probability you have this sow over fat, and the boar may also be in a similar condition. Reduce her condition by compelling her to hunt for part of her living in a good grass paddock, where also you might supply her with green food such as lucerne, saccaline, cow cane, sweet potatoes, and pumpkins. Cut the grain ration down to a minimum, and do not allow as much milk food as at present. Our Veterinary Officers are of opinion that many of these troubles are caused through the sow becoming injured at farrowing time, this especially so if the sow is over fat at this time. Very fat sows frequently fail to recover properly after farrowing, the result being that septic inflammation (metritis) is set up which tends to make them shy breeders if not altogether sterile. This indicates the necessity of keeping sows as well as the boar in medium breeding condition only (not fat). The sow also should be mated as soon as she has weaned her litter—*i.e.*, at about nine weeks after farrowing—and it is not advisable to allow the sow to run with the boar except at mating time. Sows should not be mated in the first instance before they are ten months old, nor should the boar be used earlier than this. It is suggested that you try syringing the uterus with a solution of one teaspoonful of table salt in one pint of sterile water; water which has been boiled and allowed to cool down to blood heat is best for this purpose. Mr. Veterinary Surgeon Rudd states that this has been tried, and has been effective in 80 per cent. of cases. If this does not give satisfactory result, try twenty grains of permanganate of potash in one pint of water at blood heat, and follow up with the saline solution every day for three consecutive days before service. It is also advisable to give the sow a course of purgative medicine like two or three ounce doses of Epsom salts, either as a drench or in her food. It is an advantage, if at all possible, to change the boar, using a young vigorous boar, but in every case keep the stock in medium breeding condition and do not feed too heavily on grain, particularly during the spring and summer months when green food is usually available in good quantity.

HINTS TO DAIRYMEN.

J. DAVIES, Inspector of Dairies.

Wash your own hands before starting to milk and after milking each cow; also wash each cow's udder with clean cold water with just enough Condy's crystals added to colour the water.

Use plenty of lime around the bails and dairy.

Do not spill milk about the bails and dairy.

Keep each separation of cream separate until conveyed to the factory. You cannot stir it too often. Do not mix fresh cream with stale; it pays to send the fresh cream in a separate container. (The mixing of fresh with stale cream results in second and third grade tests.)

Flush the separator with warm water—not skim milk, which appears to be the general practice.

During the summer months, October to March, never separate below 38 per cent., preferably around 40 per cent. The winter months, 35 per cent. to 38 per cent.

Cream should be delivered at least three times weekly, and should not be held for a longer period.

Do not leave cream exposed to the sun's rays. Place a clean wet bag around the can when going to the railway station or factory by road. Always open your cans on return.

Wash your dairy utensils first with warm water and soda and then immerse them for five minutes in boiling water. Allow to drain and dry.

Do not put your cream in a can until it has been thoroughly scalded and rinsed with clean rain water. *Never use creek or dam water,* unless it is quite unavoidable.

The use of a cream cooler is most important, for it not only helps to cool the cream quicker, but also takes away a good deal of the weed taints.

Do not grudge the time you spend in your dairy and bails. The more care you take in the handling of cream the better your factory return and the dairying industry generally.

EGG-LAYING COMPETITIONS.

MOUNT GRAVATT.

In September 5,619 eggs were laid, an average of 20·8 eggs per bird. Although this is not up to last year's figures, the yield can be considered satisfactory. Four deaths occurred in Section 2, otherwise the general health has been satisfactory. Individual scores :—

SECTION 1.

White Leghorns.

Name.	A.	B.	C.	D.	E.	F.	Total.
W. and G. W. Hindes	134	130	130	136	136	146	812u
W. E. Woodward	123	129	134	112	31	107	736
Mrs. R. E. Hodge	123	122	116	140	103	118	722u
John J. McLachlan	115	131	124	113	133	95	711
Eclipse Poultry Farm	138	126	107	121	118	92	702
B. Driver	126	101	91	119	121	128	686
E. J. Stilton	115	117	114	132	130	74	682
M. F. Marsden	106	116	107	98	117	127	671
S. L. Grenier	136	127	137	68	95	102	665
H. Fraser	73	121	126	124	118	96	658u
R. C. J. Turner	115	106	114	124	83	112	654
Jas. Earl	110	124	80	117	99	117	647u
J. Harrington	80	105	95	130	114	122	646
W. Wakefield	122	131	94	113	104	73	637
Jas. Hutton	113	101	134	85	86	109	628u
Geo. Marks	82	120	101	97	128	99	627
N. F. Newberry	77	107	134	115	100	91	624
H. P. Clarke	90	120	85	103	87	119	604u
T. H. Craig	85	117	101	100	92	106	601
J. E. G. Purnell	109	81	109	125	104	70	598
L. Bird	115	84	88	86	138	84	595u
Mrs. C. E. Lindley	97	76	96	123	102	101	595u
E. Anderson	56	90	90	97	126	129	588u
G. W. Cox	72	88	121	116	106	85	588
Mrs. H. P. Clarke	77	120	98	92	118	70	575
Chris. A. Goos	126	69	89	107	74	107	572
A. S. Walters	106	97	83	98	58	118	560
T. W. Honeywell	87	2	117	99	104	87	496
W. D. Melrose	122	103	39	9	105	15	393

SECTION 2.

Black Orpingtons (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Total.
H. Cutcliffe	153	109	123	108	135	127	755u
Eclipse Poultry Farm	129	112	126	138	118	130	753u
E. W. Ward	126	112	125	118	125	110	716
Mrs. A. E. Gallagher	125	114	128	88	111	134	700u
Jas. Potter	137	110	108	106	111	123	695
Geo. E. Rodgers	114	134	127	95	123	80	673
W. and G. W. Hindes	148	83	97	82	111	132	653
Carinya Poultry Farm	119	118	69	89	123	104	622
J. Pryde (R. I. Reds)	98	97	79	120	101	111	606
Thos. Hindley	140	77	116	81	114	72	600
R. Burns	111	84	99	111	105	83	593
W. D. Melrose	19	105	120	132	116	81	573
C. Dennis	103	95	129	108	53	74	562
E. Walters	57	62	101	103	111	97	531
Jas. Hutton	104	94	83	64	48	94	487
E. C. Stead	30	53	77	78	72	67	377u

"u" indicates that the pens have failed to average the standard weight of 24 ounces to the dozen eggs.

MOUNT GRAVATT—*continued.*

Following are weights of eggs laid by individual birds competing in this test, and also the average weight per dozen for the group.

SECTION 1.

White Leghons.

Owner.	Birds.						Average per Dozen.
	A.	B.	C.	D.	E.	F.	
W. and G. W. Hinds	1·98	2·06	2·00	1·92	2·10	1·83	23·78
J. J. McLachlan	2·06	2·22	1·97	2·10	2·08	1·88	24·62
George Marks	2 22	2·21	2·13	2·13	2·08	2.13	25·80
Mrs. R. E. Hodge	1·92	2·02	2·05	1·94	1·82	1·85	23·20
T. W. Honeywill	1·82	..	2·12	2·00	2·05	2·29	24·84
Mrs. C. Lindley	1·97	2·00	2·00	2·00	1·97	2·00	23·88
T. H. Craig	1·82	1·77	2·28	2·01	1·90	2·40	24·36
W. D. Melrose	2·50	1·78	1.79	..	2·22	..	24·84
E. J. Stilton	1·98	2·10	2·10	2·02	2·04	2·00	24·48
S. L. Grenier	2·25	2·15	2·29	2·07	2·15	2·02	25·86
G. W. Cox	1·80	2·15	2·01	2·06	2·03	2·03	24·16
H. Fraser	2·10	1·82	2·14	2·10	1·78	2·00	23·88
W. Wakefield	2·05	2·12	2·08	1·80	2·97	2·00	24·44
M. F. Marsden	2·04	2·10	2·20	2·37	2·00	2·00	25·62
J. Harrington	2·06	2·00	2·15	2·00	1·98	1·95	24·28
Jas. Hutton	2·07	1·77	2·05	2·06	1·92	2·00	23·64
J. E. G. Parnell	1·94	1·95	2·15	2·05	2·02	1·95	24·12
M. F. Newberry	2·03	2·05	1·95	2·27	2·07	2·22	25·18
W. E. Woodward	2·10	2·02	2·02	2·22	2·05	2·05	24·92
Jas. Earl	1·68	2·05	2·02	2·11	2·10	1·78	23·48
H. P. Clarke	1·88	1·96	2·02	2·02	2·20	1·70	23·56
R. C. J. Turner	2·08	2·07	1·65	2·27	2·18	2·00	24·50
Chris. A. Goos	1·85	2·17	2·10	1·80	2·00	2·10	24·04
L. Bird	2·00	..	1·58	2·08	1·88	1·83	22·28
Mrs. H. P. Clarke	1·95	2·00	2·02	2·00	2·07	2·07	24·22
E. Anderson	1·90	1·90	2·22	1·80	1·78	1·98	23·16
A. S. Walters	2·00	2·00	2·02	1·98	2·05	2·03	24·16
B. Driver	2·20	2·00	1·92	1·90	2·17	1·84	24·06
Eclipse Poultry Farm	1·82	2·27	2·02	2·05	2·17	2·00	24·66

SECTION 2.

Heavy Breeds.

Owner.	Birds.						Average per Dozen.
	A.	B.	C.	D.	E.	F.	
Eclipse Poultry Parm	1·93	2·01	2·00	2·03	1·87	1·87	23·42
Carinya Poultry Farm	2·00	2·05	1·95	2·02	1·98	2·07	24·14
H. Cutcliffe	1·60	2·15	1·65	2·07	1·98	1·84	22·58
W. D. Melrose	2·20	2·00	1·95	1·90	2·04	2·12	24·42
Thomas Hindley	1·78	2·19	2·17	2·02	1·98	2·14	24·56
Jas. Potter	1·75	2·12	2·00	2·19	1·94	2·00	24·00
Jas. Hutton	2·30	2·27	2·20	..	2·17	2·35	27·12
R. Burns	2·35	2·25	2·20	2·02	2·00	2·00	25·68
W. and G. W. Hindes	2·00	2·22	2·08	2·03	2·03	2·04	24·80
E. W. Ward	2·05	2·07	2·13	1·88	1·95	2·08	24·32
E. Walters	1·92	2·27	2·02	2·08	1·85	1·88	24·04
Mrs. A. E. Gallagher	1·63	2·13	2·00	2·00	1·80	2·17	23·46
G. E. Rodgers	2·05	1·75	2·08	2·25	1·78	2·11	24·04
C. Dennis	2·08	2·02	2·00	2·08	2·22	2·02	24·84
E. C. Stead	2·05	1·88	1·78	1·60	1·93	1·94	22·36
J. Pryde	2·13	2·20	2·25	2·27	2·12	9·15	26·24

N.U.P.B.A. TOOWOOMBA SUB-BRANCH.

Single Test Egg-Laying Competition—Scores to 30th September, 1925.

WHITE LEGHORNS.

Pen No.	Name.	Sept.	Total.
52	R. B. Howard ..	18	132
42	D. H. Dipple ..	18	131
41	D. H. Dipple ..	19	125
39	R. C. Cole	23	125
8	H. S. Wagner ..	19	121
9	A. C. Horne ..	17	118
40	R. C. Cole	10	116
50	C. A. Keen	17	116
21	G. E. Rogers ..	21	114
33	H. J. Manning ..	19	113
29	J. H. Jones ..	19	110
32	J. Newport ..	20	106
27	J. W. Short ..	16	105
28	J. W. Short ..	15	105
19	H. Dibbs	15	102
49	C. A. Keen	17	101
30	J. H. Jones ..	21	100
11	Jas. Hutton ..	18	100
54	E. W. Howe ..	19	99
38	P. J. Fallon ..	16	97
60	M. Murphy ..	13	95
26	W. G. Harper ..	22	95
51	R. B. Howard ..	14	93
35	R. C. J. Turner ..	11	91
56	J. F. Dahlheimer ..	13	88
2	Jas. Taylor ..	20	87
61	J. Goggins	14	86
3	E. Parker	19	84
48	G. Stilton	14	83
1	Jas. Taylor ..	10	83
59	M. Murphy ..	12	80
46	M. J. Frawley ..	5	80
17	W. D. Williams ..	12	77
62	J. Goggins	9	77
20	H. Dibbs	13	75
37	P. J. Fallon ..	13	72
45	M. J. Frawley ..	7	71
13	J. E. King	7	70
25	W. G. Harper ..	20	69
10	A. C. Horne ..	15	68
5	G. Maurer	18	65
44	S. V. B. Sharkey ..	0	63
6	G. Maurer	13	61
4	E. Parker	12	61
22	G. E. Rogers ..	0	60
12	Jas. Hutton ..	15	58
55	J. F. Dahlheimer ..	10	53
43	S. V. B. Sharkey (replaced)	15	22
53	E. W. Howe ..	*18	119
57	S. Chapman ..	*20	113
14	J. E. King ..	*19	104
7	H. S. Wagner ..	*17	102
23	Everlay P. Farm ..	*12	101
58	S. Chapman ..	*7	101
24	Everlay P. Farm ..	*20	75
36	R. C. J. Turner ..	*13	69
15	W. Grant	*16	69
16	W. Grant	*18	68
47	G. Stilton	*6	50
18	W. D. Williams ..	*11	45
34	H. J. Manning ..	*15	44
31	J. Newport	*20	35

OTHER VARIETIES.

Pen No.	Name.	Sept.	Total.
71	H. Dibbs (Lang.) ..	16	121
75	— Badcock (R.I.R.)	19	103
64	S. Chapman (B.L.)	12	95
65	Mrs. K. O'Connor (B.L.)	22	85
73	A. W. Le Pla (R.I.R.)	21	82
69	— Badcock (Lang.)	20	81
68	E. Parker (B.L.)	23	70
72	H. Dibbs (Lang.)	8	60
70	— Badcock (Lang.)	11	56
67	E. Parker (B.L.)	16	50
81	V. Brand (B.L.)	16	49
74	A. W. Le Pla (R.I.R.)	5	48
80	Everlay P. Farm (W. W'dotte)	*14	103
82	V. Brand (B.L.)	*19	98
77	L. Maund (Col. W'dotte)	*13	93
66	Mrs. K. O'Connor (B.L.)	*22	91
79	Everlay P. Farm (W. W'dotte)	*11	75
63	S. Chapman (B.L.)	*4	69
76	— Badcock (R.I.R.)	*10	63
78	L. Maund (Col. W'dotte)	*4	59

BLACK ORPINGTONS.

Pen No.	Name.	Sept.	Total.
120	Jas. Hutton	10	135
99	A. R. Petty ..	24	133
89	A. W. Le Pla ..	16	132
117	T. Hindley	10	130
132	G. E. Rogers ..	21	128
105	L. Maund	9	124
119	Jas. Hutton	23	123
121	E. W. Brock ..	14	122
128	J. W. Short	8	121
107	C. Graham	12	112
106	L. Maund	13	112
96	R. Burns	23	110
97	V. J. Rye	13	107
100	A. R. Petty	11	105
118	T. Hindley	20	104
114	D. W. Williams ..	18	103
111	E. Walters	19	101
126	H. B. Stephens ..	16	97
98	V. J. Rye	7	97
88	J. Head	15	95
90	A. W. Le Pla ..	16	93
109	S. McBean	13	91
86	— Kelly	19	86
102	T. J. Carr	8	85
85	— Kelly	4	85
108	C. Graham	10	83

* Signifies bird laying under-weight eggs.

N.U.P.B.A. TOOWOOMBA SUB-BRANCH—*continued.*

BLACK ORPINGTONS—*continued.*

Pen No.	Name.	Sept.	Total.
112	E. Walters	6	80
84	W. R. Wilson ..	14	76
113	D. W. Williams ..	9	75
83	W. R. Wilson ..	17	75
103	W. S. Adams ..	13	72
95	R. Burns (dead) ..	—	71
123	P. Hopkins	4	70
92	K. Macfarlane ..	14	67
115	Everlay P. Farm ..	10	63
110	S. McBean	11	58
122	E. W. Brock ..	8	58
87	J. Head	8	46
125	H. P. Stephens ..	2	44

Pen No.	Name.	Sept.	Total.
131	G. E. Rogers (replaced)	5	5
130	R. Neil	*25	144
127	J. W. Short ..	*22	125
116	Everlay P. Farm ..	*12	119
124	P. Hopkins	*12	90
94	T. C. Ollier ..	*17	73
91	K. Macfarlane ..	*11	70
129	R. Neil	*5	64
104	W. S. Adams ..	*17	64
101	T. J. Carr ..	*10	51
93	T. C. Ollier ..	*5	47

* Signifies bird laying under-weight eggs.

JOSEPH GARNER, Government Supervisor.

N.U.P.B.A. ZILLMERE

The average production for September was 20.2 eggs per bird, sectional results being—White Leghorns 21.4, Black Orpingtons 19.0, and Other Varieties 17.3.

One death occurred—No. 73, White Leghorn—and Nos. 163 and 5 were withdrawn owing to sickness. Otherwise the health of the birds has been satisfactory.

WHITE LEGHORNS.

Pen No.	Name.	Sept.	Total.
82	G. W. Cox	27	157
35	S. L. Grenier ..	23	151
8	R. G. Cole	24	150
27	J. J. McLachlan ..	26	146
95	S. A. Doman ..	24	146
86	H. T. Pember ..	21	146
81	R. Marshall ..	23	142
39	R. Duff	25	133
85	H. T. Pember ..	21	131
79	R. Marshall ..	18	128
65	A. S. Walters ..	22	127
15	R. C. J. Turner ..	25	126
36	S. L. Grenier ..	23	125
92	C. Quesnell ..	17	125
45	J. R. Wilson ..	25	122
43	J. R. Wilson ..	25	122
19	J. L. Chapman ..	22	122
78	A. Hodge	23	122
59	J. Hutton	24	121
17	J. T. Webster ..	22	120
83	G. W. Cox	22	119
14	R. C. J. Turner ..	25	119
51	F. J. Williams ..	25	117
53	E. C. Raymond ..	19	116
10	J. Fordyce ..	22	116
6	W. J. Berry ..	25	116
67	W. H. Forsyth ..	23	115
42	S. A. Chapman ..	21	114
96	S. A. Doman ..	29	114
16	J. T. Webster ..	25	111
23	H. Pearce	25	110
13	R. C. J. Turner ..	24	108
50	F. J. Williams ..	24	107
84	G. W. Cox	23	106

Pen No.	Name.	Sept.	Total.
99	A. Anderson ..	10	105
47	G. E. Rogers ..	21	105
33	W. E. Woodward ..	20	105
41	S. A. Chapman ..	23	103
11	J. Fordyce ..	17	101
40	S. A. Chapman ..	21	101
70	S. Lloyd	21	101
12	J. Fordyce	16	99
16	J. T. Webster ..	19	99
29	M. F. Newberry ..	26	97
52	E. C. Raymond ..	22	94
22	H. Pearce	22	93
21	J. L. Chapman ..	20	90
1	J. Earl	22	90
77	A. Hodge	19	90
89	R. H. Woodcock ..	23	90
48	G. E. Rogers ..	22	89
38	R. Duff	18	89
61	W. Wakefield ..	25	89
3	J. Earl	26	88
62	W. Wakefield ..	26	87
7	R. C. Cole	22	86
80	R. Marshall ..	21	85
69	W. H. Forsyth ..	19	84
75	J. E. G. Purnell ..	23	84
98	A. Anderson ..	22	82
58	J. Hutton	25	81
24	H. Pearce	2	81
25	M. F. Newberry ..	22	79
71	S. Lloyd	22	76
2	J. Earl	27	75
20	S. L. Chapman ..	13	75
34	S. L. Grenier ..	26	73
54	E. C. Raymond ..	15	70

N.U.P.B.A. ZILLMERE—*continued.*

White Leghorns—*continued.*

Pen No.	Name.	Sept.	Total.
49	F. J. Williams ..	5	58
91	C. Quesnell	20	58
72	S. Lloyd	20	52
97	A. Anderson (replaced 26-6-25)	18	51
37	R. Duff (replaced 18-8-25) ..	20	28
73	J. E. G. Purnell (replaced 14-9-25)	11	11
25	J. J. McLachlan ..	22	U166
87	H. T. Pember ..	25	U160
26	J. J. McLachlan ..	25	U157
31	W. E. Woodward ..	25	U157
30	M. F. Newberry ..	25	U155
64	A. S. Walters ..	24	U155
44	J. R. Wilson ..	23	U145
66	A. S. Walters ..	24	U142
46	G. E. Rogers ..	22	U138
60	J. Hutton	19	U136
90	R. H. Woodcock ..	21	U134
57	J. P. Marshman ..	19	U126
9	R. C. Cole	18	U122
76	A. Hodge	17	U118
94	S. A. Doman ..	21	U118
55	J. P. Marshman ..	25	U115
32	W. E. Woodward ..	25	U113
88	R. H. Woodcock ..	25	U112
4	W. J. Berry ..	20	U108
68	W. H. Forsyth ..	26	U108
93	C. Quesnell	17	U105
74	J. E. G. Purnell ..	28	U104
63	W. Wakefield ..	23	U80

Black Orpingtons.

122	W. H. West ..	23	156
110	G. E. Rogers ..	20	154
102	J. Hutton	16	154
124	H. M. Chaille ..	25	153
125	H. M. Chaille ..	22	152
140	T. Hindley	17	152
148	J. Potter	28	149
139	T. Hindley	22	149
103	C. C. Dennis ..	18	149
138	W. D. Melrose ..	16	143
143	J. Pryde	25	141
128	E. C. Raymond ..	20	135
109	G. E. Rogers ..	18	131
101	J. Hutton	24	129
144	J. Pryde	21	119
142	J. Pryde	24	114
126	H. M. Chaille ..	20	114
100	J. Hutton	24	114
147	E. Walters	7	114
132	T. C. Ollier ..	23	113
149	J. Potter	14	107
141	T. Tindley	21	102
112	W. R. Wilson ..	25	91
135	R. Burns	22	87
134	R. Burns	9	86
113	W. R. Wilson ..	27	85
133	R. Burns	18	84
127	E. C. Raymond ..	13	83
104	C. C. Dennis ..	23	78
121	W. H. West ..	13	23
146	E. Walters	21	U149
130	T. C. Ollier	22	U147
108	W. H. Forsyth ..	23	U141
150	J. Potter	12	U133
131	T. C. Ollier	24	U135
107	W. H. Forsyth ..	25	U131
111	G. E. Rogers ..	29	U117
123	W. H. West ..	22	U113
105	C. C. Dennis ..	25	U108
106	W. H. Forsyth ..	19	U93
145	E. Walters ..	0	U89
114	W. R. Wilson ..	26	U80
137	W. D. Melrose ..	3	U58
136	W. D. Melrose ..	0	U42
129	E. C. Raymond ..	9	U29

Other Varieties.

118	Mrs. J. Pryde (R.I.R.) ..	21	140
155	W. L. Howard (W.W.) ..	20	118
152	W. H. Forsyth (S.W.)	18	114
151	W. H. Forsyth (S.W.)	20	114
166	A. S. Keith (Ancona) ..	12	108
157	J. Pryde (Lang.) ..	18	106
120	Mrs. J. Pryde (R.I.R.) ..	21	101
119	Mrs. J. Pryde (R.I.R.) ..	18	98
167	A. S. Keith (Ancona) ..	21	94
153	W. H. Forsyth (S.W.)	22	92
159	J. Pryde (Lang.) ..	21	90
164	J. L. Hill (B.L.) ..	20	86
154	W. L. Howard (W.W.) ..	22	U118
156	W. L. Howard (W.W.) ..	16	U112
160	W. and G. W. Hindes (B.L.)	26	U110
161	W. and G. W. Hindes (B.L.)	19	U106
162	W. and G. W. Hindes (B.L.)	20	U84
168	A S. Keith (Ancona) ..	0	U63

"U" indicates eggs under 2 oz.

C. KIDD, Hon. Secretary.

DESTRUCTION OF INSECT AND FUNGUS OR FUNGOID PESTS.

A COMPARISON OF METHODS.

By A. H. BENSON, Director of Fruit Culture.

The numerous pests of one kind or another that attack all kinds of farm, orchard, or garden crops are a very heavy tax on all primary producers, and the loss caused by their ravages is probably greater than that due to any other cause. This being so, the question of how best to combat the various pests is a matter for most serious consideration, especially as the cost of treatment is of much importance. Remedies that cost more to purchase and apply than the extra value of the returns obtained as a result of their application are of little, if any, use to the commercial primary producer, to whom it is essential that the cost of treatment be kept as low as possible.

In order to determine how this may be brought about it is necessary to compare the methods now in use for the destruction of insect and fungus or fungoid pests.

A Review of Methods.

This necessitates a brief résumé of the work that has been done during the past fifty years, for prior to then there were few mechanical aids for the distribution of the various remedies, such simple contrivances as the ordinary garden syringe and the sulphur bellows being mainly depended upon. The first great advance was made when force pumps fitted with specially constructed nozzles, capable of distributing the liquid used in the form of a very fine mist, were introduced, as it was found that the material used for the destruction of the various pests could be much more economically, effectively, and rapidly applied by them than by any previously existing method. The pumps so used were known as spray pumps, and the operation of applying the various remedies was known as spraying.

Spraying was in general use for several years in the United States of America before it was introduced into Australia, and it was not until the early nineties that the first public demonstrations of spraying fruit trees were given by the writer—then an officer of the New South Wales Department of Agriculture. Since then spraying has made wonderful strides, as in place of hand-power force pumps we have now motor pumps capable of being worked at a very high pressure, which, when fitted with improved nozzles—of which there are many kinds—are capable of producing any kind of spray that may be required, from the finest mist to the long-distance, more direct spray, obtained by the use of a spray-gun.

There has also been an equally great change, not so much as regards ingredients as the method of preparing the various spraying mixtures. At first practically every spraying mixture was made by the actual user of the spray, but now large numbers of proprietary spraying mixtures, in a more or less concentrated form, are on the market. These proprietary spray mixtures are, as a rule, ready for use, all that is required being to add a quantity of water to them in order to reduce them to the desired strength. Their use saves the producer a lot of work, time, and trouble, but I am by no means convinced that the results are in any way superior to those obtained when the spraying mixture was manufactured by the user. This is certainly the case where fungicides such as Bordeaux or Burgundy mixtures are used.

In this State there is one great drawback to spraying, especially for field crops, and that is the difficulty that is frequently met with in obtaining an adequate and suitable supply of water. This adds materially to the cost, as the labour entailed, first in obtaining the necessary water, and secondly in applying the spraying material in a liquid form, is so costly that many producers frequently prefer to run the risk of loss by disease rather than incur the expense of spraying. This does not apply so much to orchard or vineyard spraying as to the spraying of such crops as potatoes, tomatoes, strawberries, melons, pumpkins, cucumbers, &c., and the question arises: Cannot these and similar crops be treated more expeditiously, cheaply, and equally as effectively by some method other than spraying?

Dusting.

This brings up the question whether it is not possible and practical in such cases to apply the material or materials required for the destruction of pests or for preventing disease in a dry form, instead of using a liquid spray. This is by no means a new suggestion, as for many years finely ground sulphur applied in the dry state has been used as a preventive of Oidium in grape vines and for the

destruction of red spider and similar spinning mites on fruit trees of different kinds, as well as on many kinds of plants. During recent years the application of insecticides and fungicides in the form of a fine dust has received considerable attention in the United States of America and elsewhere, and there are many producers who now consider dusting preferable to spraying for many diseases. As far as this State is concerned, dusting has been practically confined hitherto to the application of sulphur to grape vines, but recently, owing to the increase of insect and fungus or fungoid diseases on banana plants and fruit and the impossibility of spraying the affected plants, except at an absolutely prohibitive cost, it has been given a trial in their case with, so far, satisfactory results.

It has been found that the application of pyrethrum powder in dust form destroys the thrips that are the cause of the fruit rusting, as well as the caterpillars which gnaw and disfigure the skin of the fruit. Dusting with a copper-lime fungicidal dust has also proved effectual in preventing the injury to the fruit known as black spot or anthracnose, and there is every reason to believe it will prove equally effectual in the case of the banana leaf spot, rotting, and "cigar end" of the fruit.

PLATE 123.—APPLYING INSECTICIDES AND FUNGICIDES IN DUST FORM BY MEANS OF POPE'S KNAPSACK DUSTING MACHINE.

The work of dusting bananas, either the bunch or the whole plant, does not entail heavy work and can be carried out rapidly, whereas spraying is slow and entails very heavy work, as it must be done by hand. Only a knapsack spray pump can be used, as the bulk of our bananas are grown on hillsides that are too steep to permit of the use of a power spraying outfit, and this method of treatment is far too costly.

Dusting has one great advantage over spraying, and that is the small amount of labour required to apply the dust, so that the producer can easily do the work without any extra help—a very important consideration to the majority of producers.

There is no water to obtain or distribute, no loss of time preparing the dust, and it is very much easier to work a dusting machine or dust-gun than a spray pump, in addition to which the work is done much more rapidly.

In my opinion, dusting will never entirely supersede spraying, but will become a valuable adjunct to it. Spraying is essential in the case of contact insecticides, which must reach the bodies of the insects that are being dealt with, especially so in the case of sucking insects; but for the treatment of mites, red spider, thrips, and similar insects, the poisoning of leaf-eating and chewing insects, and the application of fungicides, dusting gives good results. The effectiveness of dusting depends very largely on the fineness of the material used—as the finer the dust the easier it is to distribute and the more evenly it is distributed. This is a very important point, and users should see that the material with which they are supplied is in the finest state of division possible.

Dusting must not be carried out on windy days; the best time is in the early morning and late evening, though a dull, quiet day answers well. Where copper-lime dust is used, the best results are obtained when the tree or plant is moist with dew, as immediately this dust comes in contact with moisture it is converted into Bordeaux mixture, which will adhere to the plant for a considerable time and thus protect the foliage and fruit against the attack of fungus spores of many kinds.

There are several types of dusting machines or dust-guns now on the market, ranging from a simple rubber bulb, such as that used with a motor horn, and fitted with a rubber cork and short length of brass tube, to powerful power-dusting machines on wheels with various types of dusters, rotary and otherwise, and knapsack dusting machines between those two extremes.

With respect to knapsack dusting machines, which appeal to me as the best all-round dusters to use in this State, it is interesting to note that a very effective machine very similar to the French "Torphile" knapsack sulphurer, used for sulphuring vines, is now being manufactured in Brisbane, and is being offered for sale at a lower price than any imported duster of equal quality and capacity. The illustration shows the machine at work.

Poison Gas as an Insecticide.

In addition to the use of fungicides and insecticides in the form of a spray or dust, there is the well-known method of destroying insects by subjecting them to the fumes of poisonous gases, the most effectual remedy for all insects that live by suction. Here again the use of a dry powder—very finely ground calcium cyanide—is taking the place of sodium and potassium cyanide, as this powder does not need the addition of sulphuric acid to liberate its poisonous gas, but gives off hydrocyanic acid gas when it comes in contact with the air. The tree to be treated is covered with an airtight sheet in the same manner as that employed where the gas is generated from the cyanide and acid placed under the tent, the only difference being that the dust is blown into the tree under the sheet by means of a special blower.

Where insects injure the roots of the tree or plant new methods of destruction are now being thoroughly tested. Formerly this class of insects were found to be extremely difficult and costly to either destroy or even control, the only remedy of proved worth being bisulphide of carbon, which proved effectual in the case of the phylloxera of the grape vine when systematically injected into the soil.

Paradichlorobenzene promises to become a valuable addition to our list of insecticides, as when used in a similar manner to that employed in the case of phylloxera it is destructive to soil-infesting aphides, mealy bugs, and the larvæ of several kinds of insects that feed on the roots of plants. It is also apparently distasteful to the weevil beetle borer of bananas, as recent experiments tend to show that where it is applied to the soil surrounding beetle infested stools the bulbs leave the stools. This substance retains its characteristic scent for quite a long time when placed in the soil, being superior in this respect to any other materials that have been tested. From these general remarks it will be seen that the time has come when we can no longer depend entirely on any one method of treatment for the destruction of our numerous pests, but must employ the method which is best adapted to the particular crop or pest that has to be treated. Thus spraying must still be mainly depended upon for the treatment of most of the diseases attacking fruit trees, but dusting should be systematically tested in the case of farm crops, as well as in banana plantations, and soil fumigants should be used where crops are being injured by root-eating insects.

SOIL ACIDITY.

By C. R. von STIEGLITZ, A.A.C.I., Analyst to the Bureau of Sugar Experiment Stations.*

It may be permissible, because of the connection of soil acidity with the general fertility of the soil, to preface my remarks with a few generalisations on soil fertility.

Soil fertility is often spoken of as though it were an absolute property of the soil. Far from being this, it is really a particular relationship subsisting between soil conditions on the one hand and plant growth on the other. The conditions affecting this relationship may be classed under two headings—

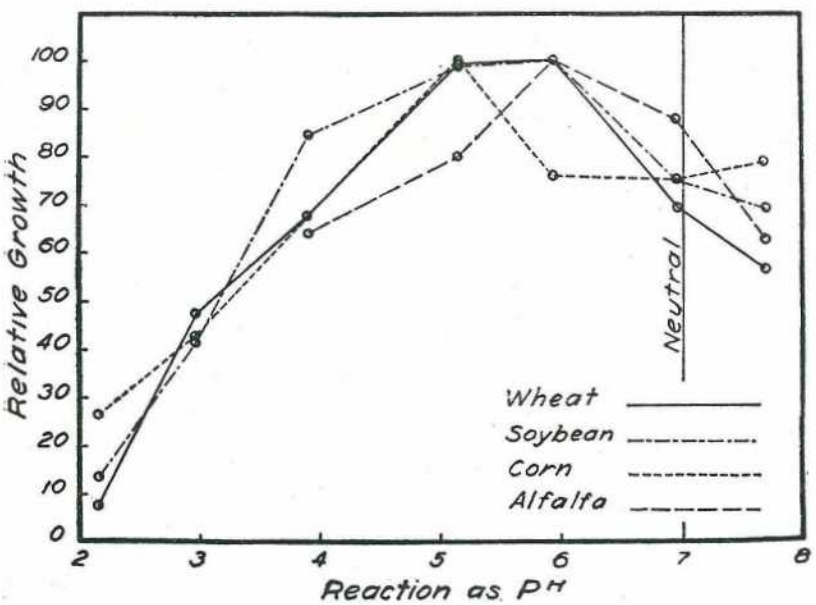
(1) Those of a chemical, physical, and biological nature.

(2) Those of a topographical and climatic nature.

So it is that an equilibrium is eventually reached in the soil which is the resultant of these various factors interacting. Some of these factors cannot vary to any great extent without limiting or controlling crop production, and fortunately most of these may be controlled by the farmer.

In particular, the reaction of the soil profoundly affects both the growth of organisms and plants, not merely through the direct effect of acidity or alkalinity, but also through the displacement effected on the complex chain of soil equilibria. Therefore the importance of "soil acidity" or "sourness," to use the farmers expression, must not be overlooked, and its attempted correction by the use of lime in various forms ranks amongst the oldest agricultural operations.

Because of the increased crop yields observed as a result of this practice, the idea became prevalent that all acidity was harmful. Modern field experiments, however, worked in conjunction with laboratory investigations, prove that most crops make optimum growth in soils showing a slight degree of acidity. It may be of interest here to append a graph taken from Dr. Russell's (1) book on "Soil Conditions and Plant Growth" showing a growth of seedlings for varying acidity (as expressed by the Hydrogen ion exponent pH) in culture solutions.



Of recent years a great amount of research has been done on the subject of soil acidity in most countries of the world, in an endeavour to account for its presence and to formulate methods for its estimation and correction.

* Paper read before Members of the Australian Chemical Institute (Queensland Branch), 23rd October, 1925.

Although much useful information has been procured, there is still much controversy as to the degree and form of such acidity which is harmful to plant growth.

Various theories have been advanced to account for its presence, and E. A. Fisher (2) of Rothampsted Experimental Station, has written an excellent résumé on this subject. There are three main theories.

1.—Humic Acid Theory.

One of the oldest theories, advanced by Sprengel in 1826, attributed the presence of acidity to the accumulation of insoluble complex organic acids—the so-called humic acids—produced by the decomposition of plant remains.

The dark alkaline solution obtained on treating an acid soil with ammonia was supposed to contain the soluble salts of these acids, and the acids themselves could be precipitated on acidifying. Soils rich in calcium or magnesium were supposed to contain these acids, combined with the bases mentioned, and were insoluble in alkalies unless previously treated with acid.

This theory was held until about 1888 when van Bemmelen suggested that these bodies were not definite chemical compounds, but mixtures of a base and various colloidal substances held together by some sort of surface attraction. These ideas were developed and extended and eventually gave rise to what is known as the

2.—Selective Adsorption Theory.

which theory is usually associated with the name of Cameron. He showed that all the phenomena of soil acidity could be explained as simple colloidal manifestations and did not require the assumption of soil acids at all.

It was only necessary to suppose that the soil colloids absorbed the base more readily than the acid of blue litmus, and all the phenomena were explained. He showed that cotton and other absorbents behaved similarly, gradually turning blue litmus red.

Work in support of this theory was done by Harris in an investigation of Michigan soils. He showed that these soils turned blue litmus red; an aqueous extract was neutral; but an extract made with a neutral salt—*e.g.*, calcium nitrate —was acid. It was, therefore, assumed that either an insoluble potent mineral acid was present or else the basic portion of the indicator was taken up in preference to the acid portion. The latter was indicated because, as in the case of peat, the amount of acid from different salts was not liberated in equivalent proportions as it should be in a chemical reaction.

3.—Basic Exchange Theory.

Many, however, still held that a real interchange of bases took place with the complex alumino-silicates of the clay fraction, with the subsequent solution of aluminium. This aluminium then hydrolysed producing an acid condition, and furthermore the aluminium was given up from the soil in amount approximately equivalent to the base taken up. According to Daikuhara the mineral soils of Japan and Korea fitted in with this explanation.

Hartwell and Pember showed that true acids added to nutrient solutions affected barley and rye similarly, whilst extracts of acid soils affected them differently. On investigation of the soil extracts they found that the difference was due to aluminium.

Much work has been done on the part played by the aluminium ion in the toxicity of acid soils, but modern thought tends to the conclusion that both adsorption and interchange of bases may occur together in the same soil, although possibly with different soil constituents.

The different varieties of acidity may be summarised as—

(*a*) Organic;

(*b*) Siliceous;

(*c*) Formed by hydrolysis of iron or aluminium salts.

They may adversely affect plants or micro-organisms by reason of their strength or their quantity. On the other hand they may have no injurious effect.

Various qualitative and quantitative methods have been devised to indicate the need or otherwise of a soil for lime.

Qualitative Methods.

The method probably most widely used is the observed effect of the soil on litmus. The customary method is to place some soil in a small dish, add sufficient water to bring to a thick paste on stirring, and then place on top of the soil strips of blue and red litmus paper. After about half to one hour the effect may be observed.

This method in a modified form is adopted by the Agricultural Chemist here in Queensland. The litmus paper is laid on the bottom of a glass vessel, and a piece of filter paper interposed between the litmus and the moistened soil.

H. R. Christensen (3), who has written a great deal on both qualitative and quantitative methods, prefers to use a neutral solution of litmus, shaking a few grams of the soil up in a test tube with the solution. Some soils, however, do not settle readily, and the colour of the soil at times makes observation difficult. Many other methods have been suggested, but whilst acting well enough for acid soils they mostly fail to distinguish between neutral and alkaline.

A method proposed by Comber (4) of the University of Leeds is interesting. He treats the soil with an alcoholic solution of potassium thiocyanate, and assumes that in an acid soil the potassium will liberate some iron to the solution, which will then give the red colour of ferric thiocyanate. A neutral or alkaline soil will remain colourless. To distinguish between the latter a trace of ferric chloride is added, the red colour remaining for neutral and disappearing for alkaline soils.

Hissink in Holland has used the method extensively, and correlated it successfully with hydrogen ion measurements. Other writers, however, adversely criticise it in this respect. Comber claims to have correlated it with the Hutchison-MacLennon method so widely used in England (*i.e.*, the absorption of calcium from calcium bicarbonate).

Another recent method is one suggested by E. M. Crowther and W. S. Martin (5), of Rothampsted Experiment Station. A calcium carbonate suspension in distilled water is alkaline to indicators such as cresol red (the distilled water being previously boiled to ensure freedom from carbon dioxide). Such a suspension added to a few grams of an acid soil and shaken, will be almost instantly changed to the yellow form. Neutral or alkaline soils will remain unchanged. The test illustrates the ability of acid soils to decompose calcium carbonate.

Quantitative Methods.

Quantitatively chemists study acids in two ways (6)—

1. By measuring the hydrogen ion concentration, a value based on the assumption that an acid on solution in water, dissociates into two parts called ions—one being hydrogen and the other the rest of the molecule.
2. By determining the titration value—*i.e.*, the number of c.c's of standard alkali solution which a given volume of the acid solution will neutralise.

This measures the total quantity of hydrogen ions producible under the conditions of the experiment, supposing them to be neutralised or linked up with hydroxyl ions as quickly as they are liberated, but makes no distinction between strong and weak acids which produce marked differences on plant life.

Most of the "lime requirement" methods provide a more or less rough measure of the titration value, the differences observed (which are often considerable) as between different methods, are partly due to absorption and partly to the number of hydrogen atoms concerned.

The determination of the hydrogen ion concentration—*i.e.*, of the ions actually present, as distinct from those that would finally be liberated on neutralisation—attempts to measure the intensity of the acid as distinct from its quantity.

The principle is based on the ordinary dissociation law

$$\frac{H \cdot \times X'}{HX} = K.$$

where H· and X′ are the ions produced on the dissociation of the acid HX and K is a constant.

Hydrogen Ion Measurements.

There are two ways of measuring the number or concentration of the ions—

1. Electrometrically.
2. Colorimetrically.

The latter has found most favour in connection with soil work, and seems to correlate fairly well with the more accurate and more lengthy electrometric methods. H ion concentration is usually recorded as pH value—*i.e.*, the common logarithm of the reciprocal of the H ion concentration. A method proposed by Gillespie (7), U.S.A., described the estimation of pH values for soils without the aid of buffer mixtures.

Briefly the principle of the method is the following:—At a definite pH value a certain definite per cent. of a dissolved indicator is in the acid form and the rest in the alkaline form. To express this Gillespie gives the following equation

$$pH = K + \log \frac{\text{alkaline form}}{\text{acid form}} \qquad 1$$

where K is the dissociation constant for the indicator concerned.

If now the alkaline and acid forms are separated for convenience in test tubes, the colour effect observed on viewing the tubes together will be the same as when the two forms are present in the one solution.

This division was accomplished by dividing 10 drops of indicator into various drop ratios such as 1 to 9, 2 to 8, 3 to 7, &c., one portion was made acid, the other alkaline.

The colour effect, produced by observation of any one pair of tubes, can then be correlated with the colour produced by a solution of known pH value on the same amount of indicator undivided—*i.e.*, equation 1 may be written:

$$pH = K + \log \text{ ``drop ratio.''}$$

If now a soil solution is compared with the known pH value of a certain pair of tubes, its pH value is at once assessed. The effects are viewed by means of a boxlike comparator containing spaces for six test tubes (the test tube being as uniform as possible). For a detailed account which cannot be given in a short paper of this description, reference must be made to that written by Gillespie.

Many attempts have been made to correlate the pH value of the soil with its lime requirement. Much useful information has been obtained when the investigations have been confined to soil of a distinct type, and for particular crops the fluctuations of the pH value have been correlated with the increase and decrease of crop production.

Much interesting work has recently been published on H ion estimation in soils by E. M. Crowther (8), of Rothampsted Experimental Station. He determined a succession of pH values for different soils, after additions of increasing quantities of Ca $(OH)_2$ until neutrality or alkalinity of the solution was shown.

The following graphs taken from his paper are interesting:—

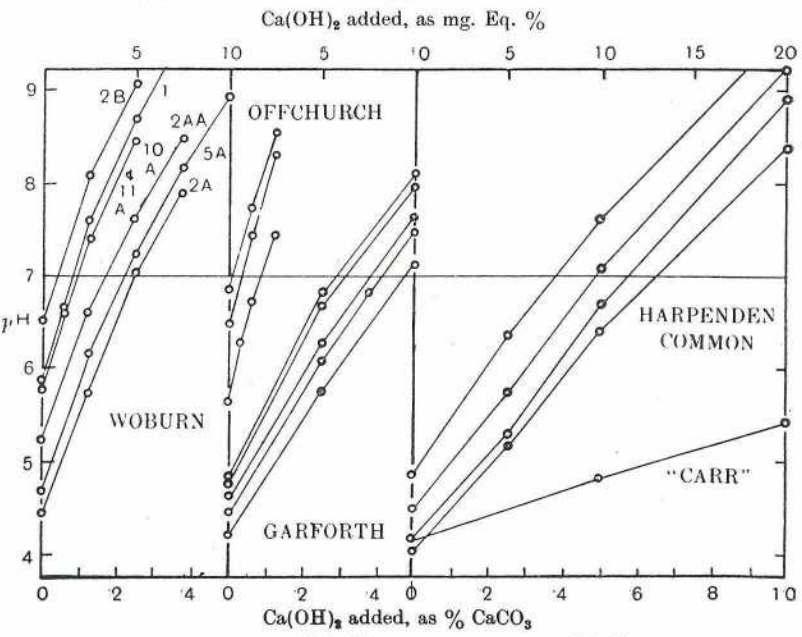


Fig. 2b Fig. 2c

It will be noticed that for different degrees of acidity in the same soil type a series of similar curves resulted.

Crowther's measurements were carried out electrometrically in a soil water ratio of 1/5. A measure of the lime requirement of the soils in question was thus obtained from these curves. In field experiments the effect produced is generally less than that indicated.

Titration Methods.

A method used extensively in England, and which for a time was adopted in Queensland by the Agricultural Chemist, is that of Hutchison and McLennon (9). In this method a known quantity of soil is treated with calcium bicarbonate solution for a definite period. The filtered extract is titrated against standard acid, and by use of a factor the so-called "lime requirement" per acre is expressed as either per cent. or cwts. of calcium carbonate, according to the particular convention employed.

A method used a great deal in America is that of Jones (10). An acid soil on treatment with calcium acetate will take up the calcium liberating acetic acid which is measured by titration with standard alkali and the "lime requirement" calculated from this result.

Jones's method, used in conjunction with that of Hopkins (11) (the treatment of soil with potassium nitrate solution), has been used most successfully at the Purdue Experiment Station. The study of acid soils there has been going on for about twenty years and over 10,000 samples of soil have been treated. Jones's method measures the "total acidity." Hopkins the "mineral acidity." They employ the following formula:—

$$k = \frac{H^2}{J - H}$$

where H expresses the acidity as determined by Hopkins's method and J that of Jones.

The difference gives the "organic acidity." They consider a K value of over 25 to indicate a lack of lime for lucerne, a K value of 100 or more to indicate the need of lime for all grain crops.

These two methods have been tried on all soils submitted for analysis to the Agricultural Chemist during the past year, and it is pleasing to note that 62 per cent. of these showed a K factor of nil. Approximately 14 per cent. had a K factor of 25 or more. Just how this value may be applied for different crops and different climatic conditions is a problem which must be correlated with field observations.

An investigation of some typical sugar soils was carried out by H. W. Kerr (12) before leaving for America. The worth of the above method was demonstrated as Bundaberg soils, known not to respond to liming (yet showing high total acidity) gave a negligible K factor, showing the acidity to be organic in nature, which form is seldom harmful.

Some of the far northern soils showed very high K values, and it was thought as a first rough estimate that a K value of 60 or over would certainly indicate the need of lime for sugar-cane.

During the past year only two soils exceeded this value, one being 74 and the other 125. In both cases the cane was doing badly. It is hoped shortly to estimate the pH values of soils showing a high degree of mineral acidity.

In conclusion, it may be stated that when applying lime to acid soils as a corrective measure due consideration should be given, not only to the form and degree of such acidity, but also to the particular crop in question, as different crops show marked differences in their love for lime.

Soils showing high mineral acidity will benefit firstly by an application of lime followed by superphosphate. The form of lime to be used will depend to a great extent on the physical texture of the soil in question.

Summary.

1. No one theory is adequate to account for the presence of acidity in soils. Different classes may exist in the same soil.

2. Both hydrogen ions and aluminium ions may prove toxic to plants.

3. No qualitative method has yet been proved to act in a reliable manner for all classes of soils, but when dealing with the variations of one type much useful information may be obtained.

4. Most quantitative methods for expressing "total acidity" differ in the result obtained owing to absorption effects. Very useful results have been obtained in America by the use of a formula connecting the "mineral acidity" and the "organic acidity."

5. Routine methods for H ion estimation are best carried out colorimetrically.

6. When attempting to correct for acidity in soils due regard must be given to the crop concerned and to the physical texture of the soil.

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WHEAT CROP PROSPECTS.

Mr. C. S. Clydesdale, Assistant Instructor in Agriculture, who has just completed a visit of inspection of some of the Departmental Wheat Experimental Plots on the Darling Downs, situated at Inglewood, Pratten, Allora, Southbrook, and Pittsworth, stated in the course of a recent Press interview that weather conditions were affecting the outlook. Some of the departmental varieties were only affected, however, in a minor degree, indicating in no uncertain manner that individual wheats possessed greater resistance to dry weather and to frosts than others, so much so, that the experience to be gained in a season like the present was invaluable from the point of view of an experimentalist in appraising the true value of a variety for Queensland conditions. Speaking generally of the prospects of the wheat crop there had, unfortunately, been a rather severe set-back through a continuation of the dry weather accompanied by westerly winds, also from the effect of late frosts.

In the Inglewood district, many fields are planted rather too late in the season and the wheat never thoroughly established itself. On such situations the crops were being fed off in preference to allowing them to mature, as at best they could not be expected to yield more than a few bushels of grain per acre. A limited area of early-sown crops grown on well-prepared land may yield from three to four bags per acre, but rain is urgently required.

In the Allora district the crops looked better than in any other locality visited; here, the straw ranges from 2 to 3 ft. in height, the better grown crops being found on the higher country where the yields of gram should average about four to five bags per acre; this anticipated increase in yield being influenced to some extent by heavier falls of rain in the early part of the season. On the low-lying, heavy black soil country, growth and development were not so good, nor were the crops anything like so forward. Two heavy frosts on the 18th and 24th September caused much damage, particularly to the favoured Pusa variety, which at that time was both in the shot blade and flowering stage.

The Cunningham-Pratten area also appeared to have felt the dry weather, but here again the wheat on the more elevated and well prepared lands showed much more promise than on the heavier type of country on the low lands.

In the Southbrook district, the crops, generally, were above the average; here, the wheat is a little more forward than in other districts mentioned, and as good rain fell in August in this locality, it came at a time when the young plants could make better use of the moisture, inducing them to stool and to develop a better root system, which latter has since enabled the ripening crops to stand up against the recent dry spell.

Several weeks ago the Pittsworth district wheat plots gave much promise, but latterly the dry weather had reduced expectations of the grain yield by fully 50 per cent.

A general review of the outlook for this year's wheat crop is not at all promising. A larger area was put in, estimated at about 25 per cent. more than that of last year, but unless rain falls almost immediately there is little prospect of obtaining, in the aggregate, any more than a light crop.

FERTILISER DONT'S.

By J. C. BRÜNNICH, Agricultural Chemist.

Don't apply fertilisers unless you know how.

Don't buy cheap fertilisers.

Don't buy low-grade fertilisers, as the cost of handling and carting of useless bulk is largely in excess of its value.

Don't buy fertilisers without getting full details of the plantfoods they contain, and the form in which the plantfoods are present, in accordance with the regulations under the Fertilisers Act, which is specially framed for the protection of the farmer.

Don't expect results from fertilisers containing one plantfood only, except in a few special cases.

Don't scoff at scientific farming, but listen to the advice of persons who made the use of artificial fertilisers their special study.

Don't apply fertilisers without a full knowledge of the requirements of the crop and condition of your soil.

Don't expect too much from the chemical analyses of the soil and of the crop; they are only useful hints and may point out striking deficiencies, but other factors may be of great importance.

Don't hesitate to apply to the Department of Agriculture and Stock for any information you desire to get, and obtain the pamphlets bearing on the subject of fertilising.

Don't be afraid to make fertiliser trials on a small scale, as the results obtained therefrom are a valuable guide for the use of fertilisers on a larger scale.

Don't expect results from fertilisers if the season is unfavourable for want of rain.

Don't lose hope if you do not get satisfactory results with your first experiments, but try and try again.

Don't expect that the application of artificial fertilisers will replace good and thorough cultivation.

Don't expect that any artificial fertiliser will give good results if the soil is in a bad physical condition and contains little or no humus.

Don't expect that artificial fertiliser can replace farmyard manure; but, if possible, use them conjointly.

Don't apply the same kind of artificial fertiliser year in year out, but make a change occasionally.

Don't apply the fertiliser at the wrong time; it may be all lost before the crop can utilise it.

Don't apply large amounts of artificial fertilisers at one time, as better results are obtained by applying portions in two or more dressings during the growth of the crop.

Don't let your plants come in close contact with large amounts of artificial fertilisers, but mix the fertiliser well with the soil.

Don't overlook the difference between quick and slow acting fertilisers, and use the former if you want immediate results with quick-growing crops.

Don't think that one application of fertiliser will last for many seasons, but use fertilisers regularly.

Don't expect that, after years of cultivation without the use of fertilisers, an application of complete fertilisers will give you at once a good crop.

Don't expect that green manuring alone will maintain soil fertility, as the green manure crop cannot return more plantfood than it took from the soil, but it makes the same more available.

Don't apply nitrogenous manure too liberally if you want to get a high yield of grain, fruit, or tuber.

Don't think that lime is a fertiliser and can replace all other fertilisers.

Don't mix quicklime with any fertiliser containing nitrogen in the form of ammonium salts, or in form of organic nitrogenous compounds, present in blood and meatworks fertilisers, but apply the quicklime, after being air-slaked, a few weeks before other fertilisers.

Don't leave bags of fertilisers in the open, exposed to all weathers, but keep them under shelter.

Don't forget that fertilisers not only improve quality and quantity of the crops, but give them a better stamina to resist diseases.

Don't sell all your soil fertility with your crops and stock, and thus overdraw your banking account with your soil, but maintain the soil fertility by the combined use of green manuring, application of farmyard manure and artificial fertilisers, and deep and thorough cultivation, as the natural fertility of a soil once lost is very hard to build up again.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1925 AND 1924, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1925.	Sept., 1924.		Sept.	No. of Years' Records.	Sept., 1925.	Sept., 1924.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	0·65	24	0·27	2·42	Nambour	2·48	29	0·30	1·83
Cairns	1·71	43	0·72	4·08	Nanango	1·92	43	0·87	2·18
Cardwell	1·43	52	0·82	0·57	Rockhampton ...	1·30	38	1·04	1·83
Cooktown	0·57	49	0·54	0·89	Woodford ...	2·22	38	0·37	2·12
Herberton	0·50	38	0·99	1·44					
Ingham	1·27	33	1·69	1·84	*Darling Downs.*				
Innisfail	3·56	44	3·12	2·61					
Mossman	1·34	17	1·07	2·19	Dalby	1·80	55	0·53	3·50
Townsville	0·79	54	1·33	1·21	Emu Vale ...	1·95	29	0·93	35·2
					Jimbour	1·63	37	0·21	30·3
Central Coast.					Miles	1·49	40	0·28	2·87
					Stanthorpe ...	2·47	52	0·49	3·85
Ayr	1·48	38	1·48	0·24	Toowoomba ...	2·25	53	0·30	3·51
Bowen	0·81	54	0·97	0·44	Warwick	1·91	60	0·61	3·09
Charters Towers ...	0·76	43	0·87	0·30					
Mackay	1·59	54	1·61	0·89					
Proserpine	2·11	22	1·95	0·48					
St. Lawrence ...	1·31	54	2·12	1·36	*Maranoa.*				
South Coast.					Roma	1·56	51	...	1·62
Biggenden	1·68	26	0·39	2·09	*State Farms, &c.*				
Bundaberg	1·78	42	0·57	2·03					
Brisbane	2·08	74	0·42	1·16	Bungeworgorai ...	1·36	11	0·01	1·78
Childers	1·95	30	0·76	2·68	Gatton College ...	1·73	26	0·26	2·65
Crohamhurst ...	2·71	30	0·59	2·12	Gindie	1·12	26	...	1·24
Esk	2·28	38	0·27	2·35	Hermitage ...	1·72	19	0·78	2·62
Gayndah	1·58	54	0·89	3·20	Kairi	0·61	10	...	0·72
Gympie	2·17	55	0·53	2·39	Sugar Experiment Station, Mackay	1·49	28	1·40	0·70
Caboolture	1·95	38	0·24	1·71					
Kilkivan	1·75	46	0·31	3·25	Warren	0·73	11	1·07	1·40
Maryborough ...	1·98	53	0·67	3·57					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

THE CLYDESDALE HORSE.

By H. S. HUNTER, Treasurer, Clydesdale Society of Queensland.

The horse is again coming into his own. An increasing accumulation of evidence received from many countries indicates distinctly the swing back to normality after the revolution in methods of hauling, brought about by the improvement of mechanical power. Whilst it is admitted that the motor truck and the motor tractor are superior to the horse in speed and power for certain kinds of work, it is also realised that the draught horse is still indispensable, and may be regarded as an economic necessity on the farm, on the road, and in the city. Owners of motor vehicles, who are now able to review the efficiency of their machines in comparison with their economic working over a period of years are, in many instances, reverting to the use of the horse. We may take as an example the United States of America, where approximately 90 per cent. of the world's motors are produced, where motor fuel is comparatively cheap, and where about 87 per cent. of the motor power of the world is used. That country has gone most carefully into the question of horse usage, and, as a result of the investigations of the Horse Association of America, it has been definitely proved that the horse is absolutely indispensable. *Nearly 75 per cent. of the freight handled in New York City is still drawn by horses.*

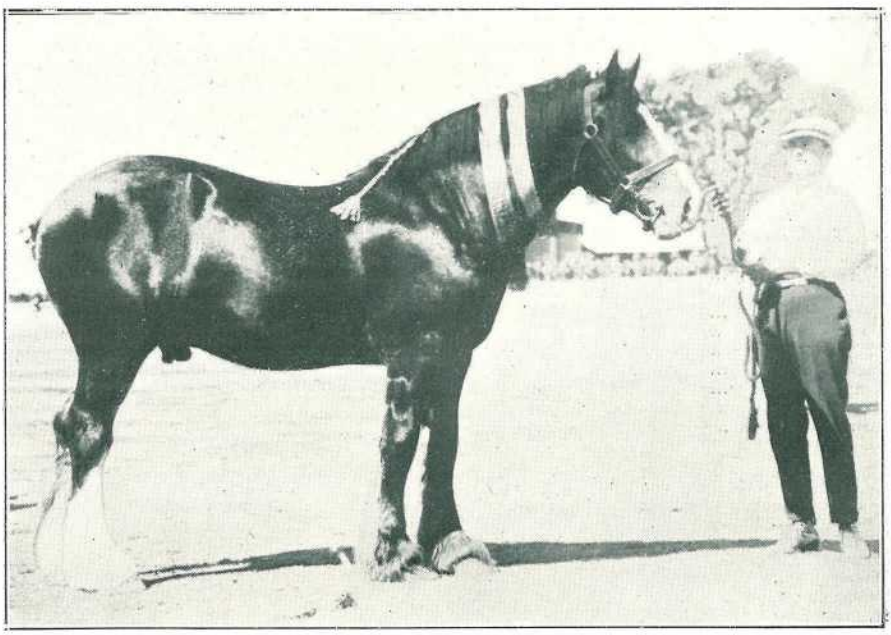

PLATE 124.—CLYDESDALE COLT, "PROFESSOR," 2 YEARS AND 9 MONTHS OLD.

First and Champion, Royal National Show, 1925. Bred by Department of Agriculture and Stock. Exhibited by Mr. Gavin Elliot, of Laidley.

In a pamphlet entitled "Facts for Horse Breeders and Horse Users," published by the Victorian Branch of the Commonwealth Clydesdale Horse Society, the following passage, having reference to horse usage in the United States of America, appears:—

"Statistics are of more valuable help to us, as they indicate the manner in which the horse has maintained its place, despite the enormous use of motor power in recent years. In 1914 there were 24,876,000 horses and mules in the States. During the war period approximately 1,400,000 horses and mules were exported to Europe. The American farmer and horse breeder experienced a most depressing time after the close of the war, and, like Australia, both horse and cattle breeding suffered. The latest horse returns are encouraging, as on the 1st January of this year the Federal Department of Agriculture estimates were 17,589,000 horses and 5,411,000 mules, in farms, and approximately 2,000,000 horses and mules in non-agricultural work. This makes a total of 25,000,000 horses and mules in the United States. When it is remembered that there are nearly 18,000,000 motor cars and trucks

in use in that country, it will be realised that the position of the horse and mule is highly satisfactory, and is a magnificent tribute to the value of these animals in all classes of work.

"It is generally claimed that the tractor will do the work of from six to eight horses, and a recent advertising report claims that half the farmers in the United States have tractors. The latter claim is a gross exaggeration, but, even if it were true, it would be a bad advertisement for the tractors, as, if they could do what was claimed for them, they should have thrown out of work the whole horse population of the United States, as there are over 6,000,000 farmers in the country. On farms investigated by the United States Department of Agriculture it was found that the average number of horses which could be dispensed with through the use of a tractor was a fraction over two head."

In the neighbouring country of Canada we have also ample evidence of the reversion to the use of the horse. During the war her farmers went in rather extensively for tractors, which, they thought, would overcome labour difficulties. We are told on the authority of the Live Stock Commissioner for Canada that between 1916 and 1920, something like £6,000,000 was spent in the purchase of 33,000 tractors, by farmers in the Provinces of Alberta, Manitoba, and Saskatchewan. The Commissioner further stated, however, that in 1921 it was officially estimated that "not more than 10 per cent. of the tractors were being used in field work. Farmers and transportation companies learned from bitter experience that horses still furnished the cheaper form of power."

Speaking at Chicago (U.S.A.), in December last, Mr. J. G. Robertson, Live Stock Commissioner for the Province of Saskatchewan, said that—

"Horses are cheaper in all kinds of field work, and have superseded almost entirely such tractors as were used between 1914 and 1920 in field work in Canada. He cited cost figures, showing that the cost of ploughing with steam tractors was 50 per cent., and with gas tractors 100 per cent., greater than the cost of doing the same work with horses."

In Great Britain the return to the horse is no less evident. In many of the larger cities and towns there was a big increase in the use of horses last year, and in London alone the increase has been given as 25 per cent. Numerous councils, including Westminster and Ilford, have reinstated horses for all street cleaning work. In Glasgow it was found that the cost of doing this work was 40s. 11d. per day with electric motor power, as against 18s. 8¾d. with horse-drawn vehicles.

Germany has recently made large purchases of Clydesdale horses from Scotland, and it is evident that the motor is also being relegated to its proper sphere of usefulness on the Continent. A parallel state of affairs to those obtaining in the older countries, in this respect, is also to be found in Australia. Here motors are in many cases being dispensed with and their owners are reverting to the more economical use of the horse, and are thus incidentally reducing the dead national loss which is represented in all moneys paid for imported machinery, motor fuel, and oil.

In order to determine the most economical method of ploughing, comparative tests were recently carried out with the tractor and with the horse at the Werribee Experimental Farm, Werribee, Victoria, and the results of these investigations show that the cost of ploughing with the tractor was 10s. 8d. per acre as compared with 6s. 3d. per acre for work done by the horse. A difference of 4s. 5d. per acre in favour of the horse.

This revived demand, however, is not confined to horses for farm use alone. The commercial and carrying people in the large Australian cities find that the horse is the cheapest and most efficient for all short hauls. The carriers of Sydney (New South Wales) are almost unanimous in their opinion that the horse-equipped vehicle gives better service and more profitable results than the motor vehicle for heavy carrying work and for delivery operations. In a statement made to the "Daily Telegraph," Sydney, Mr. James McMahon, Managing Director of J. McMahon and Co., Ltd., an extensive carrying firm which has nearly 500 horses in regular use, stated—

"For the shorter city deliveries horses could beat the motor for cheapness. I make the comparison from the point of view that a heavy motor lorry costs £1,000 and it will draw 40 tons a day. We can put on the city streets eight two-horse wagons for the same amount of money, and they will draw 80 tons a day. The additional 40 tons, at 6s. a ton, represents £12 a day.

"The experience of all master carriers had been that horse traction in the city was cheaper and more remunerative to them. *Personally, he had tried it out and proved it to his own satisfaction.* He spoke in this way for the 240 members of the Master Carriers' Association of New South Wales, and there were probably as many

more outside of the association in the city and suburbs. Despite any competition of the motor, Mr. McMahon adds, *we are employing more men and doing more business than ever before.''*

The quality of the Clydesdale horses exhibited at this year's Melbourne, Sydney, and Brisbane Shows, and the interest displayed in this section, is only another proof of the revival of popularity of the draught horse.

It is obvious that an effort will be necessary on the part of breeders to meet this increasing demand, especially in view of the fact that the breeding of draught horses has of recent years been neglected. This fact was early appreciated by the Queensland Government, and its action in purchasing and importing six high-class Clydesdale stallions from Victoria in 1922, whose services have been made available to owners of mares at the most reasonable rate of £2 2s. per mare, has proved most advantageous to horse owners in this State, by materially assisting in the breeding of an improved type of animal at a time when high-class sires were very scarce.

During the first two seasons' operations, 791 farmers' mares, which were first subjected to veterinary examination and approval, were mated with Government Clydesdale stallions, and as a result some very promising young stock are now to be seen in the districts in which the stallions were stationed. By the end of this season well over 1,000 mares will have been served by Government Clydesdale stallions.

The advent of the State Clydesdale stallions undoubtedly gave an impetus to Clydesdale breeding in Queensland. During Exhibition week a most enthusiastic meeting of Clydesdale breeders was held in Brisbane, and a ''Clydesdale Society of Queensland'' was formed, with the object of promoting the breeding of purebred Clydesdales and to safeguard the breeders' interests.

In farming districts high-class sires are in demand, and farmers are realising the importance of breeding only from a good type of mare. General satisfaction is also expressed with the licensing of only approved stallions and the elimination of the nondescript entire as provided for by the recent application of the Stallion Registration Act.

It is to be understood that the existing demand is only for a good type of horse. The breeder of nondescript animals, apart from the fact that the enterprise is most unprofitable to himself, is only playing into the hands of the motor salesman.

It has long been realised that the Clydesdale is the ideal type of draught horse for Australian conditions, and if bred in the right way, and the foals and brood mares allowed a generous ration of food, the Clydesdale will supply the characteristics so much in demand—*i.e.*, weight, good appearance, hard flat bone, sloping pasterns, sound open feet, and good clean action.

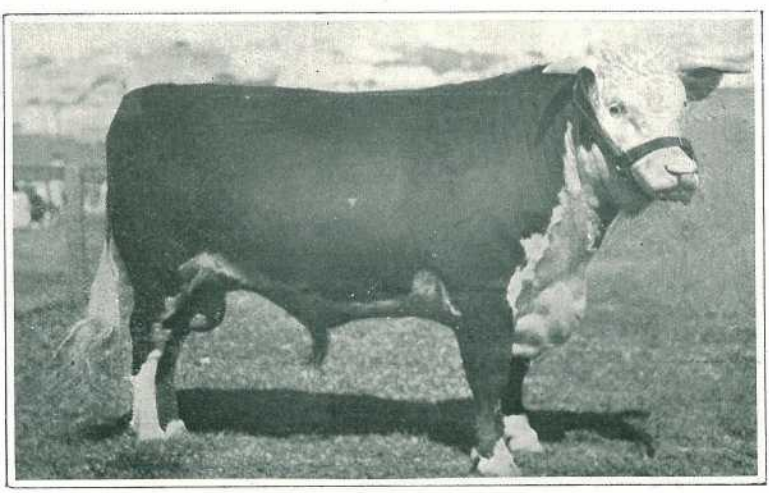

Photo.: "Livestock Bulletin."]

PLATE 125.—"ODIN."

Second for eighteen months and under two years; first with ''Miniver VI.'' in the English Hereford Herd Book's Special for pair of yearlings; second in group of three bulls; second in sires' progeny stakes. Bred by Messrs. Archer Brothers, Graecmere, Rockhampton.

MILK GOATS—I.

In response to requests for information about milk goats from readers in several parts of the State the subjoined notes have been compiled.

Goats are kept for milk production in many countries, especially Continental Europe. They are finding favour to some extent in the United States, while in pastoral and mining Australia every camp and township has its more or less nondescript flock of goats. Goat's milk forms a most important item in domestic economy, particularly in respect to the dietary scale of the bush baby in places where the keeping of cows is not practicable.

The comparatively dry western climate of Queensland agrees with goats, and they do well on country differing widely in topography and feeding conditions. Goats do not thrive well on low or swampy country.

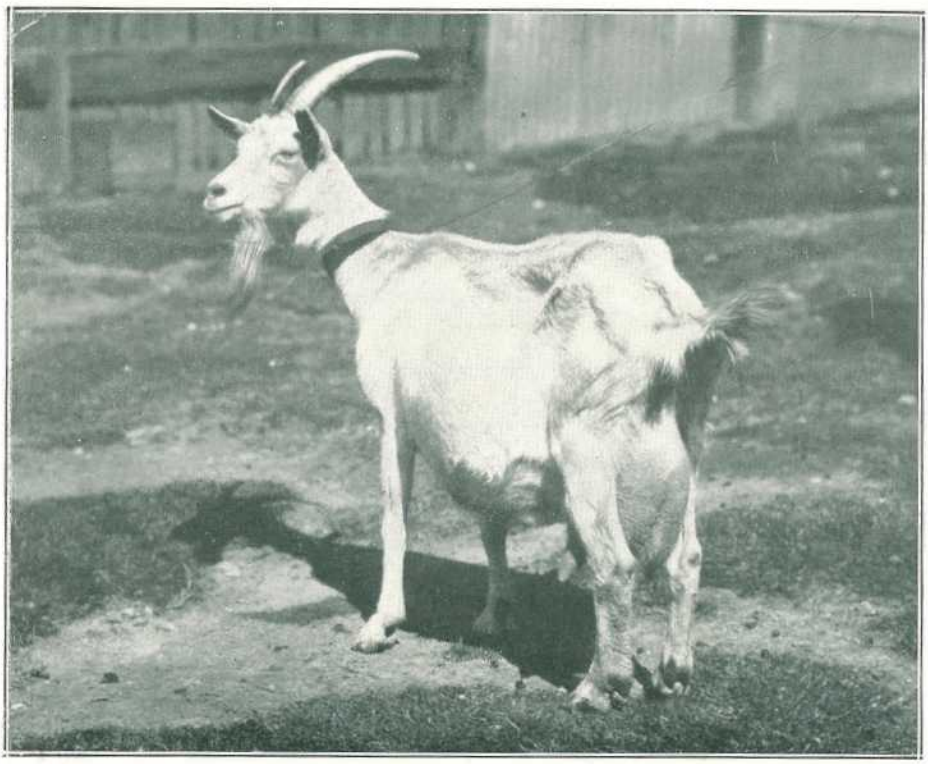

PLATE 126.—A SAANEN DOE.
The property of Mr. W. C. Thurlow, Red Hill, Brisbane.

Little has been done in this State towards improving on the common goat, and little attention is being given to methods of feeding. As a rule the ordinary milk goat that fills the role of the Western "cow" is left to fend for herself, which she does pretty thoroughly.

Goats are economical to keep, and that accounts for their popularity in the newer townships and on the mining fields. The herbage they eat and thrive on would otherwise go to waste. Not only are they valued for their milk, but also as "mutton," and many a young wether has passed over the butchers' block camouflaged as "lamb." Taken all round, provided the domestic gardens are kept securely fenced, the goat in many parts of Queensland is a valued factor in household economy.

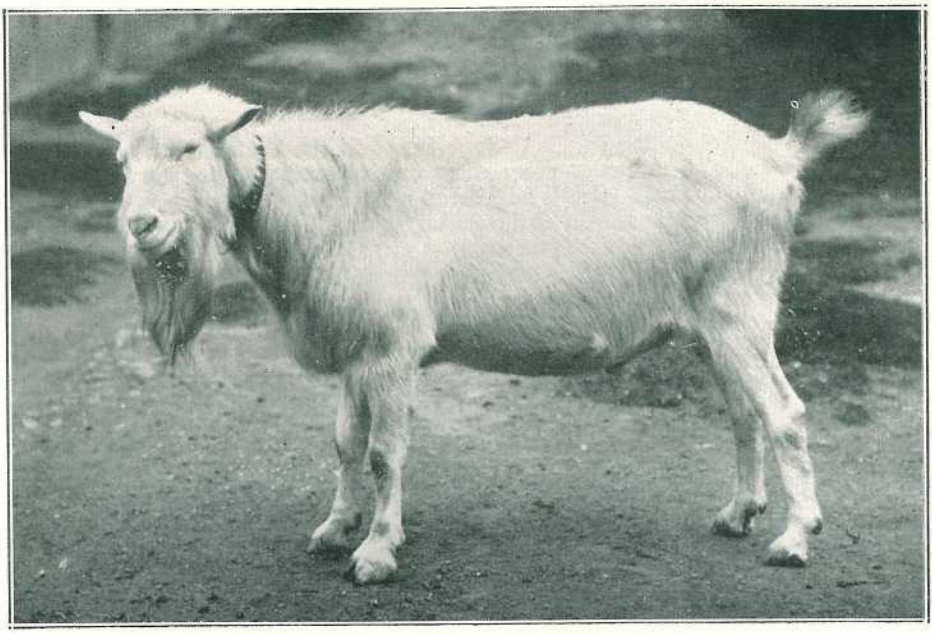

PLATE 127.—A TYPICAL SAANEN BUCK.
The property of Mr. W. C. Thurlow, Red Hill, Brisbane.

PLATE 128.—A SAANEN DOE AND HER VIGOROUS PROGENY.
The property of Mr. W. C. Thurlow, Red Hill, Brisbane.

Breeds.

There are many breeds of milk goats, chief among which are the Toggenburg, Saanen, and Anglo-Nubian. A great variety of crosses and goats of no particular breeding also abound.

The native home of the Toggenburg is in the Toggenburg Valley, Switzerland, where it has been bred for centuries. Their prevailing colour is brown, both light and dark, with white markings. A white bridle-mark is always present on each side of its face. White is also present on the underline and on the legs below the knees and hocks. White is also found sometimes on the animals' flanks. As a rule they are hornless, but horns are sometimes developed. The head is rather long, facial lines straight or slightly concave, ears of a medium size, more or less erect, although sometimes held almost horizontally. The neck is somewhat long and slender and there may be wattles at the base of the lower jaw. Toggenburgs usually have a beard, which on the male is long and heavy. The better specimens of the breed are always lean and of medium size, females weighing about 100 lb. to 140 lb., while bucks, as a rule, weigh from 110 lb. to 140 lb. Both long-haired and short-haired animals are often seen in the same herd. Generally, Toggenburgs are very hardy and excellent mothers.

The Saanen is another Swiss breed, similar to the Toggenburg in general conformation. They are a little heavier in weight, maturing bucks weighing from 175 lb. to 200 lb., and does from 110 lb. to 140 lb. They are of white or cream colour and usually short-haired. The Saanen is considered a hornless breed, but horns often occur as in the case of the Toggenburg. The Saanen could be used to great advantage in grading up the ordinary common goat herded in Queensland, as they are often white in colour. Some excellent specimens of the breed may be seen at Red Hill, Brisbane, where Mr. W. C. Thurlow, an enthusiast in goat-keeping, has a small, but notable flock.

Further and fuller notes on the goat, particularly in respect to milk values, are reserved for the next issue of the Journal.

CO-OPERATIVE COTTON MARKETING.

According to the Department of Markets and Migration, the steps that are being taken by a large number of cotton-growers in the United States of America to send cotton to Britain and elsewhere in a better condition, and to cheapen production by eliminating such middlemen as may be found unnecessary, were outlined recently to a special meeting of cotton spinners and manufacturers by a delegation from the American Gotton Growers' Exchange. The meeting was held in Lancashire.

The delegates stated that they were interested in getting cotton in the most economical way from the farmer to the factory. They were attempting to cut out as many as possible of the wastes in the production of cotton in order to get the material to spinners and manufacturers as cheaply as possible. Each of the cotton-growing States now had a co-operative marketing association of growers. These were organised legally under the laws of their several States and were federated under the title of the American Cotton Growers' Exchange. Approximately the membership consisted of 300,000 farmer growers, and there had been a good increase in the amount of cotton the Exchange had handled for its members during the three years it had operated. In the first year it had handled 600,000 bales, in the second 800,000 bales, and in the year just passed 1,000,000 bales. Moreover, there was a steady growth taking place in the membership.

The Exchange had gone very seriously into the ills of the industry, and last year they sent over to Britain a commission to investigate the condition in which American cotton arrived there. The report was a disgraceful one and disclosed that American cotton was the worst-looking, dilapidated cotton that entered the English market. It was also disclosed that the staple of American cotton was growing shorter every year and losing its prestige in the consuming markets of the world.

The delegates hoped that through their co-operative movement they would be able to interest all along the lines of distribution the men who touched the industry in overcoming that bad effect.

As an indication of the permanency of their organisation, delegates stated that in each State they were banded together for a series of years—in Texas for five years, and in some of the other States for seven years. In Texas, where they had taken out a charter for fifty years, they had been together now for four years, and they were signing up the members for the next five years fairly rapidly.

GROUND MILKING COMPETITION AT THE ROYAL SHOW.

By L. ANDERSON, Senior Herd Tester.

The Ground Milking Competition conducted at the last Royal National Show held at Bowen Park, Brisbane, in August, was a record for Queensland, and it is believed to be a record for Australia. No fewer than thirty-seven entries were received from all parts of the State, representing all breeds of cattle.

Five cows were withdrawn for various reasons, with the result that thirty-two actually competed in the several classes.

The competition, which was conducted under the supervision of Messrs. R. W. Winks and L. Anderson, Department of Agriculture and Stock, took place on 9th and 10th August.

The cows were milked three times daily—viz., 5 a.m., 12.30 p.m., and 8 p.m.

Several excellent records were made in the course of the competition. The whole of the competing animals produced an average of 51 lb. of milk daily, while in the class for the cow producing the largest quantity of milk thirteen cows averaged slightly over 60 lb. daily.

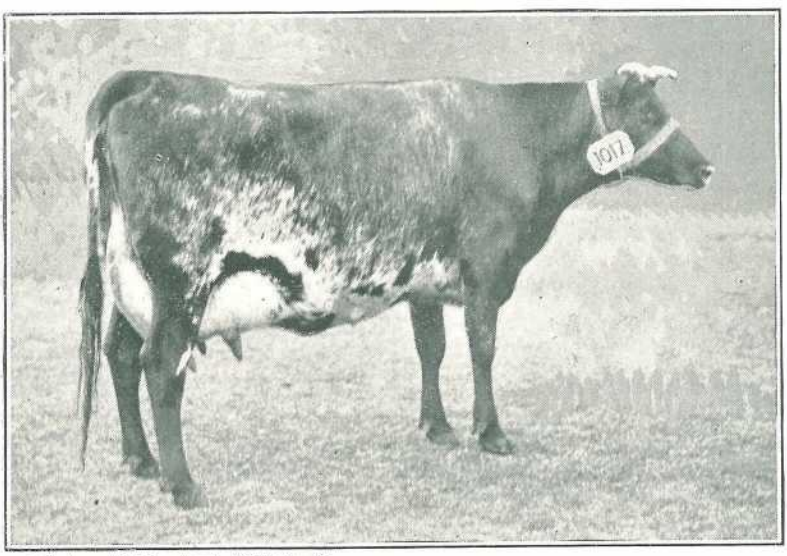

Photo.: "Livestock Bulletin."]

PLATE 129.—"IVO OF DNALWON."

First with "Floss" and "Nightshade II." in the sires' progeny stakes at this year's Royal National. Champion at Beenleigh, 1924, and has a record of 62 lb. milk in twenty-four hours and 20.3 lb. c.b. in seven days. Bred and owned by Mr. A. J. Caswell, Dralwon, Wangalpong.

"Chance of Woodleigh" put up a record for the Brisbane Show by averaging 2.895 lb. butter fat in twenty-four hours and winning for her owner, Mr. J. Phillips, the Champion Butter Fat Test, and in addition two firsts, one special, and a third for a cow giving the largest quantity of milk.

No less than fifteen animals competed in the class for cows under four years.

The winning cow "Primrose of Dnalwon," owned by Mr. A. J. Caswell, produced the excellent record of 2.60 lb. butter fat daily, equal to 3 lb. commercial butter, while Mr. Krause's "Peggy II. of Iliawah" was a good second.

A new class was created this year for cows not exceeding 800 live weight. Only six of the cows competing managed to qualify for this class, in which Mr. J. Williams' Jersey cow "Carlyle Lady Lynn" had an easy win.

Class 381 for cow giving the greatest quantity of milk created great interest while the competition was in progress.

In this class Messrs. Brown Brothers' Friesian cow "Doral Wayne II." was leading throughout and created a record for the ground by yielding an average of 81 lb. 10 oz. daily. It would be interesting to know if this has been equalled on any other show ground in Australia. Unfortunately this cow failed to reach the standard 3.3 per cent., and the first prize therefore went to her paddock companion "Korndyke Lottie Canary," with a production of an average of 72 lb. 13 oz. daily.

Following are full details:—

Cow, four years and over, averaging the greatest daily yield of butter fat for forty-eight hours; points for lactation period conceded: J. Phillips's "Chance of Woodleigh" (I.M.S.), 46.32 points, 1; Brown Brothers' "Korndyke Lottie Canary" (Friesian), 44.8 points, 2; J. C. Mann's "Viola of Glenmore" (Ayrshire), 44.38 points, 3.

Cow, four years and over, averaging greatest daily yield of butter fat for forty-eight hours: J. Phillips's "Chance of Woodleigh," 2.895 points, 1; Brown Brothers' "Korndyke Lottie Canary," 2.675 points, 2; E. M. Franklin's "Peggy II. of Fairfield," 2.671 points, 3.

Cow or heifer, under four years old, averaging the greatest daily yield of butter fat for forty-eight hours; points for lactation period conceded: A. J. Caswell's "Primrose of Dnalwon" (I.M.S.), 41.6 points, 1; W. M. Krause's "Peggy II. of Illawah" (I.M.S.), 38.88 points, 2; B. O'Connor's "Wakeful III. of Oakvale" (I.M.S.), 33.36 points, 3.

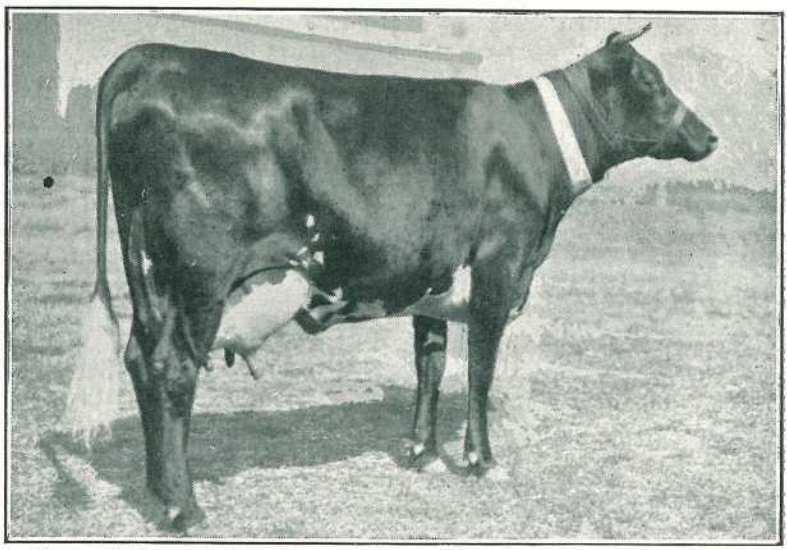

Photo.: "Livestock Bulletin."]

PLATE 130.—"VIOLET 2ND OF ILLAWAH.

First for I.M.S. Cow, four years and under five, in milk, and third in progeny stakes group. She has records of 54 lb. milk and 2.59 c.b. in twenty-four hours and 395.16 lb. butter fat in 273 days. Owned by Mr. M. Krause, Brooklyn Terrace, Lanefield.

Cow yielding the largest supply of milk in forty-eight hours: Brown Brothers' "Korndyke Lottie Canary," 145.1 lb., 1.; E. M. Franklin's "Peggy II. of Fairfield," 133.1 lb., 2; J. Phillips's "Chance of Woodleigh," 132.7 lb., 3.

Cow or heifer, under four years of age, averaging greatest daily yield of butter fat for forty-eight hours: A. J. Caswell's "Primrose of Dnalwon," 2.60 points, 1; W. D. Krause's "Peggy II. of Illawah," 2.43 points, 2; Macfarlane Brothers' "Bella V. of Kilbirnie," 1.985 points, 3.

Cow or heifer, not exceeding 800 lb. live weight, averaging the greatest daily yield of butter fat for forty-eight hours: John Williams's "Carlyle Lady Lynn" (J.), 2.365 points, 1; E. Burton and Sons' "Oxford Noble Rosette" (J.), 2.15 points, 2; R. T. Ward's "Fussy of Mountview" (I.M.S.), 1.835 points, 3.

Special prize for cow giving the best butter fat results for forty-eight hours: Jos. Phillips's "Chance of Woodleigh" (I.M.S.), 5.79.

Champion Cow.

Royal National Butter Fat Test Cow (any breeding), averaging the greatest daily yield of butter fat for forty-eight hours; points for lactation period conceded. Special and champion ribbon: Jos. Phillips's "Chance of Woodleigh" (I.M.S.), 5.79, 1 and champion; Brown Brothers' "Cornucopia Doral Wayne II" (Friesian), 4.90, 2.

Home Milking.

Ayrshires.—Cow or heifer giving the greatest yield of butter fat for twenty-four hours under Babock test: J. C. Mann's "Viola of Glenmore," 1; J. Holmes's "Tidy II. of Longlands," 2; J. Holmes's "Jeanette of Marinya," 3.

Jerseys.—J. Williams's "Carlyle Lady Lynn," 1; W. and D. Carr's "Carlyle Larkspur," 2; W. Spresser's "Carnation Butterfly," 3.

Illawarra Milking Shorthorns.—W. M. Krause's "Dolphin of Illawah," 1; A. Pickle's "Jean 5th of Blacklands," 2; Wunulla Estate's "Eileen 3rd of Wanulla," 3.

Friesians.—P. P. Falt's "Dairymaid," 1; Brown Brothers' "Cornucopia Doral Wayne II.," 2; Grindles', Limited, "Hamburg II. of St. Athan," 3.

Guernseys.—A. Cooke's "Shamrock 6th of Wollongbar," 1; A. Cooke's "Minnamurra Cherubine," 2.

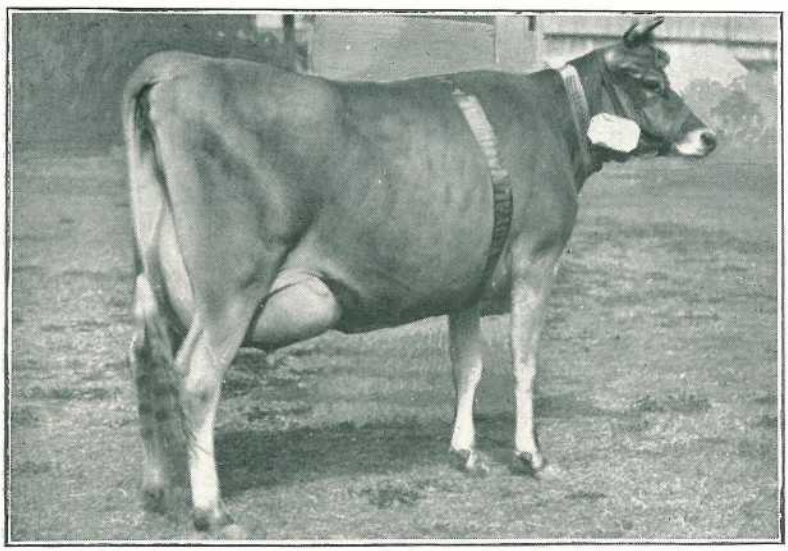

Photo.: "Livestock Bulletin."]

Plate 131.—"Carnation Butterfly."

First prize Heifer, two years and under three; second for Australian bred cow or heifer averaging greatest quantity of butter fat in twenty-four hours with 2.242 lb.; first in group for sire and his progeny; second in breeders' group; second in group of three cows; second in exhibitors' group; first in sires' progeny stakes and reserve champion. Bred at Mr. W. Spresser's Carnation Stud, Brassall, near Ipswich.

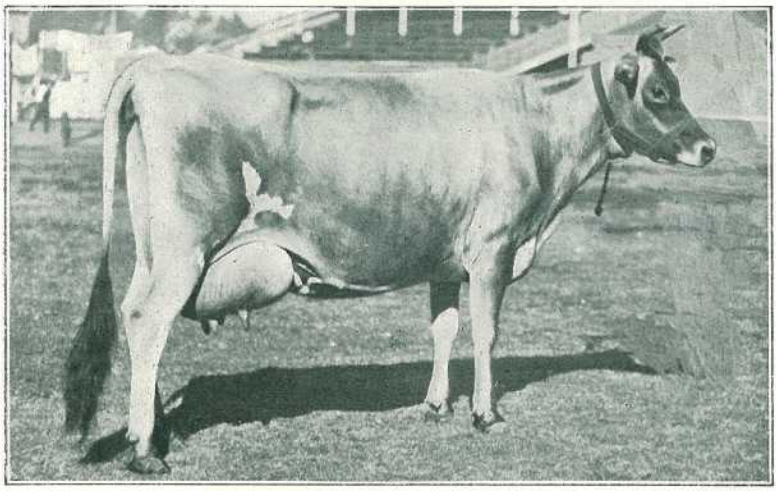

Photo.: "Livestock Bulletin."]

PLATE 132.—"OXFORD NOBLE ROSETTE."

A member of the prize-winning groups and second in the class for cow or heifer not exceeding 800 lb. live weight, averaging the greatest daily yield of butter fat for forty-eight hours. She produced 84.14 lb. milk and 4.30 lb. fat. Bred and owned by Messrs. E. Burton and Sons, Oxford, Wanora.

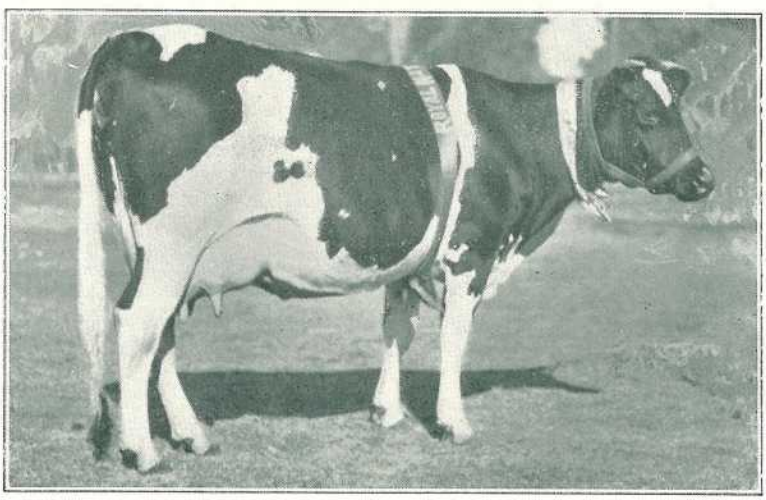

Photo.: "Livestock Bulletin."]

PLATE 133.—"MOOROOMBIN MAUD."

First Friesian Cow, two years and under three, and reserve champion. Bred by Messrs. Brown Brothers, Maroombin, Toogooloowah.

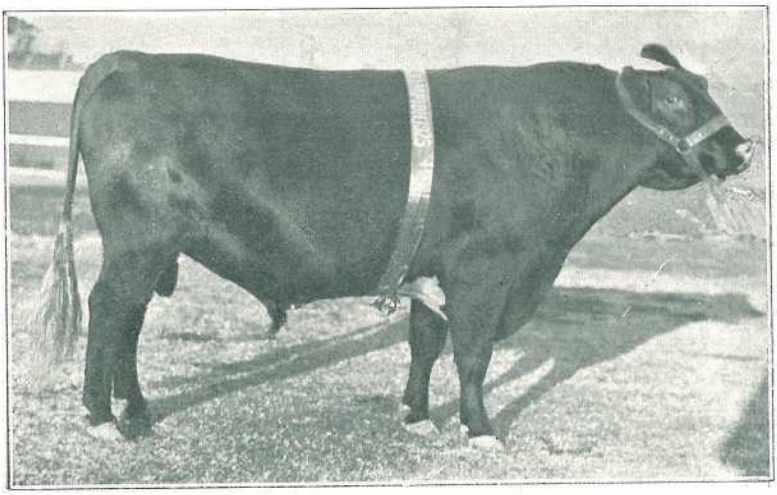

Photo.: "Livestock Bulletin."]

PLATE 134.—"PLUM'S BOY OF MOUNTSIDE"

First I.M.S. Bull, four years and over, and reserve champion. He has also won two championships at Pittsworth and a champion and reserve at Toowoomba. The property of Mr. W. Von Pein, Pinelands, Pittsworth.

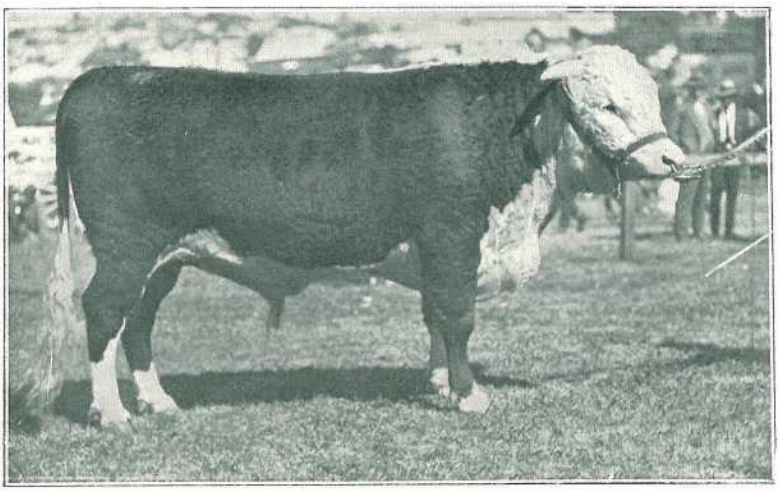

Photo.: "Livestock Bulletin."]

PLATE 135.—"MINIVER VI."

First with "Odin" in the English Hereford Herd Book's Special for pair of yearlings; second in group of three bulls. Bred by Messrs. Archer Brothers, Gracemere, Rockhampton.

Photo.: "Livestock Bulletin."]

PLATE 136.—HEAD OF THE NEW CHAMPION, "BRILLIANT OF OAKVALE."

The junior sire of the Oakvale Stud, Colinton, this year's winner of the male championship in one of the strongest showing of bulls ever seen in the Brisbane show ring. The property of Mr. Ben O'Connor.

Photo.: "Livestock Bulletin."]

PLATE 137.—"STAR OF ULSTER."

Champion Shorthorn bull at Warwick, 1924; champion at Brisbane, 1924; reserve champion at Sydney, 1925, and again this year's champion of Queensland at Brisbane. The property of Mr. A. E. Slade, Glenbar Stud, Warwick.

THE WORLD'S COTTON POSITION.

The world position with regard to the supply and consumption of cotton has been causing anxiety for a good many years, states Professor John A. Todd, of Liverpool, in the "Chronicle," New York. Continuing, he says that as far back as 1902 the establishment of the British Cotton Growing Association in Manchester indicated the realisation on the part of British spinners that, while the American crop was still increasing steadily on the whole, the dependence of Lancashire on a single source of supply for the bulk of the "bread and butter" cotton, of which its consumption mainly consisted, was unsatisfactory in view of the great possibilities of the British Empire for the production of cotton. As years passed it became increasingly evident that, in view of the rapid spread of the terrible cotton pest, the boll weevil, throughout the American Cotton Belt, there was grave danger that the increase of the American crop might be checked or even reversed. The war brought about in an unexpected way a serious reduction of supplies, and when that was over the expected recovery in America did not take place, owing to the weevil reaching the Atlantic States, where its progress was much more rapid because of the favourable climatic conditions.

In 1921 the American crop was a calamitous failure, and the three following years showed only a very partial recovery. The effect was obscured for a time by the fact that a comparatively large crop in 1920 coincided with a very serious restriction of consumption, owing to the deflation slump in that year. But consumption recovered much more quickly than the crop, and in the following three years the huge surplus which had been accumulated in 1920-21 completely disappeared, and left the world in the latter half of the season 1923-24 in a state bordering on famine. During this period of depletion of supplies, however, prices again rose to very high levels, and this gradually produced an expansion of acreage which culminated in record figures in 1924. That year, fortunately, was favoured with an abnormally lucky combination of circumstances which produced the fourth largest crop in the history of cotton, but the subsequent fall of prices very quickly restored world consumption almost to a pre-war basis, for while England and the Continent of Europe generally were still well below pre-war figures, America, Japan, and some other countries had far exceeded their pre-war requirements, so that the more ample provision of 1924 soon began to appear hardly adequate. At the same time it became evident that the increased crop of 1924 was due not to a complete recovery of the producing capacity of the States, as shown by the average yield per acre, but mainly to the increased acreage.

For 1925 the prospects are in some respects again very favourable. The acreage once more established a record, and, as far as the weather is concerned, the Cotton Belt on the whole made a very favourable start, though this was qualified by a serious deficiency of the spring rainfall in Texas, which involved much danger to the final outcome of the crop unless conditions throughout the summer were abnormally favourable. There is also the danger that the weevil, which in 1924 had the most unfavourable season that it has known for many years, may again find climatic conditions to its liking and may reproduce the disastrous conditions of 1921 to 1923. The result is that the whole position with regard to the American supply is still very speculative. The world absolutely requires a big American crop this year, and it may not get it.

The world's supply of other kinds of cotton, while on the whole progressing favourably, is still relatively too small to counterbalance the risks of the American crop. For fine cotton the world is now mainly dependent on Egypt, because the small but exceedingly valuable crop of Sea Island cotton, which came mostly from Georgia and South Carolina, has been completely wiped out by the weevil, and the sole supply of that class of cotton is now a very small quantity in the West Indies. But the Egyptian crop, as will be seen from the table annexed, has also had a very bad time since 1914, and even in 1924 it did not succeed in reaching pre-war totals. The Indian crop is the only major source of supply which has definitely exceeded pre-war figures during the last three years, but its quality is, on the whole, much too low to take the place of American cotton. The same applies to the relatively large crop of China and Russia, which latter before the war had been developing very

rapidly, but suffered almost complete extinction since the revolution, and its recovery will inevitably be a slow business, as it depends more than almost any other on the general economic conditions of the country.

Other areas, such as Brazil and the various Empire fields in Africa, have increased considerably as the result of the high prices of recent years, and the efforts of the British Cotton Growing Association and others in Africa are now at last beginning to get well beyond the pioneer stage, and to produce appreciable amounts of cotton, though it is unfortunately necessary to point out that the total yield of Empire cotton in Africa in 1924-25 is estimated at no more than 320,000 bales, which is still only a drop in the bucket. No doubt the rate of increase will be maintained and probably even accelerated, but the fact remains that the whole world's supply from new cotton fields is still relatively so small that unfavourable conditions in America, resulting in a loss of 15 or 20 lb. an acre from the average yield, would more than set off any possible increase in all the new fields put together. The world, therefore, has not yet been emancipated from its dependence on the American Cotton Belt, and until the fate of the boll weevil is definitely settled in favour of the crop, the position will remain very far from satisfactory.

Thus the world is still faced with the fact that the potential consumption of cotton is likely to be limited by the supply available, mainly from America, and that the steady increase of consumption which had been going on for many years before the war is now no longer possible. Unless something happens to the boll weevil, the world will have to learn more and more to do without cotton. Some day the new cotton areas may establish a condition of balance of power, and perhaps then the development of other textile supplies, especially artificial silk, may take the place of cotton to some extent, but for the time being the old days of ample supply which made cotton the cheapest textile fabric in the world seems to be gone without hope of recall.

THE WORLD'S COTTON CROPS.

Bales of 500 Lbs. (Approx.), 000's Omitted. Linters included in American Crop.

Year.	American.	Per cent. of World Total.	India.	*Egypt.	Russia.	China.	Others.	Total.	Per cent. of 1914.
1902–03	10,784	61	3,367	1,168	342	1,200	801	17,662	63
1903–04	10,016	59	3,161	1,302	477	1,200	751	16,907	61
1904–05	13,697	66	3,791	1,263	536	756	803	20,846	75
1905–06	10,726	61	3,416	1,192	604	788	938	17,664	63
1906–07	13,305	60	4,934	1,390	759	806	1,027	22,221	80
1907–08	11,326	62	3,122	1,447	664	875	950	18,384	66
1908–09	13,432	61	3,692	1,150	698	1,933	971	21,867	79
1909–10	10,386	51	4,718	1,000	685	2,531	950	20,270	73
1910–11	11,966	53	3,889	1,515	895	3,467	968	22,700	81
1911–12	16,109	61	3,262	1,485	875	3,437	1,058	26,226	94
1912–13	14,091	58	4,421	1,507	870	2,360	1,160	24,409	88
1913–14	14,614	57	5,066	1,537	969	1,963	1,287	25,436	92
Pre-war	averages	59							77
1914–15	16,738	60	5,209	1,298	1,152	2,332	1,154	27,883	100
1915–16	12,013	56	3,738	961	1,113	2,068	984	21,177	76
1916–17	12,664	58	4,489	1,022	1,085	1,569	1,027	21,856	78
1917–18	12,345	59	4,000	1,262	605	1,583	1,086	20,881	75
1918–19	12,817	61	3,972	964	334	1,725	1,296	21,108	76
1919–20	11,921	53	5,796	1,114	302	1,690	1,483	22,306	80
1920–21	13,700	64	3,600	1,206	120	1,351	1,471	21,448	77
1921–22	8,360	50	4,485	972	78	1,340	1,436	16,671	60
1922–23	10,320	52	5,073	1,243	48	1,814	1,619	20,117	72
1923–24	10,811	52	5,162	1,306	212	1,741	1,916	21,148	76
1924–25	14,501	55	6,058	†1,440	†417	†2,000	2,073	26,489	95
Post-war	average	56							76

*400 lb. bales. †Estimates.

THE SCIENCE OF COOKERY.

By Miss M. A. WYLIE, Inspectress and Organiser of Domestic Science Classes, W.A.*

Some women are born to be cooks; some achieve the art by long and arduous practice; some never try to cook, and others, when they do attempt it, have but little success. At some time in life, however, almost every woman has cooking to do, or she is called to superintend or pass judgment upon the cooking of others; hence knowledge of the subject is essential to all.

Cooking is a means of bringing about certain chemical changes in foods, rendering them more tender and easier of digestion; it is a means of making foods more palatable, and of producing certain appetising dishes with distinctive flavours; but, if there is ignorance of the principles of cookery, the food value is lost and the desired changes do not take place.

The first point to consider is the value of the food substances used. These may be briefly classified according to the particular part they play in the nourishment and maintenance of the body.

Meat contains albumen, which is flesh-forming material.

Fish contains gelatine, which is flesh-forming material.

Eggs contain albumen, which is flesh-forming material.

Milk contains casein, which is flesh-forming material.

Flour contains gluten, which is flesh-forming material.

Peas and beans (pod vegetables) contain legumen, which is flesh-forming material.

Flour contains starch (as well), which is heat and energy producing.

Grains contain starch, which is heat and energy producing.

Meals contain starch, which is heat and energy producing.

Sugar of milk, fruit, &c., fats of animals, nuts, and butter are heat givers.

In all fresh foods, especially in milk, fruit, and vegetables, the vitamines known as A, B, and C are found. These may be considered as the living elements, the presence of which acts as a preventive to various diseases of the skin and body, and assists in the growth of cell tissue.

The science of cookery not only aims at preserving the value of the food substances tabulated, but at breaking down and softening the fibrous network and walls of the cell that contain them. These objects are achieved by heat, either moist or dry, for heat at various temperatures effects changes in food. Water boils at 212 deg. F., when it bubbles; fat at 360 deg. to 400 deg. F., when a blue fume rises—bubbling fat indicates the presence of water, which should be eliminated; albumen hardens at 212 deg. F., and at that stage is indigestible. Thus foods containing albumen should never be allowed to reach boiling point either in oven or water. It is a well-known fact that the white of an egg—almost pure albumen—when exposed to long and great heat becomes tough and horny. This is particularly noticeable in the edges of an over-fried egg. It should always be remembered that the shell of an egg only protects the albumen from hardening, through contact with heat, for from 2½ to 3 minutes; after that time the heat penetrates and affects the texture.

The old axiom, "stews boiled are stews spoiled," is a good one, and capable of infinite application.

Custards boiled are custards spoiled.

Soups boiled are soups spoiled.

Meats boiled (after first 10 minutes) are meats spoiled, as these foods are chiefly albuminous and flesh-forming, which are hardened if exposed to 212 deg. F. Proper care in cooking can make meat tender; improper cooking can make meat tough.

* In the "Journal of Agriculture," W.A., for September, 1925.

Again, foods containing starch, such as flour, rice, and cornflour, require boiling or steaming to burst their starch cells. This is noticeable in the thickening of a white sauce. It should therefore be noted that—

Boiled puddings should be kept boiling,

Steamed puddings should be kept steaming,

until the starch cells throughout the mixture are cooked and the puddings removed from the moisture. Steam is the gaseous state of boiling water. Vapour is not steam, but moisture rising from water by means of condensation. It takes longer to steam food than to boil it, as in boiling it is in direct contact with the water.

This article will simply introduce a series dealing with the various methods of cookery, and will briefly treat with the cooking of meats.

The Cooking of Meats.

Red and white meats are composed of bundles of fibrous tubes which contain the albumens or food juices. If cut these juices are apparent and begin to ooze out and, coming in contact with the outside air, coagulate on the surface. The principles to be observed in meat cookery are—

First: That cold water opens and softens the fibres of meat and allows the juices to escape. (Experiment.—A glass of cold water containing a bit of raw meat: note the colouring of the water with the red juices.) For soups and stews, therefore, the liquid in which the meat is to be cooked must be cold to begin with, and the cooking carried on at a moderate temperature.

Second: That if the juices are to be retained, a coating in some way must be provided to protect the surface of the meat and prevent their escape. In roasting, baking, and boiling joints, for instance, the meat should be exposed—as the case may be—to a hot fire, a quick oven, or boiling water, for the first ten minutes. After that the cooking should be carried on at a moderate temperature, when there will be gradual softening of the fibres. During the first ten minutes of great heat the surface albumen becomes hardened to about the thickness of a sixpence, thus forming a casing to keep in the juices.

In shallow frying, small pieces of meat should have their surface sealed at once by exposure to boiling fat for a minute on each side and then cooked evenly for 4 or 5 minutes on each side according to the thickness of the piece.

Roasting is really cooking by the direct rays of the fire, as in the olden days, when the joint was hung in front of a fire and allowed to slowly rotate so as to produce even results. Grilling closely resembles this method of cooking, and after exposing the surface of the meat for a minute on each side for the sealing process it should be cooked evenly and turned frequently.

Third: After the weight of a joint has been decided, the time to be allowed for cooking should be considered. For large joints, pork and veal, 20 to 25 minutes to the pound should be allowed, with 20 minutes extra. For a thin piece, poultry and game, 15 minutes to the pound and 15 minutes extra.

With these principles in view the various methods for cooking meats may be easily followed.

To Bake a Joint.

1. Wipe, weigh, and trim the meat.

2. Allow time for cooking.

3. Place on a trivet or meat stand in a baking tin with fat above and below. (If the fat on the meat is plentiful it may not need more.)

4. Place in a hot oven for the first 10 minutes, then either remove to a cooler part of the oven or reduce the temperature.

5. Baste about every 20 minutes—that is, lift up with a large spoon some of the hot fat and pour it over the meat. This prevents the meat from drying and assists cooking.

TRANSFERENCE OF BEES FROM BOX TO FRAME HIVES.

The transference of bees from a box hive to a hive is best carried out in the spring during the first honey flow. Brood rearing is not then in full swing, and combs are not overladen with honey. The danger of robbing is also minimised by the presence of nectar in the fields. The work should be carried out on a sunny day, when most of the field bees are out. The beekeeper must provide as many standard hive bodies, bottom boards, and hive covers as he has boxes to transfer, and the necessary number of frames. The following requisites for the work should be provided beforehand:—Smoker, bee-brush and veil, hammer and chisel, a ball of twine, a spare box, a long-bladed knife, and a hive cover to operate upon when fitting combs into frames.

Commence by giving the colony a few blasts of smoke at the entrance; then remove the box two or three paces to the rear of its stand. Substitute for the box another hive containing a frame of brood, if available. This will make the returning bees more contented until the operation is completed. The old hive may now be turned open side upwards, or a board may be removed from the top. Place upon this the spare empty box, open side downwards, and secure by putting a weight on top. Drum the bottom hive with two sticks, and continue until the majority of the bees with the queen have clustered in the upper box. They are then shaken on a run-way in front of the new hive on their old stand.

Tying in the Comb.—The position of the combs in the old hive is next examined, and the side removed that will give access to the best ones first. Only the straightest pieces containing brood and honey in worker cells should be selected for tying into frames. To fit the combs into frames, first lay the pieces on the operating board over four pieces of string. Place the frame on top, and cut the comb to fit the frame neatly. Remove the fragments from the edges, press the frame down into position, and tie. Combs are less likely to get out of plumb if the honey, which is heavier, is put at the bottom of the frame. The smaller pieces of brood comb should be fitted together and tied into frames in the same way. As each comb is completed it is given to the bees in the new hive, placing them compactly together. Frames containing full sheets of comb-foundation may be added outside the tied-in combs according to the strength of the colony. As an extra precaution against robbing, all scraps of comb containing honey must be carefully enclosed in a tin during operations. The scraps are afterwards pressed for their honey and melted up for beeswax.

In about a week the hive may be examined, and if the combs have been made secure the strings may be removed, as they are a source of annoyance to the bees. Such combs are not up to standard, although valuable when filled with brood and food. They should be culled out at the first opportunity and replaced with good, well-wired combs or full sheets of comb-foundation, as the type of comb used in the brood chamber is a very important factor in successful beekeeping. This method of transferring may commend itself to one who has had a little experience with bees who wishes to hasten the work of establishing the bees in new hives.

Another Method of Transferring.—This is a simpler method for the inexperienced than the one described. It consists of merely turning the box with bees upside-down on its stand and allowing the bees to gradually transfer themselves.

The box is prepared as before by inverting, after which a hive is placed on top. This hive should contain a comb of brood and on each side a sheet of comb-foundation. The bees are drummed up as before, and a queen excluder inserted between the two bodies. The entrance to the hive must be above the queen excluder, all other cracks being sealed up. If, on examining the upper chamber, eggs are found on the fourth day from date of transferring, the queen may be regarded as present and the operation so far successful. The queen being unable to return through the excluded to the box, it only requires to be left there for twenty-one days, when all the brood will have emerged. It can then be removed and the combs melted up for wax. At the same time the top chamber may be set down in position on a bottom board. During the period of transfer much of the honey from the bottom box will be removed to the upper hive, thus creating a stimulus and hastening the development of the colony. Empty combs or frames with full sheets of foundation should be added to the hive as required.

This method of transferring should be adopted especially where bees are being transferred from a frame hive in which the combs have been built irregularly.—"A. and P. Notes," New South Wales Department of Agriculture.

THE BASIS OF GOOD FARMING.

A WHEATGROWER'S EXPERIENCE OF FALLOWING.*

"The basis of all good farming is fallow. The basis of maximum crops every year on that fallow is good cultivation and superphosphate. This, in turn, will give a foundation of a prosperous farm, and lead one from the period of money-saving to that of high production and money-making."

It was in these terms that Mr. W. W. Watson, Tichbourne, concluded a paper entitled "A Wheatgrower's Experience of Thirty-five Years" at the Agricultural Bureau conference at Ungarie (N.S.W.).* Presenting, as it did, the experience of a farmer who had made good under conditions of light rainfall, the paper possessed many valuable features.

His early experience, said the author, had been gained under rather hard conditions on plain lands in northern Victoria, on which as early as 1890 it was very unprofitable to grow wheat without fallowing. He had come to New South Wales in 1902, being unfortunate to hit such a dry spell for a start. He was faced, too, with strange surroundings, soils, climate, markets, and, above all, pessimists, who assured him that it was impossible to grow wheat on his class of land, as on the approach of warm weather it would burn off, and a pinched grain would be all that he would obtain. He had not known if fallowing would be successful, as there had been no previous experience.

He had ploughed the first land for fallow in the winter of 1902 with a big proportion of doubt, and even the result of the harvest following was not at all convincing. In 1906 the fallow was much better compared with the stubble, and the harvest return assured him that there might be something in fallow. The following year, 1907, was very dry, with the result that at harvest time the fallow more than doubled the stubble crop, and since then he had consistently fallowed every year. The fallow showed an average of just 20 bushels per acre over the twenty-one years, while the stubble-sown crops only returned 12 bushels, showing a 66⅔ per cent. increase, due to fallow. The average yield on fallow and stubble combined was 15½ bushels per acre, against a general State average of about 11 bushels. The yields from fallow for the past five years had reached an average of over 26 bushels per acre. He had necessarily every confidence in recommending the practice.

The Value of "Super."

One of his difficulties in the early days in Victoria had been to obtain a suitable manure. His first experience had been with a locally manufactured bonedust, which preparation, besides being indescribably offensive, was not satisfactory, as the percentage of water-soluble phosphoric acid was low, and, while its manurial value was good, it was not in a readily available form as a wheat plant-food. He was extremely glad when the manure was turned down in 1896 for the better quality material known now as superphosphate, the results from which showed that, in combination with fallow, it was a very payable proposition.

It had been his intention when coming to New South Wales to try manure and see if it was as successful as in Victoria, but for sixteen years, with a small trial of 1 to 2 tons each year, he could not get more than 2 bushels per acre increase, and with the low prices for wheat then ruling this was not profitable; in at least two years there was a distinct loss. It was not till 1920 that an improvement was shown of 3 bushels, and with wheat at 7s. 6d. this was good business. Increasing the area sown with manure the following year, there was the same increase shown over unmanured fallow, and from that date the gap had been gradually widening, till last year there had been a distinct margin of four bags to the acre.

The marked difference in the yields of wheat from manured and unmanured land during the past few years was principally due, he thought, to the process of natural consolidation taking place in their class of land. The action of weather conditions, together with the trampling of stock and the working of farm implements, had had a tendency to compact the under strata of soil below the depth of cultivation, and the experience of the past few years had shown that with more judicious cultivation and a longer fallow season more nitrates were added to the soil by the action of weather and air. It must always be distinctly understood that the liberal use of fertilisers could not make up for any deficiency in cultural methods, but with the adoption of a thorough tillage system the full benefits of good applications of superphosphate were obtainable.

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*"Agricultural and Pastoral Notes," N.S.W. Dept. Agr.

He was fully convinced that the problem of manure or no manure was being replaced by another problem—manure or more manure—at least in that district, and the endeavour was now being made to find the minimum quantity that could be applied to produce the maximum crop.

Importance of Pure Seed.

The past fifteen years' experience had proved to him the value of pure seed, said Mr. Watson. A comparison in 1910 of the yield from pure seed as against that from his own had shown an advantage of 2 bushels per acre in favour of the former. Several years later he had again made a comparison between hand-selected seed and ordinary, when the result was a gain of 1½ bushel; also again two years ago the return was as high as 4 bushels per acre.

There had been much talk of late years of the old Federation losing vigour and distinctiveness, and only, he thought, because the seed had been neglected. The extra cost of pure seed from the Department's farms (always obtainable) was easily warranted by the sight of a vigorous growth and correct type at harvest. He had reached the conclusion that pure seed always more than paid.

There were at the present time far too many varieties grown, and confusion was the result. If farmers generally were to limit their choice to two, or at the most three, finding for themselves the varieties most suited to their climate and soils, it would be a much easier task to keep wheats pure.

Oats on the Wheat Farm.

On the subject of better methods in wheatgrowing, Mr. A. H. E. McDonald, Chief Inspector of Agriculture, pointed out that fallowing did not only mean ploughing early—it involved that the soil must be worked subsequently on right lines. The sowing of the best varieties was also essential, and so was the combination of sheep with the wheat. In order that the necessary fodder for the sheep should be made available, the Department had devoted attention in late years to oats, and varieties of that cereal had been produced that were particularly suitable for that purpose, while also affording some change from wheat. As to the value of the oats for feeding to sheep, he remarked that not only were they good green feed, but the grain had been proved quite lately to be profitable when fed to sheep. In trials at Bathurst and Cowra Experiment Farms, it had been shown that instead of oats being worth only a couple of shillings a bushel on the market, they made gains, when fed to ewes with lambs at foot, which gave them a value of 6s. per bushel. When the greater yields from oats were taken into account, they were thus worth quite as much as wheat if used in conjunction with sheep.

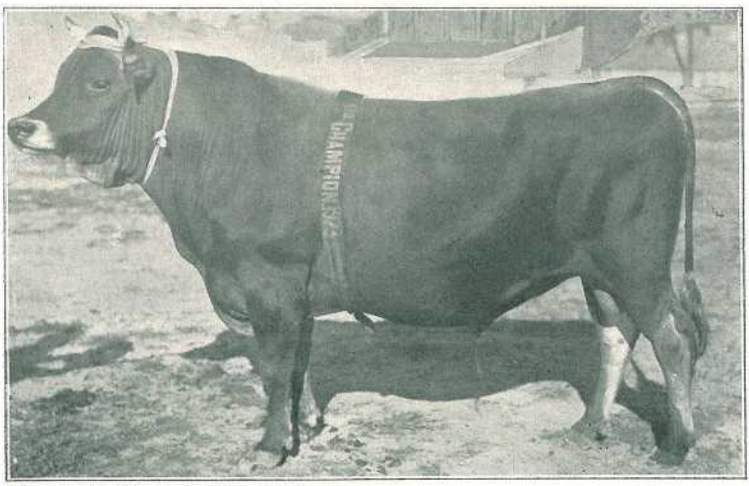

Photo.: "Livestock Bulletin."]

PLATE 138.—"LORD ETTREY OF BANYULE."

First and championship Jersey Bull of Queensland for the second year in succession and third in two groups; also winner of championships at important country shows. The property of Mr. J. Sinnamon, Trinity Stud, Goodna.

General Notes.

The Governor and the Farmers.

Writing from Kureen on the Atherton Tableland to the editor of this Journal, His Excellency, Sir Matthew Nathan, expresses cordial appreciation of the good wishes of all connected with agriculture in this State, which were extended to him on the eve of his departure from Queensland.

State Wheat Board.

Nominations have been received in connection with the forthcoming election of representatives of growers to the State Wheat Board as under:—

District No. 1—William Thomas Mulholland, Jandowae; Robert Swan, Wallumbilla.

District No. 2—David R. Edwards, Nobby; Alfred John Harvey, Pittsworth; Arthur Karl Kreig, Brookstead.

District No. 3—Harry C. Bradford, Oman-ama; B. C. C. Kirkegaard, Freestone.

District No. 4—Thomas Muir, Allora.

District No. 5—John Archibald, Oakey; John Thomas Chamberlain, Kingsthorpe.

The election of members will take place on the 12th November, 1925, and those members elected will hold office until the 31st August, 1926.

Reorganisation of the Council of Agriculture.

Fresh regulations have been approved in connection with the reorganisation on a commodity basis of the Council of Agriculture. The amendment of the Primary Producers' Organisation Acts and the Regulations under the Act, as amended, provide for the election of eight district councils for the agricultural districts and an agricultural advisory board for the Atherton Tableland. Local producers' associations in each district are grouped in nine wards. Each ward will return one member to its district council. Each district council will be composed of nine members. Suppliers to each sugar-mill will elect a suppliers' committee of three for that mill and, at the same time, will elect one representative for the district executive for each of the nine districts. The district executive will elect one representative for a sugar council, and the sugar council will elect a representative for the Council of Agriculture. The Council of Agriculture will be composed of representatives of the District Council of the sugar industry, fruit industry, and the several commodity boards, making a total of twenty-one members. The district councils and representatives of the sugar organisation will be elected in the month of December. Nomination forms are now being sent out, and are returnable on or before the 23rd November. The results of the election will be declared early in January, and the new members will meet either at the end of January or the beginning of February.

Dunedin Exhibition.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith) advises that Queensland will be well represented at the forthcoming New Zealand and South Seas Exhibition which is to be opened at Dunedin on 17th November. It should be a splendid advertisement for the State, as exhibitions of this kind attract people from all parts of the world, and experience goes to prove that no country with such wonderful latent resources as Queensland possesses can afford to let an opportunity of this kind pass to make its products more widely known. The Exhibition, it is understood, will be open for five months. This will permit of readily renewing supplies of dairy products, hams, bacon, fruit, and other Queensland exhibits.

The Queensland Court (3,000 superficial feet) is to occupy a good position in the Exhibition Building, and its three main features will be Agriculture, Forestry, and Mining. Sixty cases of exhibits have already been forwarded by the Department, representing the State's major and minor agricultural industries—Sugar and sugar-cane, wool (greasy and scoured), maize, wheat, cotton, canary seed, peanuts, broom millet, a collection of native grasses, pipe and cigar leaf tobacco, rice, cassava, sisal hemp, ropes and twine, a comprehensive assortment of farm and garden seeds, and a collection of cereals and fodders done up in attractive form.

The whole exhibit has involved a good deal of painstaking, preparatory work, but it is felt certain that the Queensland display will do credit to the State. An officer experienced in exhibition work, Mr. H. W. Mobsby, who represented the State at the Panama Exhibition, the Exhibition at Lyons, France, and at Wembley last year is in charge of the Queensland Exhibit.

Staff Changes and Appointments.

Mr. C. J. F. Miller, Land Commissioner, Cairns, has been appointed Government representative on the Cook Dingo Board, *vice* Mr. A. H. Scott, resigned.

Mr. R. H. Curry, of the Aboriginal Settlement, Palm Island, and Mr. L. G. Jones, of Brisbane, have been appointed Officers under and for the purposes of the Animals and Birds Acts.

A More Durable Butter.

A British journal reports that a more durable butter is being produced in Holland by churning in an atmosphere of carbon-dioxide. The air is easily withdrawn from the churn and replaced by the heavier gas. The portion of it worked into the butter remains a long time with ordinary handling, thus keeping out the oxygen, to which natural deterioration is chiefly due. The increased expense of churning is stated to be very small.

Honey Board.

Notice has been given of the intention to create a Honey Board to deal with honey produced in Queensland by those who have, within a period of six months prior to any election or referendum in connection with the proposed Board, at least four hives of bees and who market the honey therefrom. The Board will be in operation for two years as from the date of constitution, and will consist of five members, four of whom shall be the elected representatives of the growers and one appointed by the Minister. Any petition for a poll to decide whether the Board shall be constituted must be signed by at least fifty persons qualified to vote, and must reach the Minister before the 28th November, 1925. Those who for the past six months have kept at least four hives of bees from which they have marketed honey are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, so that they may be included in the list of persons eligible to vote on any referendum. Nominations are being called for growers' representatives on the proposed Board, and will be received up to the 28th November, 1925. Each nomination must be signed by at least five bee keepers.

Proposed Grain Board.

A notice has been approved by the Lieutenant-Governor (Hon. W. Lennon) of the intention to create a Grain (Maize) Board to deal with grain produced from seed sown after the 1st July, 1926, in any part of Queensland other than the Petty Sessions Districts of Atherton, Herberton, and Chillagoe, the function of such Board to continue for a period of six years after the appointment of the members to the Board. The Board will consist of six elected representatives of the growers. For the purpose of election, the State has been divided into three districts—

No. 1 District—The pastoral district of Moreton.

No. 2 District—The pastoral districts of Darling Downs and Maranoa.

No. 3 District—Rest of Queensland with exception of Atherton, Herberton, and Chillagoe.

Two representatives will be required from each district, and nominations for election for two years from the dates of their appointments as growers' representatives on the Board will be received until the 14th November, 1925. Each nomination must be signed by at least ten growers of maize.

Persons deemed to be growers and eligible to vote on any referendum or election before the 30th June, 1926, in connection with the Board will be persons who have grown at any time subsequent to the 1st July, 1924, for sale, grain (maize) in any part of Queensland other than the Petty Sessions Districts of Atherton, Herberton, and Chillagoe. Persons eligible to vote at any subsequent referendum or election will be persons who at any time during twelve months preceding such election or referendum grew for sale grain (maize) in the aforesaid part of Queensland.

The Board, if formed, will have power to encourage, provide, or assist in the providing of grain silos and other storage or handling facilities, and may engage in any other activities as may be approved by the Governor in Council.

Any petition for a poll to decide whether the Board shall be constituted must be signed by at least fifty growers of maize as above, and must reach the Minister before the 14th November, 1925. Persons who grew maize for sale in Queensland (excepting the Petty Sessions Districts of Atherton, Herberton, and Chillagoe) from seed sown after the 1st July, 1924, are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Proposed Canary Seed Board.

A notice has been approved by the Lieutenant-Governor (Hon. W. Lennon) of intention to constitute a Canary Seed Board to deal with canary seed harvested in Queensland during the seasons 1925-1926, 1926-1927. The Board to deal with such canary seed will consist of three persons—two elected by growers and one appointed by the Minister. Persons deemed to be growers and eligible to vote on any referendum or election in connection with the said Board will be persons who have grown canary seed between the 1st March, 1925, and the 28th February, 1927.

Any petition for a poll to decide whether the Canary Seed Board shall be constituted must be signed by at least fifty growers as defined above, and must reach the Under Secretary, Department of Agriculture and Stock, before the 14th November, 1925. Persons who have grown canary seed since the 1st March, 1925, are invited to send their names and addresses at once to the said Under Secretary.

Nominations will be received until the 14th November, 1925, for election (for one year from election) as growers' representatives on the Board. Two representatives only are required, and each nomination must be signed by at least five growers of canary seed.

The Co-operative Movement Gaining Ground.

Co-operation, as a world-wide movement, growing in strength and permanent in nature, was the view presented at a recent session of the American Institute of Co-operation by Professor Fay, of Toronto University, Canada, formerly of Cambridge University, England.

Professor Fay challenged critics who aver that the co-operative movement is of short duration, and presented a bird's eye view of the development of this idea in many lands. He said it would be a permanent institution in the United States because it is the outcome of "economic evolution and combines sound business practices and inspiring ethical standards."

Professor Fay traced the development of co-operation among farmers in various parts of the world, and added:—

"For the last twenty-five years the new world has come in line with the old, and with such brilliant examples as the California fruitgrowers and the Canadian wheat producers to its credit is leading the way along the new co-operative paths. For rich as the new world is, and indeed just because it is so rich industrially, there is need for a counter-pressure from the side of agriculture. One day conceivably we may have giant corporation farms, but this is very doubtful, and if they do come the nation will lose the rock of social stability which a prosperous community of comparatively small farmers provides.

"But there is no stability in rural life if agriculture does not pay. Acting in isolation the farmer is his own enemy. Science shows him how to increase production, but co-operative action by himself with his fellows is needed in order to bring distribution into line with production. The organised wage-earner cannot secure the full reward of his effort and neither can the unorganised farmer."

Increased Consumption of Dairy Products—Need for Better Cows.

The number of dairy cows in the United States is increasing, as well as the number of people, but not at the same rate. In only two years out of the last six has the dairy-cow population increased in proportion to the increase in human population.

The United States Department of Agriculture has just completed a study of the utilisation of milk, in which it is shown that slightly more than 1,000 lb. of milk per capita is used annually in one form or another. In other words, a grand total of 114,666,201,000 lb. of whole milk is utilised in the United States by manufacturing it into various products, by feeding it to calves, or for household purposes. This amount was produced by 26,252,000 cows, an average production of 4,368 lb. of milk per cow.

During the last few years the increase in population has been around 1,500,000 people annually. This would mean that with cows no better than those they have at present the milk-cow population should increase at the rate of 375,000 a year to supply the necessary 1,000 lb. for each person—or one cow for every four people. It is also interesting to note that the per capita consumption of milk in 1924 was 14 lb. more than in the preceding year.

Since the average production is much too low, the United States Department of Agriculture says it is not wise to consider meeting the demand for increased supply by having more cows of the kind they now have, but it would be much better to meet the situation by breeding better cows. Not more cows but higher-producing cows are what is needed to keep pace with the increase in population.

French Demand for Canned Fruit.

According to an American official report, orders for American canned fruits to be placed during August and September will be greater for 1925 than for any other year since the war. The most popular varieties are pineapples, pears, peaches, and apricots in standard American tins. Many Diggers will recall the popularity of Australian canned fruits during the war, and some of this trade should surely come our way.

Eggs—Grading and Packing on the Farm.

At the present time fully one-third of the eggs produced on commercial farms are being either exported or cold-stored. If this were not so, instead of 1s. 4d. per dozen, eggs would in all probability be down to 1s., or even less. What this would mean to the farmer with the present high cost of feeding can be left to him to figure out.

Most poultry farmers (writes the Poultry Expert of the Department of Agriculture) appreciate the position in this respect and take every precaution to see that the eggs that leave their farms are what they should be in respect of being fresh, clean, and properly graded and packed. Unfortunately, however, there are others who are not so scrupulous about any of these things. Such consignors, by their carelessness in these matters, largely increase the cost of repacking and grading, for eternal vigilance is necessary on the part of the packers to eliminate stale and small eggs. A still worse feature is the inclusion of unfertile eggs that have been under incubation.

In pre-export days, and when cold storage was practised principally on account of pastrycooks and similar users of eggs, these practices, while reprehensible, were less serious than is the case under present conditions. The greater part of the repacking, both for cold storage and for export, is done under "pool" auspices, and the farmer pays dearly, although he may not know it, for all the extra care and vigilance that has to be exercised to eliminate such eggs, and must eventually stand any loss accruing from these causes.

Quality the First Consideration.—It cannot be too strongly emphasised that poultry farming has entered upon a phase similar to that of the dairy industry, when quality must be the first consideration. In this connection, to insure economical repacking, grading, &c., it is most essential that eggs be properly handled on the farm, gathered twice a day, marketed twice per week, and graded into three sizes. First-grade eggs should weigh from 1¾ oz. upwards, the whole to average not less than 2 oz.; second-grade should weigh 1½ to 1¾ oz.; and all below these weights should be classed as pullets' eggs. In addition to this classification, any doubtful eggs should be labelled "case eggs"; while eggs that have been dirty, necessitating their being washed, should be labelled "washed eggs." These latter, if sent right into consumption, are quite good, but washed eggs lose their keeping qualities owing to the removal of their natural protective coating; hence they will not keep so long as unwashed eggs, and are unfit for storing or for export.

The observance of these simple rules would lighten the supervision over the packers, and enable the latter to handle very many more eggs. All such saving of labour is equal to a rise in price to that extent; and quality could be guaranteed, leading to greater confidence on the part of consumers, and inducing an increased demand for eggs. If only from motives of self-interest, greater care should be exercised in these matters.

Weighing Eggs.—In connection with grading to weights it may seem to many somewhat arbitrary that the weights quoted should be observed, but in reality the grading is very simple. Any person who has packed eggs, even for a few days, should be able very closely to gauge the size of eggs, sufficiently at any rate to reject those below grade in each case. Some people will, of course, pick up the idea of size much more readily than others; but, in any case, the quickest way to learn to do this is to have a pair of small scales at one's hand set to 1¾ oz., so that doubtful ones can be tested, not alone with a view to keeping undersized eggs out of that particular box, but in order to teach the packer to judge size. Such scales are now on sale at about 7s. 6d. per set. From another point of view good grading is profitable, and scales will pay for themselves many times over. One often sees in badly-graded consignments even 2 oz. eggs put into the second grade, whereas they should, of course, be in the first. When it is considered that the difference between first and second grade is often 4d per dozen, it will be obvious that quite a considerable loss can occur to the farmer from inefficient grading. The writer is often witness to losses sustained in this way, even by farmers who pride themselves upon their good grading. The fact is that scales are necessary to check one's judgment on size from time to time.—Poultry Expert, New South Wales Department of Agriculture.

Helping the Sale of Canned Fruit.

According to the Department of Markets and Migration, the method of preparing summer ices by freezing canned fruits right in the can is claimed by the California Packing Corporation to have been remarkably successful in the past several years. It is being featured again in a special advertising campaign carried out by the well-known "Del Monte" brand.

The value of this idea lies in the new interest it creates for canned fruits in summer.

The operation of this method is claimed to be simple. A can of fruit is packed in a bucket with equal parts of ice and coarse or ice cream salt in layers. After three hours the can is taken out, dipped for an instant in hot water, an airhole punched in the bottom, the top opened and the dish is ready.

Utilising Lower Grades of Canning Fruits.

According to an American Canning Trade Journal, extensive experiments on the utilisation of lower-grade fruits have recently been conducted in America, and several promising new products have been developed. One of these is an ice-cream fruit made by coarsely grinding pie or second-grade pears or peaches or apricots, adding one part of sugar to three or four of fruit, mixing and heating in a kettle, canning and sealing hot and processing thirty to thirty-five minutes at 212 degrees Fahrenheit. A simpler and nearly as good procedure consists in filling cans about two-thirds full of the ground fruit, filling with 55 or 60 degrees Balling syrup, exhausting at least six minutes (preferably twelve), sealing and processing thirty to thirty-five minutes. The products for lack of a better name have been called "Shredded Peach" or "Shredded Apricot" and "Shredded Bartlett Pear." They are excellent for flavouring ice-cream, but are satisfactory for use in the home in pies, puddings, gelatin desserts, cake fillings (when mixed with boiled frosting), and in fruit salads. They have real merit, are very easily made, use low-priced fruit, and if shredded pineapple is anything by which to judge, they have real commercial possibilities.

The World Trade in Petroleum.

World consumption of petroleum has increased remarkably during the last few years. American production has grown from less than 1,500,000,000 gallons in 1914 to over 8,950,000,000 gallons in 1924, an increase of 500 per cent., while her exports of petroleum have risen during the same period to nearly six times the volume of the 1914 shipments—from 217,570,941 gallons in 1914 to a record figure of 1,219,474,374 gallons in 1924. With the rapid development of the use of motor cars and of internal combustion engines for other purposes, the trade in petroleum, both in America and abroad, may be expected to continue to expand.

The value of American petroleum exports in 1924 amounted to more than $160,000,000, constituting an important item in her total merchandise exports during that year. Production of petroleum abroad, while not comparable with the output in the United States, has also shown a rapid growth. An interesting fact is that continental United States uses approximately 79 per cent. of the total world petroleum consumption, which figure corresponds very closely to the American percentage of the total world motor vehicle registration. Another significant fact which shows the relative importance of the United States in the petroleum industry is that the next largest consumer of petroleum, the United Kingdom, requires annually a quantity of petroleum equal to only about 7 per cent. of the American demand, while the total annual consumption in China, for example, is equivalent to about eight hours' supply in the United States.

Outside of the United States, the countries which manufacture petroleum from locally-produced crude petroleum in sufficient quantities to supply all or a large part of the domestic demand and leave a surplus for export are Mexico, Peru, and Trinidad, in the Western Hemisphere; Russia, Poland, and Rumania, in Europe; and India, Persia, the Dutch East Indies, and British Borneo (Sarawah), in Asia. Venezuelan oil is refined to an increasing extent in the country, but a larger proportion is exported as a crude oil, chiefly to Curacao (Dutch East Indies) for refining, and the refined products are exported from that point. Columbia produces from domestic crude sufficient petroleum for practically all the country's requirements, but as yet, at least, has not developed an export trade in this product.

Countries which produce petroleum from domestic crude oil in sufficient quantities to supply a part of the local requirements, but without a supply available for export to any extent, include Ecuador, Argentina, and Japan, and to a lesser degree (in proportion to consumption) France, Italy, Canada, and Czechoslovakia. A domestic refining industry operating largely or entirely on imported crude oil, and supplying petroleum to the domestic market, has been established in Englinad, Canada, Austria, Hungary, Curacao, and Australia.

Wool Growing in a Hurry.

At a meeting of sheep breeders at Chester (England) recently, Professor Barker, head of the Textile Department of Leeds University, described how a Japanese doctor had just placed upon the market a fluid which, injected into the veins of a sheep, promoted the rapid growth of wool. So rapid, indeed, was the growth said to be that two months with the injection would be equivalent to twelve months without the injection, and two or three shearings of wool per year were thus at least thinkable.

Inoculation was in the air at present, said the professor, and the University of Leeds proposed to test this Japanese idea. Although it might be laughed at, it might perhaps have to be treated seriously.

The Value of Purebred Pigs.

The great value of purebred stock is that it breeds comparatively true to type. A first cross is often a superior individual (writes Dr. G. F. Finlay, late Director, Animal Breeding Research Department, Edinburgh University), but it fails to transmit its excellence to its offspring. Prepotency or marked tendency to impress individual or breed characteristics on offspring is a quality possessed by pure breeds. When purchasing a boar, always give preference to one in whose family fertility is a pronounced feature.

When close line breeding or inbreeding is strictly adhered to, the strain becomes remarkably uniform, but in some cases uniformity has been obtained at the cost of constitution and prolificacy. If two strains which differ in their blood lines are crossed, the result is generally larger litters, and youngsters that possess a stronger and more vigorous constitution.

The progeny of a cross-mating between two pure breeds can be expected to be very uniform in type, but if these crossbred pigs are used for breeding, the next generation will consist of very mixed types. Breeding from crossbred pigs is therefore to be discouraged.

Tuberculosis—Control Measures.

It is safe to say, remarks a writer in the "Scottish Journal of Agriculture," that were bovine tuberculosis a disease of more spectacular symptoms, and were its onset more rapid and its losses more quickly evident, measures against it would long ago have been more drastic, and better progress would have been made toward eradication.

As an economic problem for agriculture, bovine tuberculosis is a serious matter. The loss in actual deaths may not be very noticeable, but affected animals fall away in condition and require more food to keep them going and to fatten them. The amount of milk they give is lessened. Their calves, which are born free of the disease (except less than 1 per cent. born tuberculous), do not long remain unaffected, and do not thrive as they would if they remained healthy. The carcass of infected animals may be partly or wholly unfit to be passed for human consumption. The disease in cattle is a fruitful source of tuberculosis in pigs, of which 10 per cent. are believed to be tuberculous in Britain.

There is no practical method of treatment of tuberculosis in animals, but by attention to the following precautions the disease may be kept under control:—

1. As cattle are the main source of infection, the tuberculin test should be applied to the herd and all reactors removed.
2. Do not allow pigs to roam about pastures and yards used by cattle unless it is definitely known that there is no tuberculosis in the herd.
3. All skim milk and other dairy products should be heated to 180 degrees Fahr., and kept at that temperature for fifteen minutes before being fed to pigs.
4. All refuse, slaughter-house offal, and similar food should be boiled before it is given to pigs.
5. Where tuberculosis is found to be present in the herd, all suspected animals should be slaughtered, and where this is done under qualified supervision the carcasses which have only a slight infection of the head glands will be passed for human consumption, the affected parts only being condemned. The pens should be thoroughly disinfected and limewashed, disinfectant being added to the lime. All litter and rubbish in the yards should be burned and the ground loosened and treated with quicklime.

Fresh air and sunlight are great enemies of the tubercle bacillus; hence pens and sties should be open and airy, and have no damp, dark corners to which the air and sun cannot penetrate.

Maize—Lateness-of-Cultivation Trials in the South.

The general practice in coastal districts of New South Wales in the after-cultivation of maize is to clean out the middles with a single-horse cultivator shortly after the maize has been hilled. One of the critical stages in the growth of the maize plant, determining the difference between good and poor yields, is during the tasselling period. It is thought by some that by continuing cultivation up to tasselling time—by maintaining the mulch and holding weed growth in check—it is possible to conserve more moisture, which will ultimately result in increased yields. To compensate for the extra cultivations it would be necessary for the increase to be sufficiently large to cover all costs incurred and show a reasonable profit. It is to be expected that the most striking results will be obtained in seasons when the rainfall has been good during the early stages of growth but deficient during the tasselling period. It was to compare the two systems and obtain definite information as to which will result in the more profitable returns that a series of lateness-of-cultivation trials were commenced at Grafton Experiment Farm (N.S.W.) in 1919.

The experiment occupied a permanent site, on black alluvial soil, fairly typical of the alluvial soils of the Clarence, and was laid out as follows:—

Plot 1.—Given as many cultivations as necessary to tasselling.

Plot 2.—Given one cultivation only after hilling.

Plot 3.—Given as many cultivations as necessary to tasselling.

In each season the experiment was planted during November with the early-maturing variety Leaming. The rate of seeding was uniform throughout—namely, three grains every 32 inches, sown in rows 4 feet apart, which is equivalent to 8 to 9 lb. of seed per acre. All cultivations previous to sowing were uniform, and such as to place the land in good order at planting time.

The results over five seasons show an average increase of 4 bushels 7 lb., valued at 14s. 9d., by adopting the practice of continuing cultivation up to tasselling. In only one year was the yield decreased, and that when the cultivation was not carried out until some time after tasselling. The increases, though not large, were sufficient to cover all costs and show a profitable margin.

"The advisability of continuing cultivation to tasselling will depend mainly on seasonal conditions, the growth of the crop, and the condition of the soil," concludes the experimentalist at the farm. "No hard-and-fast rule can be laid down, but the best results are likely to be obtained on soils that have a tendency to cake badly, or in seasons when the early part of the growing season has been good, followed on by dry weather at tasselling. On light soils well supplied with humus the soil will have a tendency to be self-mulching, and extra cultivation may not help to increase the yield to any appreciable extent. Under favourable conditions a variety may sucker freely and produce a profuse succulent growth, completely shading the soil, thereby giving rise to such a condition that any extra cultivation would be unnecessary."

Careful Handling in Haymaking.

It has been proven quite conclusively that the time of cutting of the various forage plants for hay purposes plays a very important part in both the total amount and the palatability of the nutrients obtained. A fact that does not appear to be so widely recognised (writes G. P. McRostie, in the Canadian departmental publication "Seasonable Hints") is that, even though a forage crop may be cut for hay at the proper time, the subsequent method of handling may result in serious losses. A preliminary report on investigations by the Forage Plant Division at the Central Experimental Farm indicates the reason for at least some of the losses. The tests were made during the harvesting of variety tests of various types of grasses and clovers, seeded both alone and in combination.

Either the whole or a definite portion of the cut fodder as harvested was placed on tarpaulins to dry. The material was handled very carefully during the curing process, at least with as little rough usage as it would be likely to receive under ordinary haying operations. After the curing process had been completed the hay was lifted off the tarpaulin and both it and the shattered portion remaining on the tarpaulin carefully weighed. This latter portion was computed as percentage loss during the curing operation.

The greater portion of the shattered material consisted of leaves, mixed with which was a small amount of the finer stems and a few heads. In the case of the clovers, lucerne and sweet-blossomed sweet clover lost about 7 per cent. during the curing process. Red clover and yellow-blossomed sweet clover lost a little over 5½ per cent., while the alsike and white Dutch clovers lost a somewhat smaller percentage. With the grasses, either alone or in combination, the loss fell to about 3¾ per cent. The seeding of grasses with the various legumes in all cases reduced the percentage loss due to shattering.

Rougher treatment of the harvested fodder during curing, or allowing it to lie in the swath until the leaves were quite dry increased the losses due to shattering to an alarming extent, as much as 90 per cent. of the leaves being lost in the case of white-blossomed sweet clover. "When we consider that the leaf is not only the most palatable portion of the various grasses and clovers, but contains a considerably higher percentage of protein than the stems, the necessity of preventing such losses should be apparent."

The following practices are recommended as helping very materially in preserving the original food value during the curing process:—

(1) Get the hay into swaths or cocks before the leaves become dry enough to shatter.

(2) In showery weather cut only limited quantities, and get this cocked up as soon as possible.

(3) Handle as little and as carefully as circumstances will allow.

Closing of the Cotton Harvesting Season.

In connection with the 1924-25 cotton crop, the Department of Agriculture and stock officially announces that the season is now closed and no further seed cotton is to be consigned to the ginneries.

The attention of growers is drawn to the fact that all cotton plants which are the first growth after planting should have been either destroyed or cut down to within 6 inches of the ground level and the debris destroyed; and all cotton plants which are not of the first growth after planting should have been destroyed ere this.

New Method of Preserving Fruit.

A method of preserving fruit so that it will withstand a journey of several weeks in the hold of a ship without refrigeration is said to have been discovered by a London chemist, Mr. Alan Speedy.

The method consists of dipping or spraying the freshly-picked fruit with a chemical solution; the fruit is then drained and dried, when an invisible coating forms round it which prevents transpiration and keeps it in a perfectly natural condition even at semi-tropical temperatures.

The full bouquet and flavour, as well as the colouring are, it is claimed, preserved in their entirety. The advantage of the method lies in the fact that the impermeable coating is non-poisonous and tasteless, so that the fruit can be eaten just as it arrives from shipment.

It is well known that refrigerated or cooled fruit, after unloading, often becomes bad very quickly on regaining the normal temperature. This, says Mr. Speedy, is not the case under his method, while the cost of the preparation is negligible.

Inquiries concerning the process are being made by the Commonwealth Department of Markets and Migration.

Motor Transport and Rural Life.

Motor transportation has revolutionised the life of the farm, given employment to hundreds of thousands in the automobile and allied industries, and formed a new unit in the transportation systems of the country, are points stressed in the report of the American Committee on Highway Transport submitted to the third biennial conference of the International Chamber of Commerce, opened in Brussels on 21st June.

"Motor transportation has brought the town and country into closer touch," the report declared. "It has in a considerable degree destroyed the historic isolation of the farm and farmer. It has permitted a notable extension in educational facilities available for rural populations. The centrally located school reachable by motor transportation from a large surrounding area has largely contributed to the solution of the problem of adequate equipment and adequate instruction for the rural children."

On the 6,500,000 farms of the United States there were, in 1924, automobiles to the number of 4,200,000, making the total of automobiles in use by farmers almost equal to two-thirds of the number of farms in the country. Added to these, 370,000 motor trucks were utilised by farmers. The farmer possessing motor equipment has quadrupled the economic range of his choice of markets, enabling him to take advantage of more favourable prices at a greater distance, the committee pointed out.

Marketing and distributing practices have undergone great changes through the use of the motor car, was another feature brought out in the report.

What becomes of the Consumer's Dollar.

The United States Bureau of Agricultural Economics has made several studies to determine what becomes of the consumer's dollar spent for various commodities, one of which is cotton cloth. In its study of the distribution of the price of cloth, the bureau gathered prices at four stages of the path from the grower to the consumer:—(1) Price paid by consumer for cloth at the store; (2) price paid by jobber to mill's selling agent; (3) price of cotton in New Orleans market; and (4) price received by the grower. It is pointed out, however, that these do not represent all the agencies through whose hands the commodity passes.

The division of the consumer's dollar spent for various kinds of cotton cloth was found to be as follows:—

DISTRIBUTION OF CONSUMER'S DOLLAR SPENT FOR VARIOUS KINDS OF COTTON CLOTH.

Charge or Margin.	Sheeting.	Gingham.	Percale.	Calico.
Retailer, Jobber, Transportation of cloth from jobbing centre to retailer	$0·365	$0·281	$0·350	$0·296
Bleaching and printing	..	..	..	·177
Selling agent, Manufacturer, Cotton dealer, Miscellaneous handling and carrying charges	·393	·534	·416	·288
Transportation from New Orleans to New England	·013	·010	·013	·014
Miscellaneous assembling charges	·031	·024	·020	·021
Cotton grower	·198	·151	·201	·204
Total	1·000	1.000	1·000	1·000

America Claims New Packing Methods add Millions to Returns.

Improved packing methods are adding millions of dollars annually to the sales of American products abroad, declared the Acting Chief of the United States Bureau of Foreign and Domestic Commerce recently. The bureau has been conducting a campaign to bring about better packing methods, and reports show that it is having a beneficial effect.

In order that American goods may arrive at foreign ports in first-class condition and maintain the standard of excellence which is desired for them, officials of the United States Government have been stressing upon manufacturers and exporters the necessity of packing properly.

The Department of Commerce has made a careful scientific study of the methods of packing to be employed for all kinds of products and for all kinds of conditions. This study covers practically every article of merchandise. Not only were tests made as to the carrying quality of different kinds of containers, but climatic and port conditions in various parts of the world were taken into careful consideration in the recommendations which have been prepared by the Department of Commerce.

A large part of the work in this investigation was conducted in co-operation with the Forest Products Laboratory, which made exhaustive tests into the strength of boxes and barrels of various shapes and sizes and made of different kinds of wood.

The millions of dollars lost annually through careless or injudicious packing, which invites pilferage and destroys goods through breakage or other damage, is a tax on industry which all those sharing in the distributive process should join forces to eliminate, says the official.

Packing which will be satisfactory for one country or destination, it is pointed out, may not be suitable for another, it being obvious, for instance, that shipments destined to a port with modern facilities and equipment will not always require the same character of container or internal packing as would a similar shipment which is discharged where port facilities either do not exist at all or are of a primitive character.

Feeding Young Pigs—Six Basic Principles.

One has but to visit a few farms (writes E. W. Crampton, Macdonald College, Canada) to be convinced that there is no one best way to feed little pigs. No two feeders follow the same plan, but all successful feeders recognise and observe certain fundamental principles. These may be summarised as follows:—

1. The first food given to the pig should be as nearly like his dam's milk as is possible.
2. The change from this to the ultimate fattening ration must be made gradually and slowly.
3. A minimum of fibre is essential in the early rations.
4. All pigs should be eating freely from the trough before being weaned.
5. A little pig should always be hungry at feeding time. (This is the best preventive of overfeeding.)
6. Small pigs should be fed at least three times a day.

If the principles are adhered to it matters but little what the detail of the practice is. For pigs of this size it is impossible to lay down set rules for feeding. This is where the skill of the feeder enters in. It is an art to feed young pigs—an art which must be learned in the farmyard, not from books.

Co-operative Marketing in Canada.

Queensland co-operators will be interested in the development of co-operative marketing in Canada, as disclosed in a report on the Co-operative Marketing of Agricultural Produce in Saskatchewan, by the Officer in Charge for H.M. Trade Commissioner at Winnipeg. Wool marketing in Saskatchewan was commenced by the Co-operation and Markets Branch of the Department of Agriculture, but as soon as the commodity reached a stage where it was good business to establish a co-operative organisation managed by the farmers themselves that was done, and now the Canadian Co-operative Wool Growers, Ltd., operates over Canada. This company handles fully 50 per cent. of the wool produced in Western Canada, and, with its warehouses at suitable points, is in an excellent position to give service to its shareholders. The head office in the West is at Regina, and during the past season it handled approximately 434,764 lb. in the Provinces of Manitoba and Saskatchewan. The company handles for the farmers stockmen's supplies, such as shearing machinery, branding fluid, &c., and also carried a considerable range of Canadian woollen piecegoods and knitted wear for the benefit of its shareholders and customers.

The latest report issued by the Dominion Co-operation and Markets Branch gives the following particulars in regard to the establishment of the Provincial Co-operative Stockyards:—In 1918 the Provincial Legislature took steps to establish two central live stockyards at Moose Jaw and Prince Albert. One-third of the cost of the buildings erected was paid by the Government when evidence was furnished that the company possessed enough paid-up capital to furnish the other two-thirds. These stockyards have become two of the most complete yards in Western Canada for feeding and handling stock. During 1923 these yards, in addition to live stock handled through ordinary trade channels, received 231 carloads of live stock from co-operative associations.

At the Annual Convention at Saskatchewan Grain Growers' Association, held in Regina at the end of January, the principle of establishing a live stock pool was endorsed in a resolution, and eight agricultural and stock breeding organisations are to discuss with the grain growers the question of the organisation of a cattle pool. Hitherto shippers of live cattle have made use of the cattle pool organised by the United Grain Growers, Ltd., a farmers' co-operative organisation with headquarters at Winnipeg. In 1923 this pool handled 64,195 head of cattle.

A pool was organised at the end of 1924 by the Co-operation and Markets Branch of the Department of Agriculture, in conjunction with the Saskatchewan Grain Growers' Association, for the co-operative marketing of turkeys. Sixteen carloads of turkeys were marketed in all by this method, and results are considered to have been so satisfactory that plans are being made for the permanent organisation of a general poultry pool.

In 1923 a co-operative egg pool was organised by the Saskatchewan Co-operative Creameries, and approximately 58,000 dozen eggs were marketed. A movement, however, is now on foot, sponsored by the Department of Agriculture and the Saskatchewan Grain Growers' Association, to organise a voluntary egg pool in connection with the proposed poultry pool mentioned above, and this is expected to come into being during the present year.

Lucerne in the Stack.

Lucerne hay, under some circumstances, is liable to become so heated in the stack that firing occurs, and the hay is reduced to ashes. In other cases heat is generated, but is not sufficient to cause firing, and the hay is only charred. The degree of charring varies according to the temperature reached, and in some cases is so slight that the hay is not materially damaged, while in other cases it may be so great that the hay is rendered practically valueless as feed.

The direct causes of spontaneous combustion are rather obscure, as also are the conditions which are conducive to its development. As a rule, however, it is found to occur in hay which has been made from heavy, sappy crops, especially if it is made when the weather is not suitable for drying. Great difficulty is experienced in getting the moisture out of very green lucerne, and even when the stuff is apparently dry, charring or combustion may occur. When the crop is very sappy, and the weather not favourable to drying, the hay should be put up in narrow cocks, and left in the field until no trace of moisture can be detected. Generally it is the first cutting of the season which causes the trouble, as it grows during cool weather and contains a larger percentage of moisture than later cuts. Extra care should be taken with this, and, if necessary, the hay stacked outside and away from sheds or barns, so that, should combustion occur, these will not be destroyed.

Downy Mildew—A Seasonable Reminder.

Since the first outbreak of downy mildew in Australia so much has been written and said regarding the disease and its treatment that viticulturists may consider they have had a surfeit on the subject; but, after witnessing the results of last season's vintage (chiefly due to the ravages of the disease), and the failure of many growers to realise the gravity of the menace (as shown by their neglect to spray consistently), it appears necessary to again broach the subject with a view to once more driving home the necessity for spraying, and at the same time to point out the advisability of including the operation of spraying in the general routine of vineyard work.

The weather conditions experienced last season were ideal for downy mildew development, and it was very noticeable that where spraying had been neglected crops were very poor and very little was vintaged from such patches. In the Hunter River district the necessity for spraying was particularly evident, and in this district the vintage was probably 70 per cent. short of expectations early in the season, mainly the effect of the disease. Growers who sprayed as they should have done had a fair vintage. On the other hand, those who did not spray vintaged practically no crop at all, and what was picked was inferior stuff and consequently yielded poor quality wine. The same applies more or less to other parts of the State.

It would probably be right to say that, owing to the ravages of downy mildew—or, to be more correct, owing to the neglect of many growers to spray consistently—the vintage figures for the State were reduced by 40 per cent.

It must be realised that not only is the crop at stake by not spraying, but that what may be harvested from a badly affected vineyard will make a poor-quality wine. The worst feature of wine made from grapes badly affected with mildew is that it causes the cellarman a great deal of trouble and anxiety in handling, and one cannot blame buyers who refuse to purchase either grapes affected with the disease or wine made from such grapes.

It is quite probable that the State, after experiencing a wet winter, may see a dry summer, and in that case there will be little or no trouble from this disease; but in dealing with downy mildew preventive measures should at all times be resorted to, and hence the advisability of spraying as an insurance—at all events, in the early part of the season. Further spraying can be undertaken later as it appears necessary.—Viticultural Expert, New South Wales Department of Agriculture.

Some Points about Wells.

Wells are of two kinds—shallow, or surface wells, and deep wells. Shallow wells are those which are sunk into superficial porous beds of sand or gravel overlying an impermeable stratum, such as clay or rock, by which the underground water is held up. It is possible to obtain satisfactory water from shallow wells, provided there is no possibility of pollution by soakage from surface washings, and the necessary precautions are observed with regard to position and construction. It is frequently found that not sufficient care is exercised in selecting a site for a shallow well; therefore the water from these wells should always be looked upon with suspicion until careful investigation has proved that there are no possible sources of contamination. The underground water tapped by these wells is

comparatively near the surface. Liquid sewage and other matter passing into the soil may easily reach this water in an unpurified state, and without efficient filtration it would be dangerous to use the water for domestic purposes.

As a rule, the ground water is slowly but steadily moving through the soil towards its natural outlet. This is of importance with regard to the position of the well. Should the well be above any possible source of contamination—that is, in such a position that the ground water flows from the well towards the possible source of contamination—the risk of pollution of the water in the well is generally diminished. The position of the well, however, cannot always be relied upon as safeguarding the water from pollution. If a large amount of water be abstracted from the well at any time, considerable depression of the water-level may take place, and thus cause a flow of water towards the well from all directions, including that in which the source of contamination lies. In these circumstances the water in the well would be liable to pollution.

Deep wells are defined as those sunk to considerable depths and which pass through a superficial porous bed and an underlying impermeable stratum to reach water-bearing strata below. The water tapped by deep wells has usually travelled a great distance since it reached the surface of the earth as rain. It is protected from pollution from the soil above by the impermeable stratum. Such water, though it may sometimes be hard, usually forms a safe source of water supply.

The lining of all wells should be so constructed as to be quite impervious to soakage from the surface surroundings. Instead of the brickwork being loosely laid around it, which is the common practice, it should be set in cement down to the water-level, and as an additional precaution, it is well to interpose a layer of puddled clay all around between the brickwork and the adjoining soil. A more satisfactory plan, where possible, is to substitute Monier pipes in place of the bricks, carefully cementing the joints between each length of piping. The piping should protrude above the ground a foot or two to form a coping to prevent surface washings entering the well.

The Royal Society of Queensland.

The ordinary monthly meeting of the Society was held in the Geology Lecture Theatre of the University on Monday, 28th September, 1925. The President, Prof. R. W. Hawken, B.A., M.E., M. Inst. C.E., in the chair. Messrs. E. J. Ferguson Wood and N. L. Kelly were unanimously elected as Associates. On the motion of Mr. Chas. Hedley, seconded by Prof. H. C. Richards, it was decided to ask the Government to reserve for scenic purposes some of the areas of rain forest adjoining the railway between Cairns and Cardwell. It was suggested that the Society might seek the support of the Queensland Naturalists' Club and other interested institutions in furthering the object of the motion.

Prof. H. C. Richards exhibited a meteorite found about 80 miles from Boulia, Western Queensland, and forwarded to him by the shire clerk of Boulia. It is composed chiefly of coarsely crystalline iron which indicated slow cooling under great pressure.

A paper by Dr. H. I. Jensen entitled "Geological Features of the Mandated Territory of New Guinea" was read by the Hon. Secretary in the absence of the author. The paper places on record some of the essential facts of the geology of the Mandated Territory and adjacent islands. The author states that he is in agreement with Rev. C. H. Massey in his general contention that the islands of New Guinea form the remains of a broken-up continent. Dr. Jensen concludes that up to the Cretaceous period New Guinea, the surrounding islands, the Coral Sea, and possibly New Caledonia formed a continental mass continuous with North Queensland and Central Australia. Prof. Richards, Dr. Whitehouse, Messrs. Owen Jones, D. Herbert, C. T. White, F. Bennett, and Prof. Goddard took part in the discussion on the paper.

Mr. C. T. White read a paper by himself and Mr. W. D. Francis entitled "Contributions to the Queensland Flora, No. 3." The following new species are described and figured:—*Polycarpæa glabra, Melicope stipitata, Elæodendron microcarpum, Cassia neurophylla, Polyosma rhytophloia, Xanthostemon Youngii, Sideroxylon singuliflorum, Prostanthera megacalyx, P. suborbicularis, Cryptocarya corrugata,* and *Grevillea sessilis.* In addition, the paper contains descriptions of two new varieties, records of fourteen species not previously known as Queensland plants, descriptions of flowers or fruit of species of which only fruit or flowers were previously described, and definite locality records of a number of rare native plants. Prof. Goddard and Messrs. Bennett and Herbert took part in the subsequent discussion.

Orchard Notes for December.

THE COASTAL DISTRICTS.

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

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

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

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

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

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

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

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

to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

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

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

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

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

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

Farm and Garden Notes for December.

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

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

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resistant. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

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

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

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

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

Kitchen Garden.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown. All vacant ground should be well manured and dug two spits deep. Manure and dig as the crops come off, and the land will be ready for use after the first shower.

Flower Garden.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked layer beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

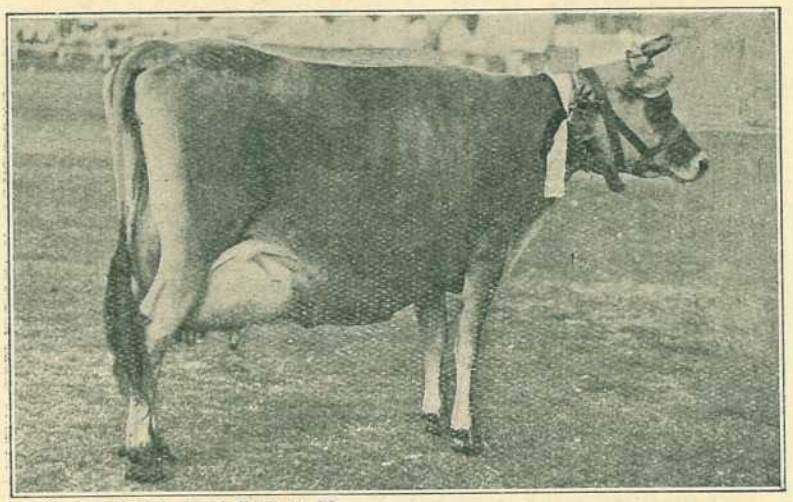

Photo.: "Livestock Bulletin."]

Plate 139.—"Carlyle Lady Lynn."

Second for Jersey Cow, five years and over, in milk; first in home milking with 2.53 lb. fat in twenty-four hours; first for cow or heifer not exceeding 800 lb. live weight, averaging the greatest daily yield of butter fat with 2.36 lb. in twenty-four hours. Winner of eight championships and numerous class prizes, including the home milking at the 1923 National. Owned by Mr. John Williams, Woodbine, Wondai.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	NOVEMBER.		DECEMBER.		MOONRISE. NOV.	DEC.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·3	6·9	4·50	6·32	6·35	7·16
2	5·2	6 10	4·50	6·32	7·32	8 9
3	5·1	6 11	4 50	6 33	8 29	8·59
4	5·0	6·11	4 50	6·34	9 25	9·45
5	5·0	6·12	4 50	6·35	10·17	10 29
6	4 59	6·13	4 50	6·35	11·5	11 8
7	4 58	6·13	4 50	6 36	11·49	11·45
8	4 57	6·14	4 50	6·37	nil	nil
					a.m.	a.m.
9	4 57	6 15	4 50	6·37	12·33	12 20
10	4 56	6·15	4 51	6 38	1·12	12·54
11	4 56	6·16	4 51	6 39	1·47	1 28
12	4 55	6 17	4 51	6 40	2 23	2 3
13	4·55	6 18	4 51	6 40	2 56	2·40
14	4 54	6 18	4 52	6·41	3 33	3 24
15	4 54	6·19	4 52	6 41	4 11	4·9
16	4 53	6 20	4 52	6 42	4 50	5·2
17	4 53	6 21	4·52	6·43	5 33	6 0
18	4 53	6 21	4 53	6·43	6 23	7·5
19	4 52	6·22	4·53	6·44	7 17	8·11
20	4·52	6 23	4 54	6 44	8 17	9·16
21	4·51	6 24	4·54	6·45	9 19	10 20
22	4 51	6 25	4 55	6 46	10·23	11·24
						p.m.
23	4·51	6 26	4·55	6 46	11·26	12 24
					p.m.	
24	4 51	6·27	4·56	6·47	12·28	1 23
25	4 51	6 28	4·56	6·47	1·29	2·19
26	4 50	6·29	4 57	6 47	2 29	3 16
27	4·50	6 29	4 57	6 48	3 27	4·12
28	4 50	6·30	4 58	6·48	4·25	5 7
29	4 50	6·31	4 59	6 48	5·22	6 0
30	4·50	6·31	5 0	6 49	6·20	6·52
31	...	..	5·1	6·49	..	7·40

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

9 Nov.	☾	Last Quarter	1	13 a.m.
16 „	●	New Moon	4	58 p.m.
23 „	☽	First Quarter	12	5 p.m.
30 „	○	Full Moon	6	11 p.m.

Apogee, 8th November at 5 36 a.m.
Perigee, 25th November at 5 36 p.m.

On the 20th November, about one hour after sunset, it will be interesting to notice that the planet Jupiter and the Moon, then nearly in its first quarter, will be apparently in somewhat close proximity in the western part of the sky. There will be, however, several millions of miles seperating the two objects as the Moon will be at a distance from the Earth of about 226,000 miles only, while Jupiter will be far away at a distance of about 700 millions of miles.

Mercury will be at its greatest elongation, 22 degrees 3 minutes east of the Sun, on the 22nd, when it will remain above the horizon 1 hour 42 minutes after sunset. The constellations in the same direction in the sky are Sagittarius and Scorpio, near the borders of which the planet will seem to be situated. As no bright stars are in the immediate neighbourhood Mercury should be clearly discernable, with Antaries the brightest star of Scopio about 15 degrees above it towards the Moon. On and about the 26th November the two most brilliant planets, Venus and Jupiter, will be apparently not very far apart in the western sky soon after sunset, with the constellation Sagittarius and Capricornus in the background. Although the Moon will be somewhat bright, being between the first quarter and full, the two principal stars of Capricornus which lie apparently somewhat remarkably close to one another should also be observable above these two planets.

On the 28th Venus will be at its greatest elongation 47 degrees 18 minutes east of the Sun, and therefore at its highest point above the western horizon after sunset. Venus will be apparently in the constellation of Sagittarius near Capricornus and will not set until 3 hours 32 minutes after the Sun.

8 Dec.	☾	Last Quarter	10	11 p.m.
16 „	●	New Moon	5	5 a.m.
22 „	☽	First Quarter	9	8 p.m.
30 „	○	Full Moon	12	1 a.m.

Apogee, 6th December at 4 6 a.m.
Perigee, 18th December at 12 18 a.m.

On and near the 1st December, about 8 o'clock in the evening, the Southern Cross will be at the lowest part of the circle which it apparently makes every twenty-four hours, also once every year around the South celestial pole, a point in the sky at the same distance above the Southern horizon as the position of the observer is from the equator. The Cross being at a distance of 30 degrees from the Pole, describe a circle 60 degrees in diameter. At Warwick, 28 degrees South, the pole is only 28 degrees above the horizon and the Cross therefore when at its lowest position is just below the southern horizon. This position is represented by Figure VI. on the clock face; about midnight the Cross will reach position VIII. and will be coming into view head downwards in a south-easterly position.

About midday on the 16th Venus will be occulted by the Moon, but only to a very small extent in Southern Queensland. As this will occur within four days of the new moon, a beautifully interesting phenomenon will be somewhat marred by the intense brightness of the Sun in too great proximity on the left.