The Manuring of Rubber.

MR. H. W. ROY BERTRAND opened a discussion on the manuring of rubber. He said that he had asked the Planters' Association to have this question of the manuring of rubber put on the Agenda, but had little anticipated that he would be asked to speak on the subject. It had struck him as being a very important question but one on which there existed great diversity of opinion.

Mr. Bertrand then proceeded to deal with the subject at length, the following being a summary of his remarks:—

He mentioned that there were two initial problems. They were, firstly, how to obtain and plant the best and highest-yielding stand of trees and secondly, how to cultivate them afterwards. For the present the latter was, in view of the already large planted acreage, possibly of first importance. Although the industry had now been going some twenty years or more, the all-important question of manuring had, in Ceylon, not yet been properly worked out. While there were many who firmly believed that manuring paid, there were others who begrudged any expenditure on it.

It was unfortunate that the manuring of rubber had been influenced by experience in tea. The two conditions were so totally different, as a moment's consideration would show. First of all, the tea-leaf was plucked and removed from the land, whereas the rubber-leaf persisted, or should do so, throughout the year. Secondly, in tea, there was a vast amount of potential fertility removed from the land, whereas in rubber the amount removed was negligible. He was indebted to Mr. R. A. Taylor for the following figures: in 1,000 gallons of latex, or say 3,500 lb. of dry rubber or from nearly 10 acres there were removed about 40 lb. of nitrogen, 12 lb. of phosphoric acid and 2½ lb. of potash. The amounts per acre were too small to be worth considering when their methods of manuring the soil made for vastly greater losses.

What happens in the beginning ? Mr. Bertrand asked. " We fell an evergreen jungle with a dense undergrowth and a depth of humus which has taken years of work on the part of plants, insects and of the micro-fauna and micro-flora of the soil to accumulate. We have a good burn and destroy three-fourths of that work. We then plant a deciduous tree, a comparatively unknown type of plant in the wet zone tropics, and we " clean-

weed " the soil. We thus expose a previously balanced soil to exceptional conditions of isolation, drip and the erosive power of torrential rains running off an imperfectly absorbent and unprotected surface. Such conditions make not only for great losses of humus by physical and mechanical means, but they induce conditions of rapid nitrification which the young plants are unable fully to take advantage of. But if nitrates cannot be taken up they are rapidly leached and lost. Losses of phosphoric acid and potash are not so great and owing to the many deep roots which the tree puts out it can probably, for some time at least, get as much as these, especially potash, as it requires. In view of many pronouncements to the contrary it would seem necessary to explain on what grounds manuring may be expected to pay. First of all, irrespective of cost, can manuring improve yields ? The H.A.P.M. results show that on a soil deficient in Nitrogen it can. In their case the control plants are literally dying out, whereas the manured have increased from 380 lb. per acre to 460 lb., and are still improving. A census of the trees around my cooly lines was taken, discarding all trees which had benefited by extra light. It was found that, whereas the average yield per tree per tapping for the estate was ·65 oz., the yield of the line-trees was 1·32 oz. Now, I trust nobody will go off the deep end and imagine that I believe such a yield possible for a whole estate. It is merely quoted to show that yields are definitely affected by plant food. Again, a small experiment has been carried out on Remuna for four years past. 'A' is manured with 300 lb. Nitrate of Soda; 'B' is Control; and 'C' is Nitrate of Soda plus minerals. The amounts supplied were quite inadequate for the rapid reconstruction of a washed-out area and for the first two years there was little advantage. In the third year, however, the complete-mixture plot exceeded the rest of the field by 31 per cent. Moreover, anyone who visits estates will soon find that people who do not manure and who think that by rubbing two cents together they have discovered the Philosopher's Stone, get down to a low yield, yellow foliage and bad bark renewals. Whereas the highly-cultivated estates are not only yielding more but have bark to spare. It may be contested that people who manure generally run their estates in other ways more efficiently. Almost universally, this is true—a high testimony to the value of manuring—but one often meets with unmanured, but otherwise carefully tapped, estates where, though there was a pleasing absence of wounds, neither yield nor foliage was comparable.

In the course of his remarks Mr. Bertrand adverted to an apparently important aspect of the question to which he gave much attention. In examining the various manure mixtures, he said, it had struck him that there was a great variety in the nature of the ingredients. Some used purely inorganic mixtures and

others expensive organic mixtures, with apparent disregard of the relative cost of units. There was a very wide variation in the relative amounts of Nitrogen, Phosphoric Acid and Potash in the different mixtures, but it was clear that there was no unanimity about their value among planters. With regard to Nitrogen, for example, there must be an economical maximum or minimum amount. While the minimum affected the metabolism of the plant there was an economical beyond which it would cause damage or, at any rate, which the increase in yields would not pay for. Again, in the case of Phosphoric Acid, there was a considerable difference in the value of the unit and, whereas a unit of rock phosphate was worth Rs. 2·80, a unit of concentrated superphosphate was worth Rs. 3·80. Adding the cost of rail-freight and field transport, he computed that a unit of Nitrogen in Castor Cake was Rs. 35 as compared with the value of a unit of Nitrogen in sulphate of ammonia which was only Rs. 11·25. In other words this meant that the cost of Nitrogen in Castor Cake was three times that of the Nitrogen in sulphate of ammonia.

After giving more examples of these variations Mr. Bertrand said that he had asked some planters why they were prepared to pay these vast differences in price and learnt that it was for two reasons: firstly, that it added bulk and humus to the soil and secondly that organic manures were more slowly available. In the case of the first explanation Mr. Bertrand adduced figures to show that a negligible quantity was added to the soil, or one part in seven thousand. He sought to dispose of the second theory with regard to the rate of availability by describing certain experiments he had conducted on his lawn which proved that the maximum was reached within three months of the date of application.

Mr. Bertrand had a suggestion to make to rubber-planters who could combine enquiry with utility by dividing their estates into, say, 20-acre blocks, scrapping old and useless estate records and thereafter proceeding on lines which would provide them with useful statistical records.

Discussion.

THE DIRECTOR OF AGRICULTURE remarked that Mr. Bertrand had opened a discussion which covered a very wide field. He would, therefore, limit himself to one or two of the questions involved in it. Mr. Bertrand had, first of all, given some data which indicated that the manuring of rubber did pay. On the other hand the Department had had a large number of figures presented to it in which the converse was clear. There were several estates which had manured their trees for a considerable period without having obtained increased yields. The Department, therefore, at the present time, took its stand on the belief that increased yields of rubber were not secured from manuring, though it did hold the belief that manuring assisted and helped in the development of the tree. It was, therefore, desirable in many areas of Ceylon, particularly on the bare, washed-out laterites, to manure rubber in order to maintain a satisfactory

bark renewal and perhaps to afford some resistance against fungus diseases. It was probable, and quite possible, that that view would be changed as time went on and as more data was available. The difficulty was that in this branch of work there were insufficient data available which could be examined statistically. The Rubber Research Scheme, however, with a view to obtaining the necessary data, had initiated a comprehensive experiment. Until data was available it was impossible for the Department to make a definite pronouncement. Mr. Bertrand had, however, brought up in his paper a very important aspect, namely, that of the unit value of manures, the importance of which was not sufficiently realised in planting circles. He would not go so far as Mr. Bertrand and advise the elimination of organic manures while recommending the use of mineral mixtures. There was one aspect of the matter that Mr. Bertrand had completely overlooked. He had dismissed the question of bulk and the apparent advantage in the rate of availability of organic manures over inorganic. The work of Mr. Joachim, the Agricultural Chemist, had shown that the nitrification of organics took place within four to eight weeks, but that there was a further increase later on. It was difficult to explain, but it was more than probable that the bacteria which were using the organic manures in the earlier stages had died and later on their bodies were nitrified. Mr. Bertrand had omitted to take into consideration the action of bacterial flora and the fauna of the soil.

With regard to what the plant loses as a result of the absorptive power of the soil the views in England were undergoing a considerable change. It was now generally held that the plant was more or less a passive agent. It could not exercise a selective action as was at one time thought possible.

MR. HOLLAND gave information of results obtained and opinions held on the subject of rubber manuring in other countries. In the Dutch East Indies remarkable increases of yield and improvement in bark renewal had been obtained by the use of inorganic nitrogenous manures on white soils found on the H. A. P. M. estates in Sumatra. On the red soils manuring had practically no effect. The opinion of the Dutch Scientists, however, was that there was a chance that nitrogenous manuring might be beneficial in certain circumstances in red soils, but that no estate should undertake expenditure on manuring until it had definitely proved by experiment that such manuring would be profitable.

He alluded further to Dutch publications which discussed the most profitable manures to use and the best means of applying them, especially where a cover crop was in possession of the land. It appeared no general definite opinion had been formed on these points and much experiment was still needed.

In the F. M. S. no definite information as to the value of manuring rubber was available and Scientists in that country advised estates to carry out experiments before embarking on a manuring programme.

In South India it appeared that in general planters were not so convinced of the value of manuring rubber as in Ceylon.

The use of Urea had in certain experiments resulted in a definite improvement as regards secondary leaf-fall.

MR. HOLLAND finally referred to the two manurial experiments in progress on the Experiment Station, Peradeniya, and remarked that there were indications that manuring had affected neither the yield nor the growth of the trees to any material extent.

At the close of the discussion which terminated with the last speaker's observations, HIS EXCELLENCY the GOVERNOR thanked Mr. Bertrand for his interesting contribution. A couple of years later, when the experiments Mr. Bertrand was conducting, had matured he would no doubt be able to speak with greater confidence than he had done that day. He was sure the audience was quite grateful to Mr. Bertrand for bringing up the question.