TROPICAL AGRICULTURE THEN AND NOW*

WHILST recently enjoying the hospitality of the Colonial Services Club, I rashly promised to contribute to the Magazine an article on the prospects or conditions of tropical agriculture. On subsequent cooler reflection the task seemed a formidable one. In many branches of tropical agriculture the present conditions are bad and the prospects, or rather the immediate prospects, no better. One seemed, therefore, likely to become involved in discussions of over-production *versus* under-consumption, increasing the yield per acre, restriction of output, tariffs, and the gold standard. These are all important and interesting subjects but their treatment, however superficially, seemed certain to involve the writer in much arduous work without bringing any commensurate advantage to the reader.

Whilst turning over in my mind how I could best redeem my promise, I happened to listen-in to the speeches at the Royal Academy banquet. When towards the close Mr. Winston Churchill rose to propose the toast of The Academy, he opened with the remark that he "would be brief and not keep too closely to the point". Here seemed a way out of my difficulties. I, too, will be brief and not keep too closely to the point.

Avoiding, therefore, the conditions of tropical agriculture let us glance at the conditions of the tropical agriculturist, now and a generation ago. The period is convenient for purposes of comparison and also personally appropriate as I have amongst the members of your Club this year a son entering the Colonial Agricultural Service. My first visit to the tropics was to Ceylon in 1896 as Private Assistant to Dr. H. Trimen, F.R.S., then Director of the Royal Botanic Gardens of that Colony. The staff included only two Europeans, Mr. H. F. Macmillan, Curator at Peradeniya and Mr. W. Nock, holding a similar position at Hakgala, the hill garden. Some time that year concern was aroused by the damage done by a fungoid disease of cacao. In those days the usual method of obtaining advice for the treatment of such troubles was to send specimens and information to Kew where the disease was diagnosed, reported on, and prescribed for by Mr. G. Massee, the Principal Assistant (Cryptogams) on the Herbarium Staff. Ceylon had already been well-nigh ruined by Coffee Leaf Disease to investigate which on the spot the services of Dr. Marshall Ward (later Professor of Botany at Cambridge) had been specially procured. The planters agreed to follow a similar course and I remember on my return in 1897 going across to the Natural History Museum to discuss conditions in Ceylon with Mr. J. B. Carruthers who had been selected for the task. Mycology had not as yet arrived at the position to warrant the appointment of a permanent Government officer. Carruthers, as Marshall Ward nearly twenty years previously, went out to conduct a special piece of investigation rendered necessary by exceptional circumstances.

On the other side of the world, in December, 1898, as one of the recommendations of the West Indian Royal Commission, there was created the Imperial Department of Agriculture in the West Indies under the direction

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of Dr (now Sir) Daniel Morris. The Department was primarily concerned with the agricultural welfare of the smaller West Indian Islands, and mainly in an advisory capacity with Jamaica, Trinidad, and British Guiana which had their own Botanic Departments. Apart from the short-lived Department of the Leeward Islands, with Dr. C. A. Barber as Superintendent of Agriculture, and the little Department at Zanzibar, this was the first Department of Agriculture to be formed in our tropical Colonies. To those familiar, or soon to become familiar, with such Colonial Departments it will be of interest to compare its equipment with its modern counterparts. When I joined the Department early in 1900 the scientific staff at the head office in Barbados consisted of Dr. Morris, the Commissioner, H. Maxwell Lefroy, Entomologist, and myself as Scientific Assistant.

There had been no provision for an Entomologist when the Department was formed and the reasons which led to the appointment of the first official Entomologist in the Colonies are best indicated by quoting from a Despatch written in 1899 by the Secretary of State.

"Specimens of diseased plants or insect pests have occasionally been sent to this country for examination, but while such specimens are naturally on their arrival here not so suitable for examination as they would have been on the spot, the time lost in such a reference may be of serious consequence, nor would it be possible to meet the difficulty to any but a very small extent in this way".

"I have therefore come to the conclusion that there should be some officer in the West Indies possessing the requisite expert knowledge, whose duty it should be to advise the Government as also individual planters and others, on this subject, and to deliver lectures from time to time under the direction of the Commissioner of Agriculture. It is accordingly proposed to appoint an Economic Entomologist. . . . The services of the officer will, in the first instance, be available for the West Indies generally, but, should the demands on his time hereafter prove more than he can meet, it will be necessary for the Governments of the larger Colonies, viz., British Guiana, Jamaica, and Trinidad, to provide for their own requirements in this respect".

It is interesting to note that the necessity for such time being devoted to investigation was not apparently contemplated at first. Maxwell Lefroy being informed in his Colonial Office letter of appointment (November 28, 1899) that:—

"Your principal duties will be to visit the various West Indian islands, to give lectures, and to recommend suitable measures for the treatment of the numerous insect pests which destroy cultivated crops in the West Indies. Your headquarters will be at Barbados, and *while not on tour and giving lectures* (italics are mine) you will be employed in preparing notes and recommendations for publication in the *Bulletin* of the Imperial Department of Agriculture and generally . . . etc., etc.

That tropical economic entomology entailed more than field diagnosis and prescription was realized before the appointment of Maxwell Lefroy's successor when amongst his duties was included "to take charge of all investigations and operations in the various colonies".

Modern laboratory accommodation was conspicuously absent in those days. The Head Office of the Department was a former private house with three small rooms on the upper floor. Two were allotted to Lefroy and myself, whilst the third provided quarters for the negro office messenger and his wife. The excellent work Lefroy accomplished in laying the foundations of economic entomology in the West Indies is an outstanding example

of what can be achieved by a man with a natural bent for his subject, combined with exceptional zeal and industry, but without the help of what would be regarded nowadays as adequate preliminary technical training or of essential laboratory equipment. I doubt whether today the selectors for the post of Entomologist to a Colonial Department would regard as a strong candidate a young man whose experience since taking a First at Cambridge (at a time when Entomology was not an important subject of study) was limited to about one year as Assistant Master at Seaford College, Sussex. In 1903, Lefroy left to become the first Entomologist in the Imperial Department of Agriculture for India, where the post of Inspector General of Agriculture had been created in 1901. No suitable candidate was apparently available at home to succeed Lefroy in the West Indies and his post was filled by the appointment of Prof. H. A. Ballou, now the Commissioner of Agriculture in the West Indies, who had been Asst. Prof. of Botany and Entomology at the Connecticut Agricultural College.

Entomology was, however, receiving some recognition in the Colonies and in 1899, Mr. E. E. Green, then a tea planter with a keen interest in insect life, was appointed Government Entomologist on the staff of the Royal Botanic Gardens, Ceylon, a part-time post if my memory be not at fault. Omitting India we see that at the beginning of this century there were two official Entomologists at work in the Colonies, in the West Indies, and Ceylon. Referring to the *List of Agricultural Research Workers in the British Empire, 1931*, we find eleven pages given up to the enumeration of over 300 Entomologists at home and overseas, of whom about sixty hold official appointments in the Colonies. Not only has the force at work in the Colonies been increased so greatly but it has the enormous advantage of help owing to close co-operation with the Imperial Institute of Entomology, dating from 1914, and other central organisations.

Let us glance now at the position of Mycology in our Colonial Departments of Agriculture. As already indicated the staff in the West Indies did not at first include a Mycologist, but about two years later (November, 1900) we find the Commissioner urging on the Government of Barbados the need for such an appointment in these words:

"It has been impressed upon me that a capable officer to deal with the various phases of the 'Rind' and 'Root' diseases in the sugarcane as well as diseases affecting Indian corn, sweet potatoes, and other plants is essential to promote the development of agricultural efforts in these Colonies".

Similarly to the Government of the Windward Islands the necessity for qualified assistance to deal with the diseases at that time attacking cacao in Grenada was emphasized.

As the outcome of the representations made the Colonial Office, in February 1901, sanctioned the appointment of a Mycologist and Agricultural Lecturer. He was to be an Honours Graduate well grounded in general science, a Botanist with a special knowledge of fungi. It was also stipulated that "he should be prepared to undertake investigations in Mycology, give lectures and addresses when required, visit and report on the work of the Agricultural Schools (in the various West Indian islands) and assist in editing the publications of the Department".

With the recognition of "investigation" as part of his work it was agreed "that he was to have the use of a good laboratory with access to books of reference and to a fairly well-equipped library containing works relating to agriculture". A small extension was accordingly made to the Head Office providing two rooms, each some 15 ft. square, which were fitted up as laboratories for the Entomologist and the new Mycologist.

The first holder of the new post was Mr. Albert Howard who was already in Barbados as Lecturer in Agricultural Science at Harrison College, an appointment under the local Government but at the cost of the Imperial Department. Howard, as might be anticipated, did much good work on the diseases of sugarcane, cacao, etc., during less than two years he held the appointment. But he was soon lost to the Colonial Service, becoming towards the end of 1902, Botanist at Wye, whence he proceeded to India as Imperial Economic Botanist.

The subsequent holders of the appointment have been Messrs. L. Lewton-Brain, F. A. Stockdale, F. W. South, S. F. Ashby, and W. Nowell. Whilst these developments were taking place in the West Indies the subject of Mycology had also won official recognition in Ceylon where by 1900, although there was as yet no Department of Agriculture, J. B. Carruthers had become Mycologist and Assistant Director of the Royal Botanic Gardens. The position of Mycology in the Colonial Service now, compared with what it was in 1900, is very similar to that of Entomology already indicated.

Leaving now these specialized branches it will be of interest to refer to the development of the modern Departments of Agriculture. It must be remembered that in early days official assistance in the introduction of new, or the improvement of existing, planting industries in the Colonies had been given through botanical establishments. The more advanced Colonies had Botanic Gardens usually under the control of a scientific Director or Government Botanist, with a Curator as chief of staff. Other Colonies had smaller establishments often styled Botanic Stations with usually a Curator in charge. All worked in close touch with the Royal Botanic Gardens at Kew, which served as a clearing house both for seeds and plants and also for knowledge relating to economic plant products. The Curators of the Colonial Botanic Gardens and Stations, were almost universally Kew trained men. The basis of all these establishments was entirely botanical. I well remember a West Indian Chief Justice, who took an interest in Colonial history telling me in Barbados in 1900 that when a Colony had reached a certain stage of development you might expect two appointments to be made—a Bishop, and a Government Botanist. I found later that he was remarkably accurate in the case of Trinidad where the foundation stone of the Roman Catholic Cathedral was laid in 1816 and of the Anglican Cathedral in 1818 in which same year the first Government Botanist was appointed some 22 years before the establishment of Kew Gardens as a national institution. When later the task of dealing with all phases of Colonial planting enterprises became more complex, the work was divided between Kew and the Imperial Institute (founded in 1887); the former dealing with botanical questions and the distribution of plants and seeds, the latter with questions relating to the properties and utilisation of colonial economic products. Although other bodies have since been formed to deal with special products, e.g., cotton, Kew and the Imperial Institute remain today the central clearing houses of information on the economic plants of the Colonies and the uses to which they can be put.

I have strayed from the immediate point of the development of Colonial Departments of Agriculture and so will return. If you consult the list published annually in the *Kew Bulletin* of Colonial Botanic Establishments you will find in that for 1900 the position was as follows: In the West Indies, the Imperial Department with a Commissioner, Entomologist, and Scientific Assistant; two Lecturers in Agricultural Science (Jamaica and Barbados), five Agricultural Instructors in the small islands, one Agricultural School (Dominica) and an Agricultural Assistant in British Guiana.

Zanzibar, a Director of Agriculture. Ceylon, an Entomologist, and Mycologist on the R.B.G. staff. A Superintendent of Plantations in the Federated Malay States, a Head of the Scientific Department in British Central Africa (now Nyasaland).

In all the other Colonies the establishments were purely botanical, at any rate in name if not in work. One should also point out that in the West Indies chemical assistance was available from the Government Analysts in Jamaica, Trinidad, Barbados, and British Guiana, and also, in Barbados, Mr. J. R. Bovell was engaged on the production of seedling canes although his substantive post was that of Superintendent of Dodd's Reformatory. The position may perhaps be still more strikingly brought home, if we consider Africa. In 1900 the official staff available to deal with all matters affecting agriculture in the whole of British tropical Africa —West, Central, and East—comprised the Director of Agriculture in Zanzibar, and the Head of the Scientific Department in B.C.A.; seven Curators of Botanic Gardens or Stations, viz., Gambia, Sierra Leone, Gold Coast, Lagos, S. Nigeria, and Uganda; with three Assistant Curators in Gold Coast, Lagos, and S. Nigeria. A total of twelve, without one man amongst them possessing a university degree or equivalent qualification.

Contrast the position in say, Nigeria to-day and in 1900. Then there were two Curators and two Assistant Curators. Today according to the *1931 List* already mentioned, there are four Directors and Assistant Directors and their deputies, one Mycologist, two Entomologists, six Chemists, four Botanists, and thirty-six Superintendents of Agriculture. In addition the Department of Agriculture includes a Veterinary Department with a staff of sixteen, and a Medical Department with ten. Of the staff of fifty-three on the more strictly agricultural side, forty-one are science graduates, nine hold diplomas and only three have no "paper" qualifications.

I have not selected Nigeria as an exceptional case but as illustrative of the far reaching change which has taken place as regards the official assistance given to agriculture in tropical Africa since the beginning of the century. In other parts of the tropical Empire development has proceeded along somewhat similar lines—mostly during the last quarter of a century.

It will be evident therefore that our knowledge of scientific tropical agriculture is of quite recent growth. On the other hand what may conveniently be termed the art of agriculture in the tropics as practised by various native races, is based frequently on very long experience and very close observation.

Take with respect to the latter point the discoveries made by native races on the properties of plants. They are indeed remarkable. The modern world uses large quantities of three beverages, tea, coffee, and cocoa, the first prepared from the leaves, the others from seeds, but all alike containing as their essential principle caffeine or a closely similar alkaloid. Two other plants of considerable but not such wide use for the sake of their stimulating alkaloids are cola (caffeine) and coca (cocaine). In these cases beverages are not prepared but the seeds or leaves respectively are chewed. The discoveries of the properties of these plants and the methods of utilization were made not only in widely separated parts of the world, tea in Indo-China, cola in tropical Africa, coffee in Arabia, cocoa in Central America, and coca in the Andean region, but so long ago that they are lost in the mists of antiquity. What is still more remarkable is that primitive man seems to have conducted his researches so thoroughly that all the resources of science have not as yet discovered any other plants containing important supplies of these alkaloids. I have often wondered when strolling through a tropical forest or through a botanic garden how primitive

man made his discoveries, for casually chewing a cola nut or a coca leaf produces no appreciable stimulation. Similarly it would be a piece of very long range research to prepare and test infusions of all the available seeds or leaves.

On a point of agricultural practice too we know that some tropical crops, e.g., coffee and cacao, are commonly grown under the shade of other trees, the practice having been handed down from remote times. When, by experiments, we endeavour to ascertain whether this is a desirable practice or not, it is very difficult to arrive at a definite conclusion even when we restrict our attention to the use of one particular kind of tree. We might expect that native races in Central America who shade their coffee do so as the result of observation and that they would use any trees which happen to be available—and they are many as shown, however, a good many years ago by O. F. Cook this is not so. In different districts they use different trees, but with one thing in common; they practically all belong to the *Leguminosae*. In other words the practice is a form of green manuring applied to permanent crops. These folks have not an ancient literature or we might have the advantage of being able to read their views on the use of these leguminous shade trees set down as precisely as those of the Chinese, the Greeks, and the Romans on the green manuring of annual crops.

This extract from p. 10 of Dr. A. J. Pieters' *Green Manuring* must suffice. "In Ts'i Min Yao Shu of Chia Szu Hsieh, who lived about the fifth century B.C., there is a passage which reads: 'For manuring the field, lu tou (*Phaseolus mungo* L. var. *radiatus* Bak.) is best, and siao tou (*P. mungo* L. var) and sesame rank second. They are broadcast in the fifth or sixth month, and ploughed under in the seventh or eighth month . . . . Their fertilizing value is as good as silk worm excrement and well-rotted farm manure'."

Plant breeding, or at any rate the selection and propagation of improved types must also have been pursued from very early times. Amongst tropical examples we may cite the countless varieties of rice in the Eastern tropics, the large number of edible seedless bananas in the Indo-Malayan region all necessarily propagated vegetatively, and the races of maize in tropical America "improved" out of all resemblance to any known wild plant.

Early man often took great pains to conserve the fertility of the soil as so well described in F. H. King's *Farmers of Forty Centuries or Permanent Agiculture in China, Korea, and Japan*, a book which all should read. As a more tropical example there is the case of Ceylon where for some 1500 years the food supplies for a large population were grown in the arid northern region with the aid of an excellent system of irrigation works. The evidence of the by-gone civilisation of this district is indicated now by the famous Buried Cities. European man favoured the wet montane areas for his coffee and later tea plantings but was not so wise in his methods. As Mr. John Still says in his charming book on Ceylon entitled *The Jungle Tide*, "It is now about one century since coffee planters attacked the forests of the hills. They have at last begun to conserve the soil, but in the early days of planting they lived on nature's capital, and the humus laid in store by the leaf fall of millions of years was flayed off by the rainfall of a few thousands of days when first the soil was denuded of its protecting forests, and carried down in spate to the sea; and now the older tea lives on fertilisers".

"In time the jungle tide will swing once more, and then those who care for other things than wealth will wander back to the wet side of the monsoon line, and while elephants browse where tea is now plucked, antiquaries will unearth the ancient bungalows of the British period, or even of the Scottish which will lie beneath it, and classify the different kinds of bottles found among the ruins, and arrange them in museums. Having both planted tea *and* arranged the antiquities of a museum, I venture to prophesy that this picture will be realised in very much less than fifteen centuries, perhaps in one-fifth of that, or perhaps in one-tenth".

There are many other tempting topics to touch upon but I must not digress further. I have attempted to sketch, however cursorily, the development of our modern agricultural organisations in the tropical Colonies. Our own knowledge and experience of agriculture in those countries is as yet very limited, whilst in many countries our officials come into touch with, and have to serve as advisers to peoples whose agricultural practices are based on experience gained through many centuries. All I would urge now on the young agriculturist is to go out with an open mind prepared to admit that if a native people do not follow some recognized British practice it is not necessarily because they are foolish or obstinate. By study of their methods he may arrive at the reason for them and then with the modern resources at his command be able to lead them on to improvements.