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EDITORIAL NOTES.

The Imperial Agricultural Research Conference.

The Empire Marketing Board having made a grant to cover the expenses of the Agricultural Research Conference to be held in October, in London, one can look forward with confidence to a most successful meeting of the representatives and delegates who will attend. Some 70 of the delegates attending are from the oversea parts of the Empire.

The importance of agricultural research cannot be over-estimated. Scientific research workers probably do not achieve sudden spectacular results, but good work has already been accomplished. From the efforts of research workers, is due the fact that cows are bred which give larger yields of milk and of meat, wheat yields a more abundant harvest, and nearly all agricultural products cost less and are of much better quality than they were a generation or two ago. Had agriculture stood still, our vast city populations to-day could not be fed.

It is due to research work that such great strides have been made. Nevertheless innumerable problems remain unsolved—problems which greatly affect the practical worker.

When it is borne in mind that the lands within our Empire in various latitudes, present problems peculiar to each, it will be seen how valuable such a Conference becomes. Further, there are many areas within the Empire, our own Colony for example, which are but on the threshold of development and stand in need of all the scientific help and advice that can be obtained.

In Canada there are many thousands of acres of virgin land, still to be conquered by man and made to bring forth fruit. Insect pests and fungoid diseases still play havoc with certain crops all over the world. Cattle-raising was made possible over enormous tracts of South Africa, through immunization against cattle plague—in course of time we may expect that foot and mouth disease will be a thing of the past. In our own Colony research work in the breeding of seedling sugar-canes, saved the Staple Industry of the Colony.

Examples might easily be multiplied as to what research work has accomplished. With regard to the financial aspect, The United States of America certainly lead the way, since the sum devoted to agricultural research in the whole of the British Empire, is less than half the amount that is spent in the United States.

This Conference will emphasise the fact that the work being done in various parts of the Empire is of interest and importance to the Empire, as a whole. The links that now exist will be amplified and strengthened, and at least one result will be closer co-operation in agriculture throughout the whole Empire.

The chief subjects which will be discussed at the Conference, according to the Journal of the Ministry of Agriculture, will be the extension of the system of Imperial Bureaux from entomology and mycology to other departments of agricultural science ; the interchange of information among agricultural research workers; the recruitment, training and interchange of workers ; and the development of the chain of agricultural research stations throughout the Empire. The main meetings of the Conference will be held in London, Cambridge and Edinburgh.

Farmers and Accounts.

Most of our farmers, if asked the cost to produce and market any of their crops, are very often forced to reply that they have not the faintest idea. Even those owning a fair area under coffee and other permanent crops frequently fail to keep figures of their transactions. The fact is that most of our farmers have no system of book-keeping at all.

There is no necessity for any elaborate mass of figures, but all of our farmers should keep books, and at the end of the year, know precisely the yields of their crops, the amount they have realised and the cost of planting, reaping, transporting, etc.

Books too, should be kept in respect to livestock and poultry. The haphazard measures adopted by most of our small farmers is to be regretted. The younger generation taking the place of the old farmer, should see to it that a simple form of book-keeping is adopted, whereby the transactions on the farm can be clearly seen.

After all, Agriculture is a business and we cannot conceive how any business can be conducted without books. The farmer to be successful must have some business ability—and further, in these ever-changing days, he should keep himself as up-to-date as far as possible. He should know something about the markets his crops reach and should study their conditions.

FRUIT INDUSTRY.

In connexion with the proposals to establish a fruit industry in this Colony, we fully endorse the remarks made by Mr. Stollmeyer at a recent meeting of the Trinidad Agricultural Society. Mr Stollmeyer, who has spent a fair amount of time and money on growing and marketing fruits, stated *inter alia* :—

" In the first place it must be understood that nothing could be accomplished in a hurry. These things took time. It might be said that they had been trying to organise the industry for the past fifty years, but the fact remained

at up to now they had not gone about it in the proper ay. It was all right to say why not market their oranges r their mangoes. In the first place they had to compete gainst highly organised associations. They all knew he ad been engaged in shipping fruit for a few years and though he had been doing it, he had not reached the proper age. Although he personally thought he had reached at stage, now that he had returned from the marketing ntres he confessed that he had a good deal to learn. It ould be surprising to know how much care was necessary the marketing of fruit. Nobody here seemed to preciate the great care necessary in the handling of fruit. ranges, limes and mangoes should be handled as carefully one would handle eggs."

Mr. Stollmeyer also voiced his opinion that as regards trus cultivation, it was the grape fruit which held out e greatest promise of success in these parts.

The above is not meant to aim at any discouragement fruit-growing in British Guiana, but rather to emphasise e importance of accurately assessing the difficulties to be vercome in connexion with highly specialised industries hich require years for development on correct lines.

MEETING OF THE BOARD OF AGRICULTURE.

A meeting of the Board of Agriculture was held at the Court of Policy Hall on Tuesday, the 4th day of October, 1927, at 2.30 p.m. The following were present: Professor J. Sydney Dash, B.S.A., (Director of Science and Agriculture), Chairman, W. Francis, Esq., F.I.C., (Assistant Director of Science and Agriculture,) Deputy Chairman. L. D. Cleare, Esq., F.E.S. Economic Biologist; Captain E. Beckett, F.L.S., S. H. Bayley, Esq., the Hon. G.L.B. Gall; the Hon. J. Mullin: H. L. Humphrys, Esq., S. M. DeFreitas, Esq., M.A., F.R.; J. J. Da Silva Esq. H. Aaron Britton, Esq., President, British Guiana Farmers' Conference. T. Earle, Esq., with E. M. Peterkin, Esq., Secretary.

Mr. H. L. Humphrys said that as the senior unofficial member, on behalf of the Board, he wished to welcome Professor Dash. He felt sure that the members were willing to co-operate with him in any scheme he brought forward for the benefit of agriculture, and he assured the Chairman that they would try to make his burden as light as possible.

The Professor thanked Mr. Humphrys for his sentiments, and said that he would take all the steps he could so as to revive interest in agricultural problems.

The minutes of the previous meeting held on April 26, 1927, having been circulated to the members of the Board and having received their approval were taken as read and confirmed.

The Chairman reported :—

His assumption of duty as Director of Science and Agriculture and Chairman, Board of Agriculture, on July 14th, 1927.

Leave of absence granted Mr. S. M. DeFreitas, M.A., F.R. Leave of absence granted Mr. T. Earle.

The reappointment of the following gentlemen as Ordinary Members of the Board for a further period of three years :

The Commissioner of Lands and Mines. The representative of the Royal Agricultural and Commercial Society. The Assistant Director of Science and Agriculture. The Superintendent, Botanic Gardens (vacant). S.H. Bayley, Esq. Captain E. Beckett, F.L.S. T. Earle, Esq., H. L. Humphrys, Esq., the Hon. R. E. Brassington. The Hon. W. M. B. Shields.

The appointment of the Assistant Botanist and Mycologist as an ex-officio member of the Board.

The affiliation of the following Associations :— British Guiana Farmers' Conference, 1927. No. 1 Canal Farming Association, 1927. Plaisance-Sparendaam Association, 1927. Stanleytown Farmers' Association, 1927. Victoria-Belfield Agricultural Association, 1927.

The Chairman stated that the estimated Rice Crop for 1927 was 42,950 acres and that the yield would probably be more than 343,600 bags of cleaned rice.

The Chairman reported that a pure bred Shropshire sheep valued $85 had been attacked in the Botanic Gardens by Mr. A. P. Camisuli's dog, and the matter was receiving the attention of the Government with regards to what action should be taken in the matter.

Mr. De Freitas said he thought the imported sheep in the Botanic Gardens should be shorn.

The Chairman said he would look into the matter with the Veterinary Surgeon.

The exchange of the Stallion "Waterbass" from this Colony with the Stallion "Nelsweep" from Trinidad was reported by the Chairman.

Mr. Britton enquired about the activities of "Nelsweep" since its arrival in the Colony, which the Chairman said he had asked for but had not been able to obtain in time for the meeting.

The following were laid on the table for general information:—

Movements of Stallion Donkey "Clay King. Movements of Stallion Donkey "Tip Top". Mr. Britton inquired about the arrangements being made for the animals to go into the country. The Chairman said he recognised

the importance of having them distributed about the country, but the impression he had got was that they were not very well looked after when they were there—they had lost two animals recently and it looked as though they were going to lose a third—he suggested that they should be brought back to the Gardens where people could take their animals until better arrangements could be made. The risks appeared to be great. He hoped to inaugurate a live stock policy in connexion with the re-organisation of the Department and the matter would then receive definite attention,

Mr. De Freitas said he thought a thorough revision of the breeding policy was very necessary, and by the bulls going into the country it was the only practicable way of broadcasting good stock. The Chairman said he was looking into the question and at present he did not care to say anything about the new policy.

The Chairman also laid on the table the Journal of the Board of Agriculture, Volumes XX, Nos. 2 and 3. He said he was not at all proud of it as it at present stood, and he did not think they would have any very great and rapid progresss in putting out a Journal of that type until they got going with their agricultural policy. There was too much "scissors and paste" in it to suit him. The tendency to fill it with popular articles was a dangerous one in many ways, particularly in regard to generalisation, and the inaccuracies which they very often contained, and such articles would be blue-penciled in the future. The popular article was usually of a general nature and contained matter which might or might not work in places other than that for which it was particularly written. The policy of the Department would be to provide efficient and reliable matter so that the farmers could be guided thereby. They had to reach the farmer by a series of leaflets so that if there was no Journal and if there was no meeting of the Board for some months, he would still be able to get information in connexion with the planting of his crops. The whole question of publication was receiving attention

in the new order of things, and he promised them that so far as the Department had anything to do with the publication of the Journal, it would be all improved.

In connection with the By-Laws for the control of the Plant Quarantine Station, the Chairman said that the by-laws had been printed and laid on the table, but he proposed to move the Quarantine Station from Brickdam which was not suitable. In the meantime, however, there was a new Order in connection with the importation of soil which he was bringing forward for confirmation, the question of the importation of plants being one which was undergoing consideration by himself and the scientific officers of the Board. At present they had very loose and lax laws in this connection, and he did not wish to run the risk of bringing in any disease in the soil and have it spread all over the Colony. So far, they had been keeping practically free, but at the same time, they must take all precaution to avoid danger in the future. There was more transportation in these days than in the past, and one of the duties of the new Department would be to protect all agriculture from the intrusion of any such pests or disease which might get in and be difficult to control.

In reply to Mr. De Freitas asking whether the new Order would prevent the importation of rose plants from Barbados, the Chairman said that Barbados was one of the worst places to bring in soils from.

Mr. Britton said that he hoped that in the interest of the local farmer, steps would be taken to prevent the importation of plantains from Suriname. The Chairman said that the matter was under consideration, but that nothing could be done at present.

On the motion of Mr. S. H. Bayley, seconded by Mr. G. Beckles Gall, the undermentioned Order of the Board of Agriculture under Section 3 of the Plant Diseases and Pests (Prevention) Ordinance No. 26 of 1920, was then unanimously confirmed.

ORDER OF THE BOARD OF AGRICULTURE.

Whereas it is enacted by Section 3 of the Plant Diseases and Pests Prevention Ordinance, 1920, that it

shall be lawful for the Board of Agriculture to prohibit the importation of any description of earth or soil, or any article packed therein, or any package covering, or thing which is likely to be a means of introducing into the Colony any plant diseases ;

NOW, THEREFORE, the Board of Agriculture hereby prohibits the importation from any country or place whatsoever of any kind of earth or soil, including leaf mould, or wrappings, cases, packages or other coverings which contain or have contained such earth or soil, or any article or material of whatever kind packed with such earth or soil : Provided that nothing in this Order shall apply to the importation of earth or soil by the Director of Science and Agriculture for scientific or agricutural purposes

Made by the Board of Agricultnre under Section of the Plant Diseases and Pests (Prevention) Ordinane No. 26 of 1920, this 4th day of October, 1927.

The programme of Agricultural Shows for 1928 was discussed. The Chairman outlined the policy hitherto adopted, which is as follows:—

Biennial Shows in 22 diffierent Districts 4 or 5 Districts each year—Grants $200 each.

County Exhibitions at Suddie, New Amsterdam, and North West District in alternative years—Grant $1,000.

Colonial Exhibitions once in 3 or 5 years to be held in Georgetown in which year no County Exhibition will be held—Grant $5,000.

Farmers' Competition every year in suitable districts —Grant $120 each.

For 1926 the sum of $1,500 was required to be used thus:—

3 District Shows at $200 each	...	...	$ 600
Farmers' Competitions	...	...	$ 600
Affiliation Grants	...	...	$ 180
Departmental Expenses	...	...	$ 120
			$1,500

The Chairman further stated that owing to the drought the Berbice County Exhibition was postponed from 1926 to 1927, and the Georgetown Exhibition from 1927 to 1928—it was thought advisable that the Georgetown Exhibition be now postponed to the early part of 1929 in order to give the new Department an opportunity of getting into its stride and to bring off something which was worthy of the Colony.

Mr. De Freitas said he welcomed the idea. He felt that the multiplicity of shows in the Colony did not improve or foster agricultural development. They had a number of petty shows all over the Colony at which many articles of poor quality were exhibited, and he felt that this was a subject which Professor Dash might consider with a view to finding whether a more constructive policy could not be devised. He thought a large Colonial Show should be held annually in the City. Professor Dash said he could be depended upon to see that the matter received the most careful consideration by the Department. He did not think the sum was excessive. In his opinion the judges had things in their hands. They had no right to award prizes where exhibits did not come up to standard. He agreed that the money might be better spent, but he felt that farmer's competitions of standing field crops were valuable things.

A letter from the Honorary Secretary, Essequibo Agricultural Association, *re* grading of Rice and Copra, was read.

Mr. Britton moved that the matter was not properly before the Board, as it should have been sent to the Farmers' Conference before it reached the Board.

The Chairman stated that this was a matter that Mr. Britton could take up with the Association ; in so far as the subject matter of the letter was concerned the question was raised in 1924 when a Joint Committee of the Government and the Chamber of Commerce reported on it.

The Chairman here referred to the report and gave a summary of the findings as communicated to the Colonial Secretary by the late Sir John Harrison. While he (the speaker) agreed with the summary generally it perhaps

did not take into account all of the points connected with the matter as were known at the present time and it would be neccessary for him to call attention just for a moment to one or two essential points with respect to the question of grading, and particularly as it applied to rice. The question of grading was not such an easy one as some persons seemed to think. Throughout the country they had one type of rice which was grown to any extent and which was at its best in Essequibo. Grown under such conditions, it was of a high quality and fine type of grain. The West Indian markets, generally speaking called for a low priced rice, and it not infrequently happened that good and bad rice were blended to meet the demands. There were different types such as the three or four months rices which they had never considered. All their rice was practically of the five months type. It would be hard under such circumstances to establish legal grades for the reason that there was much room for differences of opinion with respect to grades based on appearance only. Thus cereals were not like fruit in matters of size, colour, freedom from pest, etc., making the latter more easily judged. It was a question of growing their rice to meet the demand. They tried to meet the price instead of meeting the demand which was greater for a rice with bolder grain and more body than the fine type now produced. Some of the shorter cycle rices judiciously used would help to supply this, at the same time permitting the crop to be more cheaply produced, and he was going into this aspect of the problem. They should try to get away from the question of grading as it was proposed, type being in his opinion more important than grade. He was not saying that grading was not a good thing, but it had to be worked in such a way, as not to be irksome to those engaged in the industry. He did not think, for instance, that the Department should be called upon to be policemen—moral or otherwise. The Department existed to give advice to farmers. If they had everybody—merchant, miller, grower—working together as a whole, the difficulty about inspection would be easily solved. They should work on comprehensive lines and have a great

association with sub-associations. He had no final statement to make in this matter. He was only giving them the trend of his opinion. The question of grading would be simplified when they had different types to offer which would be acceptable to markets.

With respect to the supply of seed for 1928, the Department was taking steps to meet it as far as they possibly could. They were taking steps to give supplies to those who required, and unless they got definite orders they could not book them. Some of the growers were rather vacillating and appeared to fear excessive prices. He was going out of Georgetown within a week on rice propaganda. They must stop all operations of shying or broad-casting rice. It was a waste. The people who did it had too much land. They should work in nurseries and transplant from nurseries. They had too, to avoid planting too closely.

Mr. Da Silva pointed out that some of the people who were given seed were ignorant.

Professor Dash said that the agricultural authorities should control the seed supply of the Colony.

Mr. Britton said that in connection with the three months crop it might be all right in Essequibo, but not necessarily so on the East Coast or in places where sugar estates were sandwiched between.

Professor Dash replied that his own opinion was that they had in Essequibo a rice-growing country and they should make Essequibo their centre for exporting rice. It was going out of sugar and it should come into rice.

The following questions and motions by Mr. Britton, left over from the last meeting, were dealt with :—

Question.—How many of the agricultural apprentices, who received training at the Botanic Gardens, have by Government been settled on the land, if none, why ?

Answer.—The Chairman stated in reply that 34 lads had completed their term, 9 of whom had been awarded grants of $150 each. The system was very unsatisfactory and he intended taking steps to remedy it as soon as possible.

Question.—Whether or not steps will be taken, to import about 50 lbs of English Potatoes suitable for planting ?

Answer.—The Chairman stated that he did not think that they could do much with this matter, but it was being considered with other crops.

Question.—That the charge for Poultry Eggs be reduced by 50 per cent.

Answer.—The Chairman stated that this would be dealt with when there was some definite policy, but at present there were hardly any eggs or stock for sale.

Motion.—That in the interest of developing and maintaining an Export Trade of Produce by small farmers, it is necessary that Produce Inspectors be appointed.

Answer.—The Chairman said that he did not think that the Department, which was an instructive one, should have police duties attached to it.

The Chairman stated that in the future such matters could be dealt with departmentally rather than at a meeting where they might have interminable discussion and be unable to arrive at any definite conclusion.

The Chairman then gave a summary of many of his observations since assuming his office.

Running briefly over the situation, there were some impressions to be corrected, and he was only able to give the trend, as it were, of the opinions he had formed. Certainly nothing that he said should be regarded in the nature of a definite pronouncement.

Taking the sugar industry, he went on, he had already discussed the policy of the Department with those interested and he thought that the outcome of that should lead to improvement in the future prospects of the industry. He therefore did not intend elaborating the point further. From a general point of view there was the question of the small factory : the position was very difficult for small factories in these days, and he could only re-iterate what had been impressed already : that they should aim at co-operative factories and establish these on broad lines. It was a recognised thing, and he only mentioned the fact then because he wanted all to know that anything co-operative would meet with his approval and assistance.

The question of cane farming had been frequently raised. On that he saw little possibility under British Guiana's conditions. The small agriculturists here had an

alternative money crop, and that a quick one, and the small man was not always willing to wait for prices. The factory owner was not always ready to risk anything and he viewed cane farming possibilities at the present time as really poor. He was aware that cane farming was prospering in many places where sugar was the only crop and the factories had engaged themselves definitely in cane-farming polices. Though he saw very little hope at the present time he said that when the Colony got an increase in population they might get small communities in places away from the main towns, which might run small "community" mills, making syrup for their own consumption. This would be in places where they were far away from the factories and unable to reap the benefit of sugar and molasses, and so on. It was all a question for the future.

The rice business he had gone into already during the earlier part of the meeting.

Plantains.

Plantains were another product, and the Department had already taken steps to study varieties, growth and habits, and that brought in the question of pruning to secure bunches at the right time. They had also gone into the matter of by-products on a small scale. in the manufacture of plantain chips and plantain meal, and it amounted to this : that after the plantain had been taken out of its jacket it became a luxury. Eleven cents a pound was the figure at which they had produced plantain flour working on their small scale, whereas wheat flour was sellling at 6 cents. It was all a matter of reducing the cost of plantain flour. They had worked out their experiments at 12 cents a bunch for a bunch of 48 plantains. Of course, if they could get the price down cheap enough to balance with wheat it might become an inducement to the local bakers to make a mixture and get a very nourishing bread, but they had to produce exceedingly cheaply to compete against the big wheat countries.

They had tried several experiments, in which he was indebted to Mr. Francis, testing, among other things, the five-hours sun dried, the seven-hours oven dried and the

vacuum method, which last did not succeed. The percentage of flour obtained from the peeled plantains was about 40 to 42 per cent. and if the skins were included they got only about 25 per cent. Unless plantains were almost given away it did not seem that with any of the ordinary facilities for maufacture they would be able to do much with them. He was making preparations to have half a ton of flour made to check up the figures on a big basis. They might be able to do something more with the green bunches if they could increase shipments to the northern islands ; but that was a commercial problem.

Coconuts.

Coming to the more permanent crops, he began with coconuts, which was an important industry and which had a chance to expand. In the past, cultivators had in many instances planted in wrong situations, and if they had selected the right places, preferably sandy locations it would have been better for the industry. In order to solve the problems of sand reefs, etc., it would be necessary for the Department to carry out definite experiments, and he hoped to be able to do that soon.

The pegass lands and heavy clays were not suitable for coconuts, but the crop was a good one for working up by a population of this kind.

Coffee.

The next crop of any importance was coffee, but unfortunately they had given very little study to the varieties, etc., in the Colony. He noticed that the coffee plant here had been allowed to grow apparently without any care and he therefore had a great respect for the coffee plant after seeing it growing in some places in British Guiana. He believed there was an opportunity for hardy types, notably on the pegassy lands.

Citrus Fruit.

With respect to the question of citrus fruits, involving the lime question and citrus generally, he did not think that the conditions of the flat lands would allow citrus to be grown commercially. It was impossible to do much

with citrus in the flat heavy clays and it looked to him that if citrus fruits were to be established at all it would be in the North West. He intended to go through the district and investigate the whole situation up there, for he understood that abandoned lime trees were growing there and were free from "wither-tip," the disease which had destroyed so many of the island plantations. He believed that they probably had the nucleus of that industry in the North West, probably with coffee and cassava as additional crops. There might be sand reefs in other parts of the Colony which would favour the lime cultivation, and something might be done provided they were protected from wind, which was the deadly enemy of all citrus plants.

Bananas.

Dealing with the bananas, he said that he had already made statements which he did not think he need change. So far as investigations were concerned they were taking steps to study local varieties, and further than that they need not go because the Imperial College was doing it all at their very doorsteps. He thought he was safe in saying that he knew the banana situation at the present time as well as anybody else and he felt that they need not do anything further than they were doing.

Oil Crops.

The next heading he would consider was oil crops other than Coconut. Much had been done with the pea-nut and it was said that there were large areas in the Colony that could be used for pea-nut cultivation. He had not seen them yet but he was keeping a very open mind on the subject. There were three important factors : the kind of soil which would allow the free use of implements that would reduce the cost of labour : the climatic conditions to allow the vines to mature, and he was not sure that the Colony had those conditions. They had only got one variety which seemed to fit in with the requirements. A third factor was the necessity of having a suitable rotation crop as pea-nuts could not be grown continuously on the same land.

Three samples (which were exhibited at the meeting) had been brought down from Pln. Cecilia and the "Bunch" type had proved by far the best both for easy reaping and from the point of view of uniform maturity. It was very splendid indeed of His Excellency to start the experiment at "Cecilia," if only to demonstrate the possibilities of the local industry. Last year the people of the Colony consumed something like half a million pounds of pea-nuts and the small man could go for them, if only for local chewing. They had not got the real oil nut yet. In conclusion, he saw possibilities for a local industry, but none at present for a great export trade.

He was making efforts to retain "Cecilia" to run it as a sort of sub-station to the Botanic Gardens, (which it was thought were a sort of El Dorado where everything could be grown) and use it for minor crops—tobacco, pine-apples, pulses, etc., which could not be cultivated successfully in the Gardens. He wished to add on the question of pea-nuts that he had got into touch with the United States about the machinery for experiments in the industry generally.

He had samples of Soya beans, which were also on exhibit, and he said that it was a crop which was attracting a great deal of attention at the present time and had attracted a certain amount of attention in the West Indies in the past. The conditions had not been sufficiently understood. There were two factors: the Soya bean responded to long day illumination; and as a leguminous plant had certain soil organisms associated with it which they had not yet been able to establish in West Indian soils. By "West Indian" he referred to whole of the Caribbean. He had done some work at the Imperial College of Tropical Agriculture on the Soya bean, and those samples were ones he had brought along with him.

Miscellaneous.

In respect to fibres, what he had seen from "*Urena lobata*" appeared to be of value, but about the rest he could make no pronouncement at all. The fibre question was an economic problem.

For starches there was a fair demand in the European market. He had already noted cassava, but it was wise to mention that most of the European supplies came from without the Empire.

The European demand for pulses was also considerable, but it called for a definite product, but anything like spots on the grain cut the prices heavily.

The cocoa situation did not seen to be too healthy, and the Colony did not appear to have the conditions for any great development in this industry. All the trees he had seen appeared to be " struggling " very much to live.

Live Stock.

On the question of live stock he said that in this Colony there were numerous animals but all were "scrubby." There were possibilities for working it up. Little had been done with the draught-ox, and there were certainly possibilities with the buffalo, which gave a milk extremely rich in butter-fat which could be manufactnred into butter and ghee, such as the Indians used. Then, of course, there was the beef end of it, but he was not stressing that. They wanted to aim at producing a hardy class, as pure bred stock demanded special conditions which it would be hard to meet.

Unless something was done their live stock activities would certainly tend to drift. They might compete a little with the Venezuelans, if they got the right class of animals, but there was the question of transport to figure on. If they could possibly bring it about to have a little earlier maturing class of beef animal they might do something. He again stressed the buffalo and the draught-ox as good lines to take up. In the small stock line there was the goat—a most useful animal which played a great part in infantile health—and they could do something more with poultry, having the products with which to feed it produced in rice mills.

On the motion of Mr. Mullin, seconded by Mr. Earle, a vote of thanks was accorded the Chairman for his address.

The meeting was then adjourned.

B. G. ASSOCIATED DISTRICT AGRICULTURAL SOCIETIES' CONFERENCE.

The Tenth Annual Conference of the British Guiana Associated District Agricultural Societies was held in two sessions in Berbice, on Tuesday, the 9th August, the first taking place at the Friends Scots Church, and the second at New Amsterdam Town Hall. There was a large gathering over which the president, Mr. H. Aaron Britton, presided. The following delegates attended : Messrs. H. A. Thompson, John Adams and Colin Adams (Victoria-Belfield), H. W. Grant, J. R. Straughn and D. A. Proffit, (Beterverwagting), Nathaniel Worrel, R. P. Carryl, Amos Hinds and John Lewis, (Stanleytown, West Bank), J. E. Fox and D. A. Glasgow, (Buxton and Friendship), H. L. Palmer and R. Holder, (West Bank), and P. J. Galloway (Eversham), J. Z. Peters, J. Aaron, H. Christian (Berbice) and D. D. Haynes (Mahaicony), with Messrs. E. M. Morgan, H. Matthews, D. Bishop, Dr. T. T.Nichols, the Rev. A. E. Dyett, Mr. J. Eleazar, F.R., and Professor J. Sydney Dash. B.S.A., Director of Science and Agriculture and Mr. E. M. Peterkin.

Conference Welcomed.

Mr. J. E. Henry welcomed Conference to Berbice For many years, he said, they had been seeing what could be done to build up a healthy peasantry proprietorship and he hoped that in this, the first Conference with Professor Dash they will make a leap forward.

Replying, the honorary secretary, Mr. R. R. Baird, thanked the Berbice Association for its invitation and cordial welcome. This, he said, was their eleventh assembly and they had been living and carrying on for a decade. They had begun another decade with the great privilege of having the new Director of Science and Agriculture among them. They were looking forward to a great awakening in matters agricultural in the Colony and regarded very highly the privilege which Professor Dash had conferred upon them in being present that day to declare Conference open.

Conference Declared Open.

In declaring conference open Professor Dash said: Mr. Chairman, ladies and gentlemen—I am very glad to be here to-day at the Eleventh Annual Confernce in response to the kind invitation of your president. I wish to thank both speakers for their kind references of welcome. It is very gratifying to meet, so soon after my arrival in the colony, such a large number of practical agriculturists. In the first place, I want to thank you, sir, for the very kind telegram which you sent me, when in Trinidad, on the announcement of my appointment to the present post. (Applause). I take it as a happy augury of the good relations, which, I am sure, will exist between us. I want, in the next place, to assure you that my sympathies are entirely agricultural. I have lived among agriculturists all my life and I believe I know their point of view. All my best friends are agriculturists. (Applause). Throughout my whole career I have not found one unpleasant incident between myself and any agriculturist. (Renewed applause). You can be sure that any project, however great or however small, that has any chance of succcess is not going to be neglected. (Applause). But on the other hand, I am bound to tell you that speculative ventures or wild cat schemes will be severely left alone. I say this because I feel that there is a feeling of restlessness in the agricultural atmosphere that is not conducive to soundness, and I am quite determined that nothing should swerve me from doing all I can to conserve your interests and the colony's interests. It is probable that we may not see eye to eye on every occasion—it would be strange if we did—but I am sure that as time goes on you will come to regard me as a real friend. (Loud applause).

The Present Position.

Now the position is just this—that haphazard methods will have to give place to those that call for close study and investigation. I am just giving you an idea. This colony is just beginning its development. Its agricultural possibilities have hardly been scratched. One of the first essentials for development is an active and vigorous

Department of Agriculture, equipped with vital necessities—not luxuries—for the building up of the whole structure of our economic life Such a department must be regarded as a sound investment, and it must be substantially housed, if it must function efficiently. Modern departments of agriculture are undergoing a change in keeping with present-day conditions. Present-day land problems can no longer be solved in museums and gardens, however useful such institutions may be. I for one will not want to deprive them of their value. But, sir, the fact is that the mere introduction of a plant, or a seed, or an animal under present-day conditions is nothing compared with the difficulties and impingements to be surmounted and understood in the establishment of new crops, new industries, new methods; for after all, Mr. Chairman, agriculture primarily is a business—the greatest business in life—and its success or failure must be adjudged in strictly business terms.

RECONSTRUCTION OF AGRICULTURAL DEPARTMENT.

I am in the process, at the present time, of planning a strong department in which all the agricultural interests of the colony are receiving full consideration. I hope before long that these plans will be ready for submission to His Excellency the Governor. I mention this now because I hope it will suffice at this juncture. In the meantime as an agriculturist I appeal to you and to every agriculturist in the colony to let us unite and pull together and co-operate most heartily in the work which lies before us,—building up the whole fabric of our agricultural interests. In conclusion let me express the hope that your deliberations may be uplifting, may be imaginative, all tending towards that prosperity and happiness which we so much desire. (Loud applause.)

The President then replied at some length.

THE PRESIDENTIAL ADDRESS.

The following is a precis of the President's address :—

Members of Conference and friends : To-day for a second time since its inception the Conference assembles in

the county of Berbice, and that under very happy auspices for those on whose behalf the conference is functioning.

The New Director.

On 22nd April last, it was publicly announced that the Secretary of State for the Colonies had chosen Professor J. Sydney Dash, B.S.A., of the Imperial College of Tropical Agriculture as Director of Science and Agriculture in succession to Mr. W. Nowell. Professor Dash arrived in the colony on the 14th ultimo and assumed the duties of his office on the next day. His is in by no means an enviable position, but from the published interview he accorded to the press, it is no exaggeration to say that in Professor Dash it seems that the colony has been peculiarly fortunate in getting that type and class of official required to give the colony a move on agriculturally. The number of things that were put down pending the advent to these shores of the new Director for him to deal with, are so many that an individual with a less stout heart than Professor Dash, would already have been casting his eyes about to get out. We fervently hope that the Professor will live up to the visioned interview he accorded to the Press, and thus make it possible for the Colony within a short time not only to be capable of producing a sustained supply of fruits and vegetables for local demands, but of establishing an export trade.

Back to the Land.

It is gratifying to record that in those districts where modern pumping plants have been installed and drainage reasonably assured, there had been a steady return to the land with the result that the acreage under cultivation in those districts as also the Canals Polder, have been largely increased. As a consequence ground provisions are being sold unremuneratively.

It should be recorded that at no previous time in the history of the colony has there been so determined an effort on the part of the small farmers to put in permanent crops, with the result that the supply at the Botanic Gardens has proved inadequate. It is to be hoped that in the re-organisation of the department, the Director will give

sympathetic consideration to the views of the Conference as regards the Superintendent of the Botanic Gardens, which were forwarded by way of a resolution to the Executive Government some time ago. There can be no doubt about its being a waste of money in having highly trained and technical officers engaged in clerical work, whereas it would make for greater efficiency to have such officers engaged in out-door work.

FRUIT.

Surely it is not too much to expect that the Governor, who is now a practical farmer, will bring about the promised conference over the Joint Report for the Experimental Farms approved by the Board of Agriculture and concerning which the late Professor Sir John Harrison thought that the opinion of his successor should be had. It appears to me that the establishment of these stations would not be of any great financial burden to the colony if steps be taken to procure a grant from the £1,000,000 Imperial Vote to foster new industries as indicated in the Report of the Economic Committee. I am greatly indebted to Mr. Cecil Farrar, Persident of the Georgetown Chamber of Commerce, through whose courtesy I was in the first instance permitted to peruse the said report, or to be strictly correct, the fruit section of the Report.

CASSAVA STARCH.

The Chamber of Commerce continue to assist and co-operate with us. Just a few weeks ago samples of cassava starch made from (a) rain water, (b) artesian well water, and (c) reservoir or creek water, for transmission to England were submitted for purposes of analysis.

Once it is established that we can put on the market a starch in quality equal to that sent from Brazil, co-operative efforts will then be made to produce and put it out at a price to compete successfully on the market, therefore the farmers should adopt as their slogan "Mass Production as a way of Prosperity" which is possible by continuous labour and intensive cultivation.

At present in the Colony is Mr. H. C. Sampson, C.I.E., Botanist on the staff of the Kew Gardens. His visit is

due largely to the efforts of Sir Edward Davson, Bart., and of His Excellency the Governor. How long Mr. Sampson will remain in this colony is not known nor is his programme ; but whatever is done we plead with those concerned to let him be given the opportunity of visiting the farms of villages in different parts of the colony and also of making a thorough inspection of the coconut cultivation of which he is a recognised authority. It ishoped that the visit of Mr. Sampson is the first of a series of periodic visits to the colony by athorities of the various branches of agriculture.

Cattle Rearing.

Following upon the excellent, practical address by Mr. Stanley M. deFreitas, at the public meeting last year, efforts have been made to improve the breed of cattle. The effort has not been productive of the desired results because of the failure on the part of the Department of Science and Agriculture to arrange for the placing in the country districts of the pedigree sires. There can be no doubt that the inauguration of such a policy will in a few years result in as marked an improvement in cattle as is the case with donkeys.

Shows.

Since last we met there took place two shows. — A County Show on the race course, New Amsterdam, Berbice, on the 31st March and 1st April last, and a District Show by the Beterverwagting-Triumph Farming Association in St. Mary's school-room on 20th April. Both shows came off successfully under favourable weather conditions.

Produce Agency.

The Agency in Georgetown under Government control is still plodding on in the face of concerted opposition by the middle-man. Added to that serious handicap is the fact that the Committee conducting it is not as representative as it ought to be. During the year and largely through the efforts of Mr. E. M. Morgan, Agricultural Instructor, a similar agency was launched in the New Amsterdam market.

Visitors.

During the earlier months of the year there came to the colony Mr. H. T. Pooley, Director of the British Empire Producers' Organization and Deputy Director of the Sugar Federation of the British Empire. Accepting an invitation from the Conference and accompanied by members of the Executive Committee, Mr. Pooley made a tour of the villages of Kitty and Alexanderville, Plaisance, Sparendaam,, Beterverwagting, Triumph and Buxton-Friendship. At the last-named District through the Chairman of the Local Authority and the District Farming Association, it was made possible for the visitor to inspect a portion of the cultivated areas. He expressed his pleasure and suggested co-operation in cultivating, reaping, and marketing.

Conclusion.

In conclusion let me enjoin farmers now that there is in our midst a live head or the Department of Science and Agriculture who will shortly formulate a sound agricultural policy that they should avail themselves of the services of the Agricultural Instructors and by means of co-operative planting, co-operative harvesting and co-operative marketing, produce first-grade articles. Doing that they will come into their own, and the Colony because of their agricultural activities will become in fact the Magnificent Province.

DISTRICT AGRICULTURAL ACTIVITIES.

The Resident and District Agricultural Instructors have been actively engaged during the last quarter. In the North Western District, Mr. E. M. Morgan is now in charge of the station at Issorora. Experiments with the following varieties of Cassava have been started at this Station: "White stick," "Contention," "Fine Leaf," (white and red) and "Butter stick;" whilst seed beds of Seville Oranges and Limes have been established. Attention has been given to the river and creek dams.

Mr. Matthews, in Berbice, has been impressing upon all rice farmers the great importance of planting improved rice seed, as well as giving encouragement and advice to the the provision farmers and urging the planting of ground-nuts where the soil is suitable.

On the East Coast of Demerara, Mr. Dowding has been busy in many ways. The Farmers' Competitions, by which prizes are given for standing crops in the field have occupied a portion of his time, while he has also been actively engaged in visiting all rice farmers and urging them to make a concentrated effort to obtain good seed padi for their next crop. He is also making an attempt to get farmers to keep some record of returns and expenses, in connexion with their ordinary crops. The usual routine of instruction has also been carried out—efforts at improvement of "land drainage" and "arterial drainage" have not been lost sight of. The mulching of plots with rice straw has been persistently urged, as well as the improvement of pasture lands. He has paid regular visits of inspection to culivation, in his district including the ground-nut cultivation at Pln. "Cecilia."

In the Pomeroon, Mr. H. B. France has been making a serious attempt to improve the station at Marlborough. Attention has been given to the eradication of para grass (*Panicum barbinode*) from which pest the Station suffers materially. He has planted some ginger, started basket-making for furnishing coffee and other plants to the farmers; varieties of cassava and broom-corn have also been planted,

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He has visited many of the farms, giving practical instruction in connexion with coconut and coffee cultivations and has assisted farmers in the laying out of their lands where new cultivations have been started. Special attention has been paid by him to young coffee plantations with a view to the avoiding of mistakes that have been made by the older cultivators—mistakes the remedying of which are difficult, if not impracticable, when the cultivation has long reached maturity.

Mr. T. A. Archer, in his district on the West Coast of Demerara extending to Parika and including the island of Leguan, has been engaged in inspecting the various cultivations of rice and discussing with growers the urgent necessity of eradicating bad seed padi and securing selected seed-padi from this Department. The provision farmers have not been neglected, and good and sensible advice has been given them in connexion with their crops.

Mr. J. M. Antrobus, in the Polder District, has been occupied with the Farmers' Competition in his District and has visited most of the farms, giving advice as to the pruning of coffee, cacao, and fruit trees, the improvement of drainage and the planting of ground provisions.

Mr. Humphrys, on the East Bank of the Demerara river, has been urging the importance of more care being taken with coffee and cacao and the selection of coconuts for seed purposes. The importance of better tillage has has been stressed as well as sanitation in coconut fields. Rice farmers have also not been neglected.

Mr. R. R. Ross on the West Coast of Berbice has been pointing out to his farmers the need for rotation of crops, has been urging where conditions are favourable, the cultivation of ground-nuts, arrow-root and bitter cassava, the necessity of giving more attention to their permanent crops and the need for sanitation in coconut fields. In certain parts of his district he has been endeavouring to get farmers to extend their sweet potato areas. He has also been very busy amongst rice farmers and has pointed out the advisibility of obtaining selected seed padi from the Department,

Mr. Fingall on the upper Corentyne has been occupied with the rice farmers in his district. The importance of obtaining their seed padi through the Department has been impressed upon all growers.

Mr. J. M. Cush on the Berbice river has reported on the poor quality of the padi grown in his district. He has forced upon rice growers the need for obtaining seed padi from the Department. He has also insisted upon better tillage in provision 'beds,' and the necessity for making an effort at planting more coffee, fruit and other permanent trees. He has pointed out that the area in plantains should be less, and more acres should be devoted to sweet potatoes, yams, pumpkins, eddoes and tannias, and various peas. He has pleaded for more interest in poultry-raising and pig-rearing and has given sound advice in this direction.

Mr. R. Pasea on the Essequibo coast, has been emphasising the importance of selection of seed in connexion with rice-padi and coconuts. On the larger properties he has instructed on the necessity for more mechanical appliances. Advice has also been given with respect to the removal of 'bird vine,' the planting of ground-nuts and the early planting of rice.

Mr. Wilson, whose work is amongst the Islands of the Essequibo river with the exception of Leguan, has been pushing the cultivation of ground-nuts. The necessity for rotation of crops has not escaped his attention whilst he has urged the selection of seed padi for the next crop.

Mr. Haynes, in the Mahaica-Mahaicony areas has been giving hints on the improvement of farmers' rice crops, practical lessons in the pruning of fruit and other trees, the growing of ground-nuts, the imporvement of drainage systems, the preparation of products for market, and arousing interest in various other ways.

J. E. B

EXPERIMENTAL FIELDS.

The rice crop at the Experimental Fields has been reaped and has given excellent returns. Over 300 plants were selected and collected separately for starting progeny row plots, for the purpose of obtaining pure strains, and seed padi is now available.

A start has been made with a collection of bananas, plantains and cassava for the purpose of study.

A bed has been planted in pawpaws for experimenting with the preparation of papain.

A series of vegetable plots is being laid out for the purpose of testing imported seed.

A start has also been made with the planting of green dressing plots, but the work has been handicapped owing to continuous dry weather.

His Excellency's ground nuts have been reaped and have given a fair return. The Virginia Bunch has been the most satisfactory as regards yield and the easiest to harvest. The runner varieties continue to run after their main crop is ripe thereby producing nuts in all stages of maturity.

A limited quantity of Virginia Bunch seed is available for distribution at 10 cents per lb. This may be booked through the Resident Agricultural Instructors who have been notified accordingly. A few estates have planted on a larger scale and have promised to let the Department have their crop for distribution, if required. The Director is entering into negotiations with an implement manufacturing company to supply the Department, if possible free of charge, with a peanut plough and other mechanical implements for experimental work in peanut cultivation and harvesting.

Pln. Cecilia, East Coast, the Govenor's plot which measures 1.7 acres is being developed as a sub-station, there being no sandy loam soils under the control of the Department. The land is being prepared for tobacco, pineapples, peanuts, jute, soya beans, onions, cover crops, etc. Ten varieties of tobacco and two varieties of Teneriffe onions have already been started in specially prepared nurseries.

Three hundred bags of selected seed padi have been purchased in Essequebo so as to enable rice farmers to obtain a larger supply of seed than is usually available at the Botanic Gardens. E.M.P.

WORK IN THE BOTANIC GARDENS AND NURSERIES.

During the past quarter horticultural activities in the Flower Garden section were pushed forward. The shrubs in the beds and borders have been pruned and the surrounding parapets prepared for the planting of annuals and perennials. The progress of this work however, has been somewhat interrupted by the continuous dry weather. In connection with the planting up of the parapets, a plan has been drawn up to mass, on the edges of the beds and borders, brightly-coloured subjects purely for effect and also to maintain a continuous display.

In order not to upset the floral scheme of the Flower Garden, arrangements are being made to select special sites for the growing of flowers for sale to the public.

Much progress has been made with the renovation of the lawns. One section has been completely renewed. This area has been ploughed, raised and levelled. The cultivation of Bahama grass (*Cynodon dactylon*) to carpet

the surface of the plots is receiving attention, and has already begun to be effective. The sections which were improved last year are being maintained in good order. When the other sections of the lawns are renewed the general aspect of the Gardens will be greatly enhanced.

Unsightly trees of spontaneous growth, and all rank vegetation around the lakes are being cleared to improve the water scenes. Openings have already been made which lend picturesqueness to the scenery of the lakes. Shrubs and palms which blocked the vistas of the gardens have been removed and transplanted. A fine prospect is now obtained of the water lilies as the circular bed situated at the head of the main drive is rounded. To enjoy this scene a visit should be made in the late afternoon, or soon after sunrise just when the *Victoria Regia* are in the prime of beauty. Another pleasing sight as one proceeds up the avenue is that of the Pink Lotus Lilies standing erect 3–4 feet above the water and looking like giant tulips.

The grounds approaching the lakes are being cleared of noxious weeds, and the vistas through this section of the gardens are also being improved by removing trees, and pruning away overhanging branches, which obstruct the view. It is desirable that these grounds be maintained in good order to harmonize with the lake effects and to improve the approaches to the lily ponds of the Blue Nymphaeas.

Nurseries :— In the ornamental section the stock of plants is being increased for sale. These include Maiden Hair Ferns, Begonias, Caladriums, Anthuriums, Alocasias, Ornamental Shrubs, Crotons, Hibiscus plants and several kinds of palms.

With a view of improving the fruit culture in the Colony, propagation of budded and grafted plants is receiving careful attention in the economic section of the Nurseries. Several hundred seedlings of citrus plants have already been basketed to be used as stock for budding purposes early next year. A further quantity of seed is being sown to maintain the supply of stocks as budding progresses. At present the budding and grafting of avocado

pear plants and the grafting of mangoes are being proceeded with. In consequence, the Director has issued instuctions that no seedlings of these kind of fruit trees are to be sold, as it is desirable that only reliable and known kinds of Pears, Mangoes and Citrus Fruits are to be cultivated, so as to displace the seedlings which are now offered for sale.

To encourage, too, the cultivation of vegetable gardening and to improve on the produce which is at present grown, the department has imported for sale a collection of vegetable seeds including Tomatoes, Cabbages, Beet, Radishes, Lettuce, etc. The seeds are parcelled out into packets to suit purchasers and can be obtained from the Resident Agricultural Instructors stationed at New Amsterdam, Berbice, and on the East Coast, Demerara, also at the Vegetable Products Depôt and at the Botanic Gardens. It is expected that market gardeners will avail themselves of obtaining seeds of proved quality, and even those who maintain home gardens should take advantage of this opportunity. The idea of continuing the importation of fresh vegetable seeds will depend on the success this trial shipment meets with, and future experimental work in this regard.

A. A. A.

PREPARATION OF CASSAVA STARCH AND TAPIOCA.

Cassava Starch, sometimes known as Brazilian arrow-root, is produced on a considerable scale in Brazil, United States, East Indies, West Africa, and elsewhere. The chief centres for the production of Tapioca are Malaya, Dutch East Indies, and Brazil.

The processes of manufacturing these two products are identical up to a certain point. They consist of essentially in grating the cleaned roots sufficiently-finely to

break the cell walls and so liberate the starch, which is subsequently separated from the fibre and collected in tanks of water. For industrial purposes the starch is then dried, but if tapioca is to be made, the wet starch is placed on hot iron plates, which cause the grains to gelatinise and adhere together in lumps.

The machinery required depends on the quantity of roots available. On a small scale all the work can be carried out by hand, but where large quantities are dealt with, power driven machinery must be used. In either case the first essential to success is a plentiful supply of pure, soft water, free from iron or peaty matter. Rain water is preferable, but artesian well-water can be used if the iron is removed by aeration and filtration. Lamaha, river or trench water should not be used unless clarified and made colourless by one of the methods used for removing iron and organic matter. (*This Journal, Vol. XVI No. 2 page 160.*) Unless the water is pure the starch will be of inferior quality. Another essential is that the roots must be freshly dug

There are several types ef machines employed for the preparation of cassava starch, and speaking generally, all the machinery used in a potato starch factory can be employed for cassava, although slight modifications in the character of the grating er pulping machines and of the sieves is necessary, cassava roots being more fibrous than potatoes and the starch grains smaller.

The roots arrive at the factory in all sizes. The larger ones are usually peeled, cut in pieces, and put into a cleaning tank. The smaller roots are placed at once in a washing machine, from which they are transferred automatically to a hopper leading to a pulping machine running at a high speed. The pulp is carried away in a stream of pure water to the starch separator, but is sometimes further treated in a mill to complete the disintegration of the cells and ensure the maximum yield of starch. The starch and water from the sieves are run into large settling tanks. The clear water is run off, and fresh water added,

the starch being stirred with paddles either by hand or mechanically. This process is repeated several times until all foreign matter has been eliminated ; the starch is then allowed to settle in tanks of water.

There are several other processes for the extraction of the starch.

Samples af cassava starch from the Gold Coast and Natal have been examined at the Imperial Institute with the following results:—

	From Gold Coast.	*From Natal.*
	Per cent.	Per cent.
Starch	77.68	86.07
Moisture	21.68	13.84
Ash	0.06	0.09

W.F.

INSECT NOTES

Termites on the Gold Coast and Measures for their Control.

In a "Report on The Economic Importance of the damage due to Termites or White Ants in Accra and Achminota on the Gold Coast and the methods by which this loss may be curtailed," Mr. A. W. J. Pomeroy, Medical Entomologist, Medical Research Institute, Gold Coast, gives a detailed account of the Termites, or "Wood Ants" as they are called here, of that part of the Gold Coast. The report has a deal of information that is of importance to all tropical countries not only on the biology of these insects, but also on the means of combating them and the measures to be adopted in rendering buildings less liable to attack

Mr. Pomeroy as the result of his own investigations as well as from a survey of the work done in the past, submits three conclusions which appear pre-eminent. Firstly, that the biology of these insects is so different and so complex that no single specific means of artificial or natural control is likely to be discovered which will prove efficacious against all economic species; secondly, that the damage can be reduced by a combination of methods namely:—the material endangered must be rendered inaccessible or as resistant as possible and the continuous maximum elimination of the main source of infestation must be carried out at the same time; thirdly, from the results obtained it would appear that there is very good evidence that a definite economic profit will be shown if the project is carried out on a sound financial basis and with proved methods.

Part I. of the report will be touched upon only briefly here. It consists of observations on the most important economic species of the district, an account of the establishment of a nest, and observations on the construction of the nests of the various species of the insects. It is somewhat startling to note that "It is almost impossible in Accra

and Achminota, to find ten square yards of ground which does not exhibit some signs of Termite activity." The section concludes with a list of 55 species of Termites found on the Gold Coast.

Part II. deals with the possibilities of eliminating or materially reducing the incidence of Termites in the area under discussion. The infestation of two areas of 55.6 acres and 64.3 acres in the town of Accra is estimated at 3 nests and 2.6 nests per acre which were of serious importance. It is pointed out that the destruction of the nests alone will not secure immunity, and that the treated area should extend at least eight hundred yards beyond the point at which immunity is required.

The method used in the eradication of Termites from occupied land consists of (1) breaking up the nests with explosives, (2) subsequent fumigation of nests when necessary, and (3) ploughing the land and treating with various poisons. The large conical nests which often stand several feet high, and which have the interior hollow and partially filled with a comb-like structure of cemented earth, can be effectively and cheaply destroyed by treatment with fumes of burning sulphur and arsenic introduced by a Universal Ant Extermination.

The composite nests on account of their structure cannot be fumigated until they have been thoroughly shattered. For this purpose Gelignite has been found to be the cheapest and the most effective explosive. Holes are drilled in the nests by means of a specially constructed hand auger, being arranged around a central perpendicular hole three feet six inches deep, while the lateral holes are three feet deep and drilled at an angle of forty-five degrees (45°). The charge in the central hole is provided with a longer fuse so that this explosion takes place last allowing the charge to form a crater in the centre.

Fumigation is not always necessary and this cannot be ascertained until the nests have been blown up. When necessary the methods advocated are, the fumes of burning sulphur and arsenic, hydrocyanic acid gas, and chloride gas from a cylinder. The last method has not actually been

tried, and of the two former the sulphur-arsenic is the most successful.

After the nest has been destroyed and fumigated it is necessary to treat the ground with some poison such as sodium arsenite, sodium cyanide or arsenic mixed with dry earth, sand, or preferably, road dust.

Part III. deals with the prevention of Termite attacks and the destruction of Termites in buildings. So far there is no definite proof of any species on the Gold Coast which can infest a house by the introduction of the sexual winged forms, and the common economic species are all subterranean in their origin.

Houses can be built that with a modicum of care and attention will remain free from Termite attack. These houses are built on concrete piers each surrounded by a zinc course at least six inches in width, set in a belt of solid cement at an angle of 45° and continuous around each pier. The Termites are unable to construct galleries over the sharp edges of this course, and so gain access to the building proper. The approaches and steps must be guarded in the same way and no communication from the ground such as creeping vines, unguarded pipes, etc. be permitted. Raised buildings of this type are costly when compared with other types built on the ground, and a type recommended as affording considerable protection although not immune from Termite attack is that described by Snyder in U. S. Dept. Agric. Bull. 1472.

The defects likely to occur in concrete construction are then dealt with. Recommendations follow on the treatment of heavily infested buildings. It is suggested that in badly infested areas poisoned baits consisting of waste wood saturated with 10 per cent. of sodium arsenite be tried. It has been proved that Calomel is an effective poison and being insoluble passes through the excreta. This and the dead bodies are eagerly devoured by living Termites.

The report concludes with a summary, 11 plates and 2 maps.. L.D.C.

VETERINARY NOTES.

DISSEMINATION OF BOVINE TUBERCULOSIS TO MAN.

The relation of tuberculosis in animal to man has received considerable attention. In 1895 Rich reported five cases of tuberculosis in man where the disease could be undoubtedly traced to the use of milk from tuberculous animals. In 1897 Bailey of Massachusetts Board of Health reported cases of tuberculosis in children of non-tuberculous parents, in which the tuberculosis could be undoubtedly traced to milk infection. In the same year West reported that two children of Luther Bridges had recently died from tuberculosis, which was due from drinking the milk from a cow which, upon being killed, was found to be the subject of extensive tubercular disease, largely localized in the udder.

Five of Bridges nine children were at the time suffering from tuberculosis and several of them very ill. Now Rich reports the case of a farmer undoubtedly infected by milk from a tuberculosis cow. His case was for six weeks mistaken for typhoid fever. Shortly after his death intestinal tuberculosis was found in one of his children that was taking the milk from a cow with a tubercular udder. The father had used this milk in quantity even during his illness. The child had been removed when the father was taken sick and was probably not infected from the father. It died from tubercular meningitis.

In 1894 Smith reported a very careful study of the autopsy of a tuberculous herd owned by the Soldier's Home near Washington, D.C., which had been tested by the inspectors of the Bureau and upon which careful autopsies had been made.

This was one of the herds which had served for an experimental study in determining the value of tuberculin. Smith noted very carefully the location of the tuberculous lesios and the probable source of infection, and concluded that the infection of the mesenteric glands showed that the tubercle bacilli must have obtained access to the body by way of the disgestive processes, and perhaps at the same

time the aminal may have inhaled bacilli, and a second series of infection been started.

Smith reported a careful, comparative study of the bovine tubercle bacilli, and the human bacilli from sputum. He made careful morphological studies of the bacilli taken from human sputum, and of various bovine bacilli, and noted differences in the virulence of the disease from the various germs, the lesios which were produced upon experimental animals and the like, and brought out many other points which would indicate the possibility of a great many varieties of bacilli, and suggested many possible, important lines of investigation in the study of the bacilli, from various sources, both animal and human.

Trudeau and de Schweinitz had called attention to the fact, that the environment and food of the germ in different animal bodies might influence its appearance and pathogenic properties very materially.

Smith called attention to the differences in the morphological appearances of tubercle bacilli obtained from sputum and from a cat, which seem to be readily accounted for by the change in the nutritive media, upon which the germs developed either inside or outside of the animal body. As some animals are more susceptible to tuberculosis than others, and as practically almost all animals can be infected with tuberculosis, it would seem that there must be a possibility of more or less virulent or attenuated varieties of tubercle bacilli being established just exactly as a plant, the habitat of which is in a warm climate, by careful selection and cultivation, be gradually accustomed to more severe surroundings.

Whether we accept, however, the idea that tuberculosis is communicated from cattle to man very readily, or with difficulty, the fact remains that this disease amongst cattle is the cause of many dangers which should be avoided. Not only is it necessary to destroy tuberculous animals that are the source of infection for others, but it is also necessary to disinfect the stables thoroughly before they are used for housing healthy animals and absolutely to prohibited the attendance of tuberculous individuals upon healthy cattle. S.N.B.

ROTATION OF CROPS.

The following instructive address was read by Mr. L. A. Brunton, Manager of the St. Augustine Experiment Station, at a meeting of the Agricultural Society of Trinidad and Tobago held on the 13th October.—Editor.

In all civilised countries where the value of land is high, and in consequence the necessity for a maximum crop production per unit of land is imperative, the knowledge of the soil and of the conditions best suited to each crop, gained through the accumulated experience of generations of practical agriculturists, has evolved amongst other essential agricutural practices, that of crop rotation.

In less advanced countries, particularly in the tropics, where fertile land is plentiful and cheap, and experience has not yet co-ordinated the knowledge of soils and conditions to the same extent, rotation of crops is seldom practised, but instead, what is aptly termed " Land Rotation " or " Shifting Agriculture " is resorted to so as to maintain the fertility of the soil, when it is in danger of being impaired by the continuous cultivation of one crop.

This form of rotation has generally been adopted in the early development of new countries, and as it is based on the same general principles as crop rotation, viz: the maintenance of soil fertility and the avoidance of plant diseases, there is justification for its practice where the area of cultivable land is more than sufficient to support the population.

With the increase of population, however, the need for a less wasteful use of the land arises, and, as other means of maintaining the fertility of the soil under one crop prove inadequate, the advantages to be gained from a proper system of crop rotation became increasingly apparent.

As shifting agriculture and crop rotation aim at the same result, some consideration must be given to the former practice before dealing in detail with the latter,

Shifting agriculture or rotation of land follows very closely the methods employed by nature in building up vegetation; it ensures the fertility of the soil by avoiding the constant drain on plant food entailed in the continuous cropping of one area, and reduces the possibilities of damage to the crops by harmful bacteria, fungi, and insects. All observant planters are familiar with the variation from season to season, or in a series of years, of the vegetation on soil that is uncultivated, the low growing weeds and grasses give place, according to the nature of the soil, to taller and succulent, or coarser and hardier plants, which are succeeded by soft or hard stemmed bushes (Latrajo), amongst which quick growing soft stemmed trees spring up, to be followed, as the earlier growth dies out by hardier stemmed trees which ultimately form the forest; by changing the cultivation from one piece of land the fertility of which has deteriorated, to a new piece whose fertility is unimpaired, and leaving the first piece uncultivated for a more or less extended period, the farmer is following nature's plan for the rejuvenation of the soil, but nature in this method may be economically wasteful, so that the limit to which the limited view of man, proverbially employed is governed by the time necessary for the soil to regain its former fertility, closely connected with which is the amount of cultivable land in relation to the population, in other words the unit of land necessary for the support of one unit of the population must be multiplied by the number of years required for the rejuvenation of that unit, thus, if it requires eight years for the soil to recuperate and one acre can support one individual for a year, then one square mile of country can only support eighty persons under a system of land rotation.

It can therefore be readily understood that being based on sound agricutural principles, the use of this system can be fully justified in thinly populated countries, but, that it becomes so wasteful both in land and time when the population increases beyond a certain limit, that the general impoverishment of the country must follow, and the need to conserve the land to enable it to support the larger population becomes so insistent, as to call for a change in

agricultural methods, rendering the adpotion of crop rotation, the only means by which this can be successfully accomplished, imperative.

The agricultural development of the majority of the West Indian Islands, justifies the belief that they are rapidly approaching the day when the foundation of their cultivation will be based on a carefully worked out rotation of crops. Increase of population, however, is not the only cause which has stimulated this agricultural development, the causes are diverse and vary in the different islands and even in different districts of the same island; in this connection it is significant that in Barbados, one of the most thickly populated regions of the world, where agriculture has reached a much higher development than in any other West Indian Colony, insect pests and diseases of the sugar cane have been brought under some measure of control by a modified system of crop rotation.

There appears to be little room for doubt that this Colony is faced with similar problems, not only in its major cultivation, sugar cane, but also in the minor crops of the small farmer and peasant proprietor, it is therefore necessary, that serious consideration should be given to any suggested changes in our present methods of cultivation which will help to solve, some at least, of the problems that confront us. It is with this object in view that these notes on the rotation of crops have been prepared.

Object of Crop Rotation.

The object of crop rotation is to keep the land in continuous cultivation at a minimum cost, while maintaining it at its highest point of productivity. By taking advantage of certain established facts with regard to plant life and the nature of soils this object is attained. These facts, and the advantages to be derived by utilising them, may be briefly summarised as follows.

1. Different plants utilise the inorganic elements of the soil in different propotions, and also differ very markedly in their capacity for absorbing their food constituents from the soil. The proof of this is to be found in the fact that the composition of the ashes of all plants is not the

same; thus it is found that some plants consume a large porportion of potash and phosphoric acid, others, while requiring less of these substances, absorb much silica, and yet others assimilate lime or magnesia in larger quantities than any other of the inorganic elements. For example, the amount of potash taken up from the soil by potatoes is about twice the amount required by cereals such as rice or maize, while these latter assimulate nearly three times the quantity of phosphoric acid that potash will absorb, again, rice takes up 100 per cent. more silica, and maize 50 per cent. magnesia from the soil than potatoes do, and legumes (beans, clover, etc.,) require from 2½ to 13 times as much lime as is required by most root crops such as potatoes, mangels, etc. It follows therefore, that as each crop requires particular substances, either in special quantities, or in some peculiar state of combination, the possibilitiy of the soil being able to supply them is increased, the longer the interval that is allowed to elapse, before the same, or a similar crop, is grown upon it. By alternating the various crops one with the other, the accumulation in the soil of any particuliar substance favourable to the crop it is desired to grow, may be ensured, and the balance of the manurial ingredients in the soil can be maintained for an almost indefinite period.

2. The depth at which roots draw their nourishment from the soil varies with the kind of plant. Cereals, many legumes and some grasses, maize, clover, alfalfa, sugar cane etc., draw much of their sustenance from the subsoil into which their roots penetrate deeply. On the other hand the majority of root crops potatoes, tanias, etc., nourishment from the soluble constituents of the surface soil which have been left more or less untouched by a previous deep-rooted crop. The advantage to be gained from this fact is, that the various layers of the soil can be rested, by alternating a shallow-rooted with a deep-rooted crop.

3. Some varieties of plants which store up certain elements of plant food from the air or soil, are directly restorative to the soil, others are indirectly so, by being fed to the live stock on the land. Chief amongst

the former crops are legumes with their power of storing the nitrogen from the air in the nodules of their roots, thus increasing the nitrogen content of the soil after the crop has been reaped. As nitrogen is the substance which is soonest depleted from a cultivated soil, the importance of a leguminous crop in the course of a rotation cannot be too strongly emphasised. Plants which exert indirect, restorative action on the soil are usually fodder crops, the action being the results of the return to the soil of the manure which has been recovered from the live-stock which have been fed on the crop. The value of such crops does not depend on an immediate cash return, but on the return to the soil in the form of manure of the greater part of the plant food constituents removed by the crop, on the saving in the cost of feeding the live-stock used for cultivating the land or which are raised for sale, and, in the latter case, on the subsequent sale of stock.

Either a root-crop, mangels, potatoes, turnips, etc., or a leguminous crop, peas, beans, clover, etc., may be grown as a fodder crop. The former known as fallow, or cleaning crop, affords the opportunity which has not occurred during the several years the land has been occupied by other crops often of an exhausting nature, to plough deeply, stir and thoroughly clean the land. Further benefits are derived from the large amount of organic material at once returned to the soil in the leaves etc., the large amount of food produced, and the richness of the manure obtained from animals fed on roots, from which they return only a small proportion of the most important manurial constituents. Legumes may be classified as restorative crops, on account of their power of adding nitrogen to the soil, which when ploughed in green, they also enrich with organic matter, in addition, they provide, in peas and beans, a concentrated, and in hay from clover, lucerne etc., a bulky stock feed, and the soil reaps the benefit from the animal droppings when stock is grazed on the land.

4. The value of the crop residue, differs with the kind of crop. Legumes and grasses yield the most and are richest in ferrtilising constituents ; cereals, while leaving a large residue are poorer in these constituents, and root

crops yield the least. As this residue is the chief source of humus in cultivated soils, it is important that the nature of the crop in this respect should be considered when allotting it a place in the rotation.

5. The insects, fungi, and bacteria which attack plants vary with the kind of plant. Under natural conditions, owing to the diversity of plants contained in a given area, a certain balance is maintained between the plants and the pests insect, fungoid, or bacterial, by which they are liable to be invested. On land under cultivation of plants of the same variety, this balance is more or less upset, by the massing together on the same land providing a ready food supply or host for any insect, or disease peculiar to that variety of crop ; further opoprtunity for the rapid increase of the pest is given, when the same crop is grown continuously on the same land. Variation of the crop cuts off the food supply of the pest infesting that particular crop and it either dies out or migrates elsewhere in search of food. It is evident therefore, that in order to ensure some measure of control over plant diseases and insect pests, two crops of of the same species should never be planted in succession.

6. A definite relationship exists between the kind of plant and the kind of soil. The preference shown by each variety of plant for a particular type of soil is evidenced in the natural forests and the secondary bush growth visible around us. Cedar and cypress will grow on dry rocky hillside where hard timber trees such as balata and poui refuse to grow ; on abandoned fields of clay, clay loam, loamy or sandy loam soils, secondry growth of guava, black, sage, wild indigo, etc., appear in accordance with the type of soil especially suited to them, and on the margin of water courses, in wet or swampy soils, water cress, lilies, or succulent sappy grasses abound.

In like manner cultivated crops show a preference for certain types of soil ; maize, guinea corn, ground nuts, thrive best on well drained sandy loam, rice in a loam overlaying a stiff impervious clay, sugar cane in almost any soil containing lime, but best in rich porous clays, alluvial soils on low lands traversed by rivers, and loams formed

by the decomposition of volcanic rocks, and most root crops yams, tanias, sweet potatoes, etc., in a friable loam rich in organic matter.

This affinity between plant and soil, is principally due to the differences which exist in the physical properties and the chemical constituents of the soil ; by means of tillage, the agriculturist modifies these differences, so that he is enabled to raise crops on soils, which, previous to his efforts, were apparently unsuited to their growth ; in attaining this end he is very materially assisted, both from a mechanical and hemical standpoint, by a judiciously arranged rotation, mechanically, by the changes created in the texture of the soil, cowing to the preparation it has recieved year by year for the different crops, and by its more porous condition caused by the rotted roots of these crops especially the deep-rooted ones, and chemically, by the exposure to the action of the atmosphere of the dormant constituents of the soil which are yearly turned up thereby rendering them active and soluble and increasing the amount available for succeeding crops, and by the admission of water and air into the soil through the channels made by the decaying roots of previous crops, thus enabling the atmostphere to exert the same beneficial influence even in the sub-soil.

7. Plants naturally alternate with each other in the same soil. Evidence that a natural rotation does occur amongst plants is met with in many countries ; burnt pine forests in Sweden are replaced, for a time by birch, which however, is ultimately superseded by a regrowth of the pine ; along the banks of the Rhine, beech is gradually taking the place of the ancient forests of oak, and both are in some cases succeeded by pine ; ancient oak woods are followed by pine in the Palatinate, and in Bohemia pine alternates with beech.

It is believed that these changes of vegetation are largely dependent on the chemical composition and physical properties of the soil, and therefore that plants grow spontaneously where their needs in these respects, can be most fully and easily supplied, the opportunity being afforded to the seeds of other species of plants, lying dormant in the soil, to spring up, whenever natural causes

produce such changes in reference to their access to light, heat, etc., or in the texture and composition of the soil, as to render conditions more favourable to their growth than to that of the plant which already occupies the land.

It is justifiable to conclude, from these facts, that artificial rotation of crops, as has been already noted with regard to shifting agriculture, only follows nature, butthat the former, in distinction to the latter, hastens the operation of nature, by taking advantage of the conditions known to be essential to the successful growth of each crop.

It is evident therefore, that the success of a rotation depends on utilsing these well established facts for the benefit of the various crops which comprise it, but simple as this may appear in theory, in practice many other factors, such as markets, transport, cost of production etc., arise, which renders it impossible to lay down any definite rules suitable to all conditions, nor is it the aim of those notes to attempt to do so, but only to indicate ths general lines upon which any system of rotation of crops should be based. Unfortunately very little attention has been given to this subject in the West Indies, so that it is necessary to turn elsewhere for a basis from which to start, I venture to suggest that none better can be found than the well known Norfolk, or four course rotation, which is in fact the foundation of all rotation systems in England.

This rotation is as follows :—

First year : Autumn sown cereal, wheat,—following clover.

Second year : Fallow crop, roots, mangels, turnips, potatoes, etc.,—cleaning crop, after three years cropping. two crops of which have been exhausting cereal crops.

Third year : Spring sown cereal, barley, oats—following a cleaning crop.

Fourth year : leguminous crop, clover, peas, beans,—restorative crop should follow an exhausting crop.

Before attempting to adopt this system to our local onditions it is necessary to determine the special points with regard to climate, soil and crops, which may be considered to have a general application. These, in their order of importation, may be briefly stated as follows :—

1st. The rapid loss of humus to which all our cultivated soils are liable.

2nd. The practically continuous growth of weeds and grasses which invest all our soils.

3rd. The excessive erosion and leaching caused by the heavy rainfall during certain seasons.

4th. The length of time our major or staple crop occupies the land.

1.—The first can be practically corrected by turning under all crop residue, weed, etc., more fully by the application of long or fresh manure, and still more effectively by the adoption of crop rotation, into which a crop is introduced which extracts from the soil only a small proportion of the necessary plant food substances in the portion taken off the land, while the residue left on the land contains the constituents most desirable for succeeding crops.

2. A proper classification, and a more extended knowlength of the life history of the grasses and weeds most commonly met with on our cultivated lands, is necessary before any really effective method of weed control can be undertaken. With our present knowledge the possibility is very remote of thoroughly cleaning land, so that the majority of the weeds are killed before the crop is planted. We are therefore driven to the necessity of suppressing them while the crop is growing ; cleaning crops as used in temperate climates, are therefore of little value to the large estate, but may be used with some success by the peasant proprietor and cane farmers : the use of cover crops to smother weeds is under trial at present, and, although few that have been tried have as yet filled all the requirements of a really effective cover, appear to offer at least a partial solution of the difficulty.

3. The heavy falls of rain to which we are subject in these latitudes, are responsible for erosion on mountain sides and undulating land, and leaching on flat lands. Erosion can be prevented to a great extent, by not allowing the bare surface of the land to be exposed to the direct action of the rain, and by keeping the soil in a porous condition, so that the rain sinks in quickly instead of flowing

over the surface and washing the rich surface soil into the drains and ravines; deep-rooted crops, besides effectively covering the ground, lend material aid in opening up the soil with their roots, and, should therefore always find a place in a rotation.

4. Sugar cane, our staple crop, occupies the land for $2\frac{1}{2}$ to 5 or more years, according to the number of times it is ratooned. The drain on the soil, caused by cropping it to one crop for such a lengthy period, is undoubtedly very great, and the problem of maintaining its fertility becomes more acute year by year, the crop residue of leaves and tops adds a fair amount of humus to the soil, but the amount of plant food constituents carried off by the canes is considerable ; under present methods of cultivation part of this is returned in the pen manure applied to plant canes and subsequently augmented by fertilizers applied to the ratoons. It is a question worthy of the serious consideration of planters, whether a well-chosen rotation crop capable of adding large quantities of humus to the soil, would not ensure an increase in average crop yields by maintaining soil fertility at a higher level, and by the control, which a change of crop would effect, of the insect pests and diseases, notably froghoppers, by which this crop is liable to be attacked.

Any attempt to indicate the crops that should be utilised in a rotation, in this colony, must be considered from the separate view points of the large estate owner, and the cane farmer or peasant proprietor as each is confronted by different problems. To the former it is largely one of labour and markets, to the latter of remunerative crops. Lack of capital preventing him from planting any crop that will not yield an immediate cash return, in either case, only the variety of crop can be suggested, the specific crop must be determined by each individual according to his particular needs.

Dealing first with the large sugar cane estate, it will be helpful to analyse the Norfolk rotation, when it will be seen that it consists of two cereal crops, which are directly remunerative, but exhausting to the soil as the entire crop is usually removed from the land, and two crops which are

not directly remunerative as they are usually fodder crops fed to live stock on the farm. Both add humus to the soil, one the root or cleaning crop, leaves the land free of weeds after the crop is reaped. It is also shallow rooted and therefore allows plant food to accumulate in the subsoil, and the other a leguminous or restorative crop adds nitrogen to the soil and being deep-rooted helps to increase the plant food constituents in the subsoil.

The order in which these crops are planted shows how they inter-act upon each other ; exhausting crops, wheat, barley, oats, are followed either by a cleaning crop, roots, or a restorative crop, legumes, and these in turn are follow ed by exhausting crops.

A sugar cane occupies the land for an average of $3\frac{1}{2}$ years, it should be followed by a restorative crop, to be replaced by a cleaning crop, followed in turn by a cover *crop before cane is planted again.*

In Barbados, after the land has been under cane for 6 or 7 years a change of crop for a short period is often prac tised. This very modified two-course rotation leaves the land free from cane for 7—19 months as follows :—

After cane has been thrown out after crop, a fodder crop of Imphi is planted in April—June, cut 4 to 5 times and fed to the stock, in November of the following year, about 17—19 months later the land is replanted in sugar cane.

Or, sweet potatoes, cassava, or cotton are planted in September—October, reaped between January and Febru- ary and the land with a catch crop of yams or eddoes in November replanted in cane, only seven months having elapsed since the land was last in canes.

If the soil shows signs of deterioration, a restorative crop of woolly pyrol, pigeon peas, or increase peas is planted between April and June and used as a green dress- ing before canes are again planted in November of the same year.

As a rotation this appears to lack completeness, the long period of 7 years under cane, followed by only 7—19 months rest under a change crop, seems capable of improve- ment ; with considerable diffidence, the following is sug-

gested as more likely to enrich the soil with humus and other ingredients, within the short period of 18 months, provided the cane has been allowed to occupy the land for only 3 or 4 years.

FOLLOWING THE CANES.

1. A short or medium period cover crop, sun hemp, canavalia, pigeon peas, etc., planted in May—June cut down and turned in to the soil in September to October

2. Food or fodder crop. Sweet potatoes or corn, etc., planted in September—October, reaped in January to February.

3. Restorative crop. Pigeon peas, Bengal beans, or *crotolaria striata*, etc., planted in May—June, ploughed into the soil in October.

4. Canes planted in October. Or as an alternative :—

1. Restorative crop. *Tephrosia candida*, Bengal beans, pigeon peas, or *crotolaria striata*, etc., planted in May—June, and turned under in March—April.

2. Food or fodder crop. Yams, sweet potatoes, or corn, planted in May—June, reaped in September—October, Yams in January.

3. Short period cover crop. Sun hemp, canavalia, or Wooly pyrol, planted in October—November and turned under in January—February.

4. Canes, crop or spring planting, April—June.

It will be noted that this rotation attempts to establish some control over weeds by providing two smother crops, the first and third, both of which being leguminous crops and deep-rooted, are also restorative, and and, the second, a food crop that may be sold, or a fodder crop that may be fed to the stock.

The possibility of carrying out such a rotation on a large scale will depend chiefly on the cost, and can only be determind by tentative experiments to ascertain whether any increase, if any, over the present system of cultivation, will be more than compensated for by the improved soil conditions and control of pest, leading to a higher level of average crop yield.

I am indebted to Mr. G. A. Jones, Agromonist of the Ste. Madeleine Sugar Co. Ltd. for the following

rotation and its results, which was started by him in 1919, as a demonstration plot for the cane farmers of this company.

The plot aproximately three acres in extent, is divided into six sections of about equal size, four of these are under cane, viz., plant canes, 1st, 2nd, and 3rd ratoons respectively, one is planted in root crops, yams and cassava and the last in peas, to be followed by sweet potatoes and young cane plants. The work of the plot is done by one man working all the year round, but with time at his disposal to work as an ordinary labourer on neighbouring estates.

The effect of this system is that:—

1. Every four or five years the land is rested from cane or eighteen months.

2. The soil is thoroughly cultivated by the growing of root crops for eighteen months.

3. Each section receives an application of pen manure at the rate of twenty tons per acre every six years.

4. A steady tonnage of cane year by year is maintained, varied only by factors beyond control.

5. The farmer is provided with vegetables for his own use, the surplus being available for sale.

The results of this rotation are encouraging, the yield for the seven crops reaped from the two acres of canes, has varied from 18.5 to 30.8 tons per acre, disclosing an average yield of 25.75 tons per acre per year, the lowest yield being for this year's crop, which is no doubt a reflection of the previous year's drought. The financial returns are equally satisfatory, the first crop cost $218.80 to cultivate, the profit of $149.85, and the average year-gross receipts were $360.65. Assuming that the farmer performs all the necessary work without assistance, working 152 days a year, this provides him with a wage of 80c. a day, a very fair daily wage for an ordinary agricultural labourer.

The peasant proprietor usually plants all his land in one permanent crop, Cocoa, which leaves no scope for any rotation. the unwidsom of this is apparent when yields are poor and prices depressed, he would be well advised to leave a portion of his land for planting short crops to provide food for his own use and for sale ; the practice of

mixed cultivation should also be abandoned, and a system of rotation substituted, following along the same lines as that of the cane farmer's rotation and substituting plantain and bananas for canes, $1\frac{1}{2}$ acres divided into $\frac{1}{4}$-acre plots might be rotated as follows:

Four plots to be cultivated in plantain and bananas viz., young plants, 1st, 2nd, and 3rd crops respectively, the remaining two plots being alternately planted in cereals, root, and leguminous crops for $1\frac{1}{2}$ to 2 years. It is unnecessary to enumerate these crops as they will vary with the soil and district.

The objects to be attained by this rotation are obvious ; After three or four years under bananas the soil is rested for about two years, during which it is kept clean and its texture improved by the planting of root crops, its chemical constituents are added to by the deep-rooted leguminous crops, and organic matter is obtained from the residue of both crops. Good results will be better assured, if the peasant proprietor keeps some small stock such as a donkey, pig, goats etc., in order to obtain manure and use up surplus and unsaleable portions of his crops.

GERMINATING SUGAR CANE.

By D. W. May.

Porto Rico Agricultural Experiment Station.

With all plants a quick germination is important. They emerge from the soil with larger shoots and apparently greater vigour if they spring quickly after planting. This is especially true of sugar cane where the growth is sometimes limited by season or by well-distributed rainfall. If after a crop is planted germination languishes, it is generally due to some poor condition in the soil or lack of water.

Various methods have been used to bring about quicker germination in cane cuttings. Soaking seed in solutions is often practised, water being the most common. There are several products on the market for stimulating seed which are sold under various trade names.

In a series of experiments by the Porto Rico Experiment Station some interesting results have been obtained which should result in considerable benefit to the sugar industry. These experiments were made with two objects in view: first, to obtain a quicker and more vigorous germination of the cuttings and, second, the killing of certain insects affecting the seed, especially the cane borer (*Diatræa saccharalis*). The canes were soaked in solutions from 1 to 8 days. The good effects were apparent in one day, while the length of 8 days was detrimental and in some solutions the cane was killed. Two days was sufficient to gain the ultimate benefit from soaking, and in no case proved detrimental, while good results were possible in one day. In the case of some solutions the cane was killed even at one day.

The solutions giving the best results were water alone, lime, and lime and magnesia, soaking one day. Solutions of nitrogenous fertilizer proved of no advantage and in one case resulted in killing the cane. Soaking in water has this advantage aside from its influence in killing insects,

that the canes germinate quicker and make a greater ultimate growth than where they are planted not soaked. In some cases where planting was followed by a long drought, the soaked canes had sprouted and made a good stand, while those not soaked in many cases failed to germinate. In all cases there was a marked difference in the stand between the soaked and unsoaked canes and also in the continued growth and final yield. In soaking in limewater there was an apparent favourable condition in the earliness of germination, quicker growth and yield over the canes soaked in water alone. There was a still greater percentage of germination, growth, and yield in the cane soaked in the solution of lime and magnesia combined. In the final yield of cane treated in the manner set forth above, the cane planted as cut gave a germination of 81·41 per cent., soaked in water 86·42 per cent., and in limewater 93·03 per cent. The final yields of a series of plants were estimated as follows : Cane planted without treatment, 58·7 tons per acre ; soaked in water, 71·9 tons per acre ; soaked in limewater, 72·5 tons per acre ; soaked in limewater containing lime to saturation and 1 pound of magnesium sulphate to 50 gallons, 85·4 tons per acre.

In preparing the canes for planting the work was done on a large scale, which can be economically followed by planters. The saturated solution of limewater was made by shovelling slaked lime into the tank. The saturated solution of lime and water is 0·13 per cent. What remains over in the tank undissolved does no harm. Magnesia was added in the form of sulphate at the rate of 1 pound to 50 gallons of water. Repeated treatments have shown consistent favorable results with the combination of lime and magnesia in the water in which the cane cuttings were soaked. Also favorable results have been obtained in soaking cuttings of various plants with the object of precipitating a quicker sprouting and rooting and securing a higher percentage of growth.

The role played by lime and magnesia in plant production has been studied by Loew, and some interesting results developed by him. The writer, in collaboration with Loew, carried out some experiments in the employ-

ment of these two elements in the growth of various plants. The results were published in Bulletin No. 1, Bureau of Plant Industry, U. S. Department of Agriculture, under the title "Relation of Lime and Magnesia to Plant Growth." Anyone interested in the subject and especially the more detailed results and the theoretical explanation of the action of these elements can obtain such information from the perusal of that bulletin. Suffice to say that the influence of lime on plant growth is a matter well known in agriculture—one of the first points noted and established when man undertook to determine what affected most the production of plants and crops. The relation of magnesia to the growth of plants has been a subject of more recent study; however, the fact that this element is present in increasingly large amounts in mature seed indicates that it is there for some purpose and one that has to do with the early development of the growing seedlings.

As the experiments outlined in this article can be followed in field practice at such a moderate cost, while the indicated results are so favourable, a trial under field conditions is urged upon all cane growers. The gain indicated is threefold: First, insecticidal, the elimination of the cane borer; second, irrigation, practically the early watering of the cane; third, yield, quicker growth and larger tonnage.

FISH MEAL

Extract from Report of the Imperial Economic Committee on Marketing and Preparing for Market of Foodstuffs produced within the Empire (Fish Report—Fish).

Since the War a very important development has taken place of great value to the fishing industry, as opening a large and expanding market for the use of its waste material, and of great value also to the agricultural industry in the feeding of stock and poultry. The use of fish meal as a feeding stuff to cattle is comparatively new in Great Britain. It started a little before the War; was developed during the War—when there was a shortage of feeding stuffs—and has now become an accepted part of agricultural practice. "White-fish meal" of the kind and quality which should be used for feeding to animals, contains from 55 per cent. to 60 per cent. of protein and about 15 per cent. to 20 per cent. of phosphate of lime. It is thus a food very rich in protein and contains also a necessary mineral constitutent often deficient in other feeding stuffs. Its value does not, however, depend merely on the high percentages of these constitutents. The question has not been as yet completely elucidated, but it may be surmised that the form in which protein occurs in fish meal is one which is particularly useful in aiding the animal to assimilate other proteins which it receives in its grain foods. It is known that maize protein by itself is not effective in building up flesh tissues, but the addition of fish meal in comparatively small quantities to the cereal proteins may be an important aid in the formation of these tissues. Fish meal appears to possess a special virtue as a feeding stuff above that indicated by its chemical analysis.

The phosphate of lime and other mineral constitutents in which fish meal is rich, are also of great value—even necessary—in a ration for young growing animals especially, as the cereals on which pigs and poultry are so largely fed are deficient in salts of lime. It has further

been argued that fish meal owes some of its accessory value to its vitamin content, but on this point the evidence is not conclusive.

Fish meal has proved very useful for growing stock of all kinds, for milking cows and for egg-laying poultry. As it is a highly concentrated food it should always be given in limited quantities and in conjunction with other foodstuffs, and the prejudice which exists against it in some quarters is probably due to the neglect of these precautions. Thus, in feeding poultry, the English Ministry of Agriculture and Fisheries recommend a mixture of the following nature for chickens over a week old :—

Parts by Weight:

4 Sussex Ground Oats.
4 Middlings,
1 Maize Meal.
½ Fish Meal.

The proportion of fish meal may be increased gradually as the birds grow, until 10 per cent. to 15 per cent. by weight of the mash given to adult birds in times of heavy egg production may advantageously consist of fish meal. Five per cent. by weight of the day ration is a suitable proportion in the food of pigs between the time of weaning and slaughter ; whilst, for cows and heifers in milk, a little less than one lb. per day per animal would be appropriate.

A strong opposition to the use of fish meal in the feeding of pigs has been urged by all sections of the bacon and pork trade, who complain that thereby the flesh is liable to be tainted with a fishy taste or odour. Exhaustive attempts to produce tainted flesh at various research stations by heavy feeding of "wholesome" white fish meal have completely failed, and many large producers are known to use fish meal regularly without ill effects. Nevertheless the trade objection to fish meal should not and cannot be overlooked. There is no danger of such results, if good white fish meal is used in the quantities which the English Ministry of Agriculture and Fisheries

advise. The farmer when fattening pigs for market can, however, adopt a further precaution. Fish meal is of special benefit whilst an animal is growing or is heavily producing milk or eggs. It is of less value in the final stages of finishing for market. The pig fattener, therefore, can well cease feeding fish meal to his pigs a month before they should be ready for slaughtering and by doing so, all risk of taint, if good meal is used, will be avoided.

Other complaints of "taint" have not been so pronounced as those from the bacon and pork butchers. A certain number have been made in regard to milk, but they have been comparatively few and, it is believed, that the taint was probably due to absorption by the freshly drawn milk of the flavour of some stocks of fish meal or fish fertilizer in the vicinity of which it had accidentally been left. It is certain that none of the agricultural research stations have been able to induce a fishy taint in milk through feeding wholesome white fish meal to cows.

The risk of taint, which does arise in using fish meal for feeding, is due to the use in immoderate quantities of low-grade meals with high oil content. Nearly all the manufacturers in Great Britain have agreed to produce a meal from white fish only (without herrings or other unsuitable material) to be sold as "White Fish Meal" and conforming to the following limits of composition :—

	Per cent.
Aluminoids : Not less than	55
Phosphate of Lime : Not less than ...	16
Oil : Not more than...	5
Salt: Not more than...	4

The Fertilisers and Feeding Stuffs Act, 1926, which has not yet come into operation, requires sellers of feeding fish meal to give each purchaser a written warrantry as to the percentage content of protein, phosphoric acid, oil and salt, respectively, and also contains definitions of both "fish meal" and "white fish meal." These definitions and the particulars to be given with regard to composition may be varied by regulations made jointly by the Minister of Agriculture and Fisheries, and the Board of Agriculture

for Scotland after consultation with a Committee which has been set up to advise on matters arising out of the Act.

Experiments have not been sufficiently far pursued to determine whether and under what conditions herring meal may be similarly used as a feeding stuff without objection. In the herring, the oil is more widely distributed through the muscles of the fish ; the oil is of a different kind and carries certain strongly smelling substances over into the fat of the animal consuming the fish meal, hence the "taint."

It is not necessary to consider whether herring fish meal can be used as a food, since it posesses an outlet of little less value for use as a fertiliser, and so should command a good sale where intensive cultivation is practised, as, for instance in hop gardens. The extent of its use is a matter of comparative price with that of other organic nitrogenous manures.

The total output of fish meal in Great Britain in 1925 was about 40,000 tons, of which 8,000 tons were herring meal. The greater portion of the production of white fish meal is exported to Germany, which country, generally, imports comes in as a strong buyer in the autumn. The total imports of fish meal into Germany from all sources in 1926 was 82,000 tons as compared with 46,000 tons in the previous year. It is calculated that in 1926 some 50,000 tons out of these imports of all kinds of fish meal were used in Germany as feeding stuffs.

The English Ministry of Agriculture and Fisheries have supplied us with an estimate of the extreme limits to the quantity of fish meal, which might be used in Great Britain, if all owners of pigs, cows and poultry gave it to their stock in the proportions recommended by the Ministry. If this were to happen, 400,000 tons of fish meal would be required annually. This is a figure far in excess either of the probable demand or of the possible amount of fish meal obtainable from the quantities of fish now landed. It is sufficient, however, to show that a wide potential market for fish meal exist. If its use became more general there should be, in Great Britain, a market for all the wholesome fish meal which could be made from the fish waste resulting from the British landings of fish.

One limiting factor which we have not so far mentioned is price. As a concentrated feeding stuff, white fish meal is in competition with various oil cakes, and there is a limit beyond which farmers will not go in paying for the special attributes of fish meal, which at present is very expensive as compared with cotton, linseed and groundnut cakes. Lower prices are needed for wider demand but the the fish meal manufacturers explain that Germany is always ready to outbid the British purchaser for British meal.

We have dealt at large with fish meal as a food for stock because it appears to us that the efficient treatment of the by-products of the fisheries—fish meal and oil—should have some effect, at any rate, in reducing the cost of fish sold for human food. Such a development can only be obtained by proper organisation whereby all waste material is separated and dealt with at the ports if not in a factory ship. Plentiful supplies of good white fish meal at reasonable prices would also subserve the purpose of producing meat, milk and eggs. This is true of Great Britain. It is equally true of Canada, Newfoundland, and of any part of the Empire which is developing its fisheries. We would direct the particular attention of those Governments of the Empire, whose territories are known to be deficient in phosphates to the advantages of the addition of fish meal to the ration of cows, pigs and poultry. It appears to us that a very important advantage, which would accrue to Australia and South Africa from the organised development of their fisheiries, would be the provision of this fish food and fish ferti liser for use in places in which intensive agriculture is practised.

AN AFTERNOON WITH THE HONEY-BEE.

An address delivered by Revd. C. D. Lalla, President, Bee-Keepers' Association, at a general meeting of the Agricultural Society of Trinidad and Tobago, held on the 14th July, 1927.

The time honoured adage—"Necessity is the mother of invention," will once more appeal to us, as it did on the occasion of the world-war. On that occasion we learnt the dire experience, that our sugar and cocoa upon which we had all along depended, could not be expected to provide the necessaries of life, but that for these essentials, we looked forward to other countries, from which we were in a measure isolated by the submarine menace. There was apparently no other alternative before us then, but to revert to Mother Earth for the solution of our pressing economic problem. Agriculture was the popular medium, and Ground Provisions the timely outcome. Government Depôts for our Ground Provisions and Fruits were later developments, calculated to provide a ready market for our surplus productions and determine their judicious distribution among the various centres of our Island.

After the termination of that great war, normal conditions gradually returned affording on the one hand a most welcome relief, and resulting on the other in a consequent slackening of the war time activities. In order to correct the apparent manifestation of our economic lethargy, it would seem as though Providence, the Great Teacher had once more opened school. His method seems to have been a repetition of the war time necessity, precipitated quite recently by the unusual severity of successive dry seasons and the island-wide devastation by Froghopper Pests—the one seriously threatening the very existence of Cocoa, and the other of the Sugar Cane Industry, thereby throwing us back once more over on the lap of Mother Earth for a possible relief from the threatening gloom, which had again overtaken us. The promising outcome on this occasion has been the establishment of the Fruit Industry contem-

poraneous with the Fruit Growers' Association. To add one more string to our economic bow and provide another equally promising field of usefulness, you have been asked to spend—"An Afternoon with the Honey-Bee."

I.—Every Planter A Bee-Man.

The question might be reasonably asked—what has The Agricultural Society to do with Bee-Culture? The answer is that Bee-Culture is intimately related to Agriculture, and that every Planter is a Bee-Man, if not consciously, then unconsciously at any rate. It would seem that this was the identical view entertained by The Imperial Department of Agriculture, for in the year 1901, Sir Daniel Morris, the then Commissioner of Agriculture for the West Indies, actually engaged the services of a bee-expert in the person of Mr. W. K. Morrison, of the United States Department of Agriculture, who subsequently visited the West Indies at the expense of the Government, and in a degree modernised the West Indian Bee Industry. Coming nearer home, it is no secret, that our Director of Agriculture, The Hon. Professor Freeman, and his ever enterprising Entomologist, viz., Mr. F. W. Urich, were mainly instrumental along with others in founding the Trinidad and Tobago Bee-Keepers' Association, of which Sir Francis Watts, President of The Agricultural Society and Principal Emeritus of The Imperial College of Tropical Agriculture, is its venerable patron.

How?

Some of us might be inclined to say this is all well and very good, but tell us how? To provide an answer to this question is unquestionably the burden of our address, and we will do so by reviewing the relationship that exists between the Planter and his Plant.

As practical Planters our great concern is to adopt the best possible tillage of our fields, with the hope of reaping therefrom the largest possible crop, and with the least possible outlay. The cane planter has an eye to his largest tonnage and the cocoa proprietor to his highest fanega. The former does not only manufacture sugar and its bye-products, but also utilizes the very megass to advantage.

The latter also reaps his cocoa and even sells the cocoa-chaff or pascillos to those who usually cater for the wants of our labour community. It is manifestly clear, that every known element of usefulness in the industry is taken full advantage of and made to contribute its own "bit" to the ultimate success of the enterprise. We make use of the term "*known*" element of usefulness advisedly, because it is just possible, that with the establishment of The Imperial College of Tropical Agriculture and the progress of scientific research as undertaken in our midst, other equally useful elements hitherto unknown to us may yet appear on the planters' horizon, and of a character he lpful to the cause, which he carries seriously at heart. At this juncture, we can conscientiously assert—and without the slighest fear of contradiction, that there is one such new field unexplored by our wide-awake planters, and which is equally capable of augmenting his exchequer to the same extent—if not exceeding those derived from bye-products, which already engage his attention. It is the privilege and honour of The Trinidad and Tobago Bee-Keepers' Association to point out by practical demonstration and otherwise, that hitherto unknown field to you.

II. Planters' Omission Honey Bees' Sphere.

The roots and stems of plants provide fuel, the leaves material for mulch, the fruits and their bye-products add to the planters' bank account, but why are *flowers* excluded from the sphere of practical operation? But for this outstanding omission, the Planters' exploration of our premier industries would have been both complete and thorough. It is somewhat significant to note, that the usefulness derived from roots, stems, leaves and fruit is most carefully and scrupulously utilised, that from flowers still remains unexplored and thus go a waste. While this signal omission is apparently attributable to the planting community, it does not by any means exclude those concerned with Floriculture, and particularly applying to those of us, who have been greatly impressed with the recent claims of the Fruit Industry and the inviting field it offers. At least the range of the question embodies all Agriculturists, Horticulturists, and Floriculturists, who it would seem, that

hitherto apart from admiring the delightful flowers, actually despised and neglected their potential value. Here again it would appear as though Nature has provided this wonderful insect to explore the field thus unconsciously overlooked by us. If the wasted resources that lie embedded in the flowers were as judiciously taken advantage of, as in the case of kindred industries, there is absolutely no doubt but that, in the immediate future there be opened up to us and our posterity another avenue of usefulness and unquestionably the most interesting, the most instuctive, and the the most profitable of all the minor industries known to plantocracy. The question may next arise how can this be achieved ? The answer is through the agency of the Honey-Bee.

III.—Honey-Bees—The Planter's Friend.

It would be interesting at this stage to briefly survey the three-fold service, such as the industrious bees have been rendering to mankind from time immemorial, viz :—

(a) They facilitate the process of effective pollination, thereby improving the quality and quantity of our fruits.

(b) They extract the nectar from flowers and convert it into delicious honey, thereby transforming waste material into a profitable article.

(c) They manufacture Honey Comb from floral ingredients from which Bees Wax is made, and which, if utilized, would convert waste material to advantage.

Under the circumstances, it should be readily conceeded that the silent but extremely useful Bee deserves at our hands more than a passing reference, therefore a brief account of its Life-History may now prove both interesting and helpful.

IV.—The Life History.

1. The Home. The box in which Honey Bees are kept is called a hive. There are two kinds of hives in local use, viz. :—(a) local make, and (b) imported. The cost of the former is low, but that of the latter although high, is more convenient and durable.

2. The Colony. The inmates or colony of bees which dwell in a hive consist of three classes of bees viz :—

(a) The Queen. As her name indicates, she is the supreme object of veneration in the hive, both on account of her high rank, as also from the fact that she is actually the mother of her colony. It takes from 10—15 days to rear a queen. About a week after her birth, she embarks on her wedding flight meeting her partner in mid-air, where the union is effected. A few days later, she enters upon active service and steadily adds to the numerical strength and effectiveness of her colony. She has the capacity to lay from about 1,000—5,000 eggs daily, mating only once in her life-time. Her span of life is about five years. She has a sting but seldom has occasion to use it—her sphere of influence being indoors. She is the largest bee in the hive.

(b) The Drones. The drones are the male-bees and their sole function is of a paternal character. Apart from serving as a mate to the virgin queen on the occasion of her wedding flight, they serve no other useful purpose, and their presence in large numbers in the hive is a serious menace to the honey-store. It takes from 20—24 days to rear a drone and their span of life ranges from about 2—3 months. They possess no sting and are therefore perfectly harmless. The drones are somewhat smaller than the queen, but larger than the workers.

(c) The Workers. As their name indicates, the workers go far afield so as to provide the necessaries of life for the entire colony, as well as perform the various duties within the hive. They require from 18—21 days to be reared and live for a period hardly exceeding Three Months. As their duties require them to venture far and wide, they are specially armed

with a formidable sting, and know the art of manipulating it to advantage when disturbed in the performance of their daily vocation. The various services to which they are invariably commissioned are as follows :—

(1) Field-Workers. These daily go out to the fields, in season and out of season, searching the precious elements which go to sustain life.

(2) Sentinels. As their name indicates, their sphere of labour is at the entrance of the hive, when they are expected to challenge any intruder, and if need be, to expel him out-right from the hive.

(3) Attendants. These usually wait on the royal mother-queen, and thus facilitate her in her most important work within the hive.

(4) Nurses. These look after the care and nourishment of the young broods.

The workers are the tiniest bees in the hive but they play a very important part indeed. A word or two will next follow with regard to their culture.

V.—The Culture.

Any one desirous of embarking on the Bee-Industry may do so in one of two ways, viz :—

(a) The Nucleus Method. A nucleus is a baby hive, possessing all the elements, that would in time develop into a complete hive. A nucleus is usually placed in a box of from 3—5 frames. For a beginner or novice this method is specially recommended, because during the transition a decided gain in knowledge and experience will result therefrom. The approximate cost of a 3—5 farmers' nucleus of Italian Bees is from three to five dollars, which the bees can repay in a single season, and even leaving an appreciable surplus in the hands of the enterprising novice.

(b) The Hive Method. A complete hive possesses all the elements capable of gathering honey

from the every start. The manipulation of a complete hive will require some knowledge and experience on the part of the Bee-man or Apiarist. A general idea can be obtained by a perusal of any good bee-book, but as most books were written by men unacquainted with Tropical Bee-Culture, their recommendations often prove impracticable to us out here. Practical experience will be realised by any intelligent beginner if he has patience and an observant eye. The cost of a complete hive will vary from $5—$25. The price is usually deter mined by the strain of the bees sold, the strength of the hive, and its honey-producing capacity.

Whatever the initial outlay, the proceeds of the very first crop will more than repay it in full, and at the same time leave a fair margin on the right side. In view of these interesting statements one would naturally be curious to know something about Bee-Productions.

VI.—The Productions.

An exceptionally strong bee-hive should produce, all things being equal, two gallons of extracted honey and ½ lb. of bees-wax every third week during crop time. There are about ten extractions for each season, and that an "A-1" hive should be capable of yielding about 20 gallons or 300 lbs. of honey and 5 lbs. of bees-wax per season. Under ordinary circumstances, however, an average hive would hardly exceed half the above yield. The honey season begins from the month of October and ends in June, so that the crop lasts for about nine months. In some localities the honey flow is greater than in others, and consequently the yield varies according to the nature of the honey-flow and the extent of bee-plants in existence. A bad honey crop results from a severe drought as well as from excessive rain, as has been the case this very year. The best crop is reaped when the season is normal. As it obtains with cocoa and sugar, so there is with honey also "a good and a bad crop," but unlike the former an adverse crop in Bee-culture is hardly attendant with any pecuniary loss. After the initial expenses have been met, a skilful and enterpris-

ing Apiarist usually reckons by the profit column of his ledger. All he has to do is to occasionally but systematically supervise the hive, and the industrious bee does the rest. A honey-producing tree or bee-plant contains in its blossoms a sweet liquid, which is called nectar, from which alone the bees make honey. Honey produced by any other process is impure or adulterated honey, and the person committing such an offence is liable to incur a heavy penalty in Europe and America. Let us hope that our own government will also give us some day a like protection. The estates and forests of Trinidad and Tobago abound with bee-plants, and from a casual observation, it would appear as though fully 99% of our trees—cultivated or otherwise come within that category. The colour of honey is determined by the colour of the blossoms from which it was obtained by the bees. The light and medium colour honey fetch a higher price in the market than the dark colour liquid. Our honey must be graded, as is done with cocoa, in order to effectively compete with the aritic-le of advanced bee-beepers, who at present monopolise the world's market. The logwood tree, which is the best of all bee-plants, is well adapted to our soil and climate. As is well known, the stems of the logwood trees produce materials for making dye, and the blossoms give the best honey in the world. In this connection it would be extremely interesting to hear what one of the most distinguished bee authorities of the U.S.A. has to say. Messrs. Hooper Brothers of Kingston, Jamaica, on submitting some years ago samples of logwood honey to Mr. A. I. Root of Medina, Ohio, U.S.A., received the following opinion with respect to same :—"In looks it certainly compares favourably with anything we can produce here in America. On breaking the comb we find the honey very thick, of a beautiful crystalline amber ; and when one tastes it, he utters an exclamation of surprise and pleasure—at least I did. Logwood honey is unlike anything else. The flavour is peculiar, suggesting something between violets and geraniums,—at least the honey seems to taste somewhat as violets and geraniums smell ; and yet the distinctive flavour is not strong enough to cause one to tire of it. My im-

pression is, that if this honey were on sale in some of the cities in the U.S.A., and if customers were allowed a taste of it, it would all go off at fancy prices. Not everybody may think as much of it as I do ; but if all logwood honey is like the sample sent us, I predict it will rank side by side with the choicest products of the mountain sage or of the clovers." West Indian honey, therefore, if produced from logwood blossoms, will assuredly take the premier place in the world's markets. The logwood trees can also serve other useful purposes, such as the formation of an excellent hedge, which can be planted in the same way as is the case with hibiscus and cactus hedges. They can also be used to even greater advantage in replacing decayed savannah posts, and being a live post their four-fold value can better be imagined than expressed. The next question arises—what are the various uses to which honey and its bye-products can be put ? An explanation of their possibilities will go a long way in enabling an aspirant to determine its potential value, and if attractive, to launch out on this latest industrial expedition.

VII.—The Possibilities.

The outstanding possibilities of honey and bees-wax are as follows :—

(a) Financially. As has already been stated, the proceeds of an exceptionally strong hive per season is approximately 20 gallons or 300 lbs., which, if sold at the wholesale price of $1.00 per gallon or 15 lbs. would fetch the sum of $20.00. Now add to that 5 lbs. of bees-wax at $1.00 per lb. would yield the sum of $5.00, thereby making a total of $25.00 per hive. This calculation is based on the yield of an excellent crop, and in a locality, where bee-plants simply abound. An average hive, however, would hardly be capable of producing beyond half that amount. If this is the capacity of a single hive, then that of a thousand hives would be a thousand-fold. Therefore it goes without saying, that if the neccesary market is available, the bee-industry is fully capable of

augmenting the planters' exchequer by thousands of dollars.

(b) Domestically. Honey was the common article of diet among ancient people, to whom it served as their principal sweet. It was a table-delicacy of such a high order, that it also formed one of the items sent as a propitiatory gift by Jacob to his unrecognised son Joseph, the chief ruler of Egypt. This, we are informed took place 3,000 years before the first sugar-refinery was built. Honey—unlike sugar, can be stored away for 100 years, and will not suffer the slightest deterioration, but will on the contrary improve with age. Honey is a nutritious food and can be safely taken by both children and adults. It is pre-digested sugar, so that persons with weak stomachs and especially those suffering from diseases in which sugar is forbidden, can take it fearlessly. Milk and Honey are as good a food combination to-day as they were in the days of Canaan. Honey can be used to greater advantage than sugar, especially in making cakes, confectioneries and other table-delicacies. Honey-tea, which is a regular meal in Germany, is prepared from a cup of hot water in which one or two tablespoonsful of honey are diluted. In the opinion of scientists, the attainment of long life has been attributed in certain cases to the life-long use of Honey-tea. Vinegar made from honey is considered to be the best in the world. The high standard of honey-beer and honey-swizzles are well known to people addicted to the drink habit, but healthy folks do not need them and should give them a wide berth.

(c) Medicinally. Bee-sting, which is so much dreaded by beginners is regarded as a sure cure for muscular rheumatism. It is said that French doctors prescribe a mixture of honey and butter for invalids in preference to cod liver

oil. Honey is helpful to those suffering from pulmonary diseases, and anyone feeling distressed from a husky throat, will find a mixture of honey, lime juice, and powdered black-pepper most effective. Even bees-wax is always in demand in the drug stores, where it is utilised in various ways for medicinal purposes. Honey when taken in certain quantities acts as a mild and pleasant aperient.

l) Educationally. Bee-culture provides the most interesting and instructive nature study in the world, as it helps to instil into youthful minds lessons of industry, frugality, loyalty, co-operation and cleanliness. Modern countries, recognising this great fact, do not only insist upon its inclusion in the schools' curriculum, but also give the industry their whole-hearted support by legislation, subsidy, supervision, and otherwise. We earnestly hope that the day is not far distant, when our local government will also join the radiant circle. and thus identify itself in this, as in other kindred industries, which are destined to promote the progress of this our island-home, as also to add to the economic stability of the population at large.

Gentlemen, this brings the academic part of our reception to a close. I have already occupied your time and attention to a considerable length, and should therefore finally thank you for having given us a fair hearing. If we have even in a small degree impressed you with the poentialities of the Bee-industry, and the advantages dervable to the planting community therefrom, we shall feel amply repaid for the time and labour expended in the preparation of this address in your interest this afternoon.

DEPARTMENTAL NOTES.

DIRECTOR'S ACTIVITIES.

From 8th to 10th August, Professor Dash was in Berbice. He opened the Session of the B.G. Farmers' Conference, gave an address at their evening Session, visited certain cacao and banana cultivations, and obtained some suckers of what he considered to be the true Gros Michel. He also inspected the gardens at Colony House and the local market in New Amsterdam, ending up with a short visit to the Corentyne coast.

He paid two visits to Essequibo during August and October, in connection with the selection of seed padi, visiting most of the larger rice estates on the Coast, and conferring with millers and growers.

The opportunity was also taken to visit Plns. Hampton Court and Anna Regina, as well as the Government Industrial School at Onderneeming. A day was spent in the Pomeroon River visiting coffee and other cultivations and inspecting the agricultural station at Marlborough.

In September he visited the Canals Polder District the upper East Coast, Demerara, and also the small cultivations and holdings at Beterverwagting. A day was occupied up the Mahaicony creek, where he inspected some of the larger rice farms, in the company of Mr. Sampson from Kew. He visited Plns. Diamond, Providence, Uitvlugt, Ogle and Hope, in connexion with cane, coconut, rice, and peanut cultivations, and also rice areas on the West Coast of Demerara.

Several visits have been paid to Pln. Cecilia, to inspect and study the ground-nuts and the work in progress there, in view of its further use by the Department.

In October he also visited Pln. Lusignan in connexion with an outbreak of Sugar-cane Aphids.

Mr. L. D. Cleare, the Government Economic Biologist, visited the county of Berbice between August the 3rd and 8th, accompanying Mr. H. C. Sampson of Kew. Rice cultivations and mills were inspected in the Upper Corentyne District as well as on the West Coast of Berbice in the Fort Wellington—Bush Lot area. The lime cultivation at Pln. Providence was seen while Plns. Blairmont and Bath were also visited.

In August also a visit was made at Pln. Providence, East Bank Demerara, in connexion with Ground Nut Cultivation on that estate.

In September the Mahaica—Mahaicony and the Bartica District, were visited in company with Mr. H. C. Sampson. Three days (6th to 9th) were spent in the Bartica District and the areas inspected included the farms at His Majesty's Penal Settlement, the Agatash Estate grants on the Essequebo River between Macowan Creek and Agatash, the Hills Estate and Kilacoon and a few farms on the lower Mazaruni River.

Pln. Lusignan, East Coast, Demerara, was visited also in September in connexion with an outbreak of Sugar-Cane Aphids.

In October visits were made to Plns. Schoonord, Uitvlugt and Leonora on the West Coast Demerara, and to Pln. Cecilia on the East Coast.

In September, Mr. E. M. Peterkin visited the Pomeroon River and the County of Berbice in company with the Director of Science and Agriculture.

Three visits were made during August, September and October to Essequibo in connection with the selection and purchase of seed padi for distribution (sale) to farmers in other parts of the Colony.

He visited with Mr. Sampson, Plns. Providence and Diamond, E. B. Demerara : Canal No. 1, W. B. Demerara, and Pln. Uitvlugt, W. C. Demerara ; and Plns. Ogle and Hope, E. C. Demerara. He also visited rice cultivations in the Mahaica-Mahaicony Districts, Mahaicony Creek and the upper E. C. Demerara.

He paid frequent visits to Pln. Cecilia, E. C., in connection with the reaping of ground-nuts and preparation of land and organisation for the planting of same as a station of the Department.

He supervised Sophia Sugar Experiment Station in the absence of Dr. Whittles from June 1, to November 15, 1927.

Arrangements for judging, in connexion with the West Bank Farmers' Prize Competitions, are in the hands of the Travelling Inspector. It is hoped to have the final judging during the latter end of November.

OBITUARY.

SIR ARTHUR SHIPLEY, G.B.E., F.R.S., M.A., SC.D.,
BORN 1860—DIED 1927.

The death of Sir Arthur Shipley on September 22nd at Cambridge, apart altogether from the loss of so brilliant a scientist to the world in general, must be severely felt in the West Indies. It was he, associated with Lord Milner, and Sir Francis Watts, who was largely responsible for the establishment of the Imperial College of Tropical Agriculture in Trinidad, which Institution is now the poorer by having lost one of its most devoted supporters. The Master of Christ's was a well known figure in the scientific world, and he was not altogether unknown even in British Guiana, which Colony he visited in 1923. He endeared himself to all who were privileged to meet him—his charming personality and brilliant wit were only overshadowed by his wide scientific knowledge.

OBITUARY.

HENRY LEATHEM HUMPHRYS,
BORN 1857—DIED 1927.

It is with very deep regret we have to record the death on Friday, 2nd December 1927, at Georgetown, of Mr. H. L. Humphrys.

Mr. Humphrys was the oldest member of The Board of Agriculture. At the last Meeting of the Board held on 4th October, as senior unofficial member, it was he, who, in well-chosen words, welcomed the new Chairman, Professor Dash.

Mr. Humphrys was a native of the Colony. After leaving the Dollar Academy in Scotland, where he was educated, he returned to the land of his birth in 1875, and joined the profession of planting, starting as an overseer at Pln "Anna Regina," Essequibo. Within five years he was Deputy Manager, and when only four-and-twenty, he was Acting Manager. His ability soon obtained him promotion. In 1888, he was manager of Pln "Greenfield," E.C. Demerara, in 1893, he was appointed manager of Pln. "Chateau Margot," he next assumed the management of Pln "Ogle," eventually in 1904, becoming manager of Pln. "Nonpareil," E.C. Demerara, where he remained in harness until he retired in 1917.

Though he had retired from the actual activities of a planter, nevertheless Mr. Humphrys still took a very keen interest in Sugar and its many problems, as well as in minor economic crops and agriculture in general.

He still retained an active part in the affairs of the Colony being the oldest member of The Local Government Board and a Director of Messers. S. Sprostons, Ltd.

He was also a Director of the Georgetown Club. The Royal Agricultural and Commercial Society has also lost one of its keenest members.

Mr. Humphrys was a sportsman in the truest sense of the word, and at one time he was a brilliant cricketer, representing the Colony in Intercolonial matches in the old days. His horses were well-known on the old D'Urban Race Course as well as on the Course at Bel Air. He was also an excellent shot.

As planter, sportsman and christian gentleman, he was an example to all. His largely attended funeral was an index of the respect that was felt for one who will be missed by all classes of the community. To his widow and daughter (Mrs. C. H. E. Legge), his three sons (the Hon. H. C. Humphrys), Mr. H. W. Humphrys (Canada) and C. W. Humphrys (Malay States), we tender our deepest sympathy in their bereavement.

Meteorological Data—July—September 1927.

Recording Stations & Months.	Rainfall.	NUMBER OF DAYS OF RAIN						Evaporation.	Air Temperature and Humidity.			
									Air Temp.			
	Total Inches.	Under ·10 Inch	·10 to ·50 Inch	·50 to 1.00 Inch	1.00 Inch to 2.00 Inches	Above 2.00 Inches	Total days.	Inches	Maximum.	Minimum.	Mean	Humidity. Mean
Botanic Gardens.												
July ...	15·21	5	14	...	9	...	28	4·04	85·2	75·1	80·1	81 8
August ...	9·36	4	10	...	2	1	17	4·75	86·4	76·2	81·3	80·0
Sept. ...	3·87	5	3	...	2	...	10	5·39	87·8	75·8	81·8	79·6
Totals	28·44	14	27	...	13	1	55	14.18				
Means.	...	...	...	...	....	...	...	...	86·5	75·7	81·1	80.5
Berbice Gardens.												
July ...	16·70	2	10	4	2	3	21	...	88·4	73·9	81·1	78·4
August ...	6·39	3	6	1	3	...	13	...	89·3	74·7	82·0	74.2
Sept. ...	4·37	...	4	...	1	1	6	...	90·5	75·4	82·9	76·0
Totals	27·46	5	20	5	6	4	40	...				
Means.	...	...	...	...	...	...	...	...	89·4	74·7	82·0	76·2
Onderneeming.												
July ...	4·65	1	3	2	...	1	7	...	89·0	73·0	81·0	...
August ...	12.70	...	5	2	4	2	13	...	89·0	73·0	81·0	...
Sept. ...	2·26	...	1	1	1	...	3	...	89·0	73·0	81·0	...
Totals	19·61	1	9	5	5	3	23	...				...
Means.	...	...	...	...	...	...	...	...	89·0	73·0	81·0	...
Moraiwhanna, N.W.D.												
July ...	13·45	2	15	6	2	1	26	...	...	...	...	...
August ...	11·13	...	10	9	2	...	21	...	...	...	...	...
Sept. ...	5·32	1	7	2	2	...	12	...	...	...	...	...
Totals ...	29·90	3	32	17	6	1	59	...	...	...	..	...

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	1,718	21,726
1913 ...	5,156	4,535	2,519	3,099	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,209
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,086
1918 ...	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919 ...	4,769	2,425	1,582	2,798	1,851	2,480	1,556	1 ,4617
1920 ...	6,285	2,312	1,663	2,525	2,532	3,228	2,148	20,695
1921 ...	5,671	1,968	1,642	2,629	1,949	2,539	1,610	18,008
1922 ...	3,557	1,841	1, 05	1,593	1,525	1,522	1,397	12,950
1923 ...	4,038	2,780	1595	1,934	1,953	2,137	1,951	16,388
1924 ...	4,123	2,827	1,103	1,789	1,678	2,146	1,664	15,330
1925	3,317	2,755	,580	1,819	470	1,663	1,597	13,201
1926 * ...	1,732	2,627	1,219	2,172	364	1,268	1,600	10,982
1927 1st Qr.	414	768	346	683	266	598	598	3,673
2nd Qr.	245	174	252	409	249	327	527	2,183
3rd Qr.	180	220	255	383	150	235	391	2,014

* Decrease in attendances caused by very unfavourable weather conditions.

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first nine months of 1927.

The corresponding figures for the same period during previous years and the average for the same period for nine years previous to that are added for convenience of comparison.

Product.	*Average 1916-24.*	*1925.*	*1926.*	*1927.*
Balata, cwts. ...	4,515	4,872	4,794	5,246
Cattle food (Molascuit) tons	963	861	540	375
Cacao, cwts. ...	75	None	None	None
Cattle, head ...	334	429	11	4
Charcoal, bags ...	35,458	22,653	24,945	28,912
Citrate of Lime, cwts.	190	None	None	None
Coconuts, thousands...	1,735	963	562	187
Coconut Oil, gals. ...	15,196	20,815	15,431	17,268
Copra, cwts. ...	2,904	10,552	32,627	12,633
Coffee, cwts. ...	4,136	5,231	6,700	2,555
Essential Oil of Limes, gals. ...	237	90	228	234
Firewood, Wallaba, etc., tons	5,722	4,607	5,760	7,157
Gums, lbs. ...	2,056	477	1,232	282
Hides, No. ...	5,016	7,620	7,039	4,781
Kola-nuts, cwts. ...	6	None	None	None
Lime Juice, (conc.) gals. ...	5,488	5,474	2,511	4,376
Lumber, ft. ...	146,409	11.,256	139,827	170,346
Molasses, gallons ...	73,535	527,272	954,854	1,639,128
Pigs, No. ...	246	688	411	341
Railway sleepers, No.	10,237	30,591	10,743	17,059
Rice, tons ...	6,266	4,880	1,770	7,287
Ricemeal, tons ...	51	None	None	None
Rubber, cwts. ...	65	2:	218	278
Rum, gallons ...	1,733,535	900,695	603,729	848,165
Sheep, head ..	32	10	None	1
Shingles, thousands	1,572	1,202	1,049	1,291
Sugar, tons ...	56,456	59,500	57,195	59,398
Timber, cub. ft. ...	84,330	146,975	126,781	141,710