SYSTEMS OF AGRICULTURE AND THE POSITION OF TROPICAL AGRICULTURE*

PART I

IT has always been taken for granted that agriculture in the tropics has its own peculiar character. This need not be wondered at: the tropical differs very much from that in a northern climate, tropical soils show features not common to our European soils; lack of winter, an abundance of crop pests, and, in a large part of the tropics, an extensive rainfall and high degree of humidity, all these factors make conditions of plant production different from those we are used to.

And so as a matter of convenience tropical agriculture was distinguished from agriculture in countries at higher latitudes.

But, when exploring the field of tropical agriculture and its science, one looks for its boundaries, trouble begins. For if "tropical agriculture" does not mean anything more than agriculture in tropical countries, the difference from agriculture in other countries is only a geographical one.

This question brings us directly in contact with the question of the classification of types of agriculture.

Nobody will deny that the ways in which agriculture is practised the world over show very large differences: agriculture in humid west European countries differs greatly from that in the large arid plains of North America and perhaps still more from Chinese and Japanese agriculture. As there are large differences between agriculture in different parts of the world, it must be possible to distinguish different types, each of them practised under certain conditions.

This problem of the classification of types of agriculture has already been attacked several times and from different points of view.

Chevalier gave a system, which he called a bio-geographical one. He points out that ecologists do not seem to take much notice of cultivated plants and of the influence of culture on native vegetation. But in every part of the world a very large part of this vegetation has been supplanted by another: either cultivated plants or secondary formations occupying land that had been planted before with one kind of crop or another. He recalls the fact, that the so-called virgin forest of Central Africa is not virgin at all, but largely of secondary formation. Chevaliar concludes his introduction by saying, that in a general way all systems of agriculture which are practised in different parts of the world are adaptations to the existing conditions of topography, climate and natural vegetation and also to the civilisation acquired by its performers.

A study based on this thesis might have produced an important contribution to agricultural geography. But in the classification following this introduction other lines of investigation are followed.

It is in accordance with facts to distinguish between herding and agriculture proper. This last is divided into two groups of systems: extensive and intensive. But with this distinction the classification of Chevalier is not based more on the adaptation to topographical climate and natural conditions, than on conceptions belonging to the domain of farm management.

Every system may be practised extensively or intensively and this is the cause of much confusion. So Chevalier places under the heading "extensive without use of draught animals" both the "rays" system and

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the periodical clearing of forest on behalf of one or two crops, and agriculture on terraces in the hill country of South-Eastern Asia. But the last often is a very intensive system although no use is made of plough or dung or artificial fertiliser. And tobacco culture on Sumatra plantations, which practise a very intensive system, is based on a short period of clearing, followed by a long fallow in which forest and brush occupy the ground for several years. Systems as different from an agricultural standpoint as Chinese rice culture, plantation culture of perennials, and European agriculture as practised in Denmark, Holland, Belgium, etc. are put together in one division, that of the intensive systems.

Ahrens in 1927 published a study in which he by classification of the agricultural systems tries to show the dependence of these systems on the surroundings in which they developed. According to Ahrens these systems depend on human and geographic conditions. As it is his purpose to show the dependence on the last mentioned, he tries to separate the two influences as far as possible. Therefore he based his study on the different types of landscape (*Landschaftstypen*) Passarges.

Ahrens gives a mass of information about agriculture as practised by native peoples of the tropics and sub-tropics. He arranged it according to the classification Passarges but brought a new principle into account. He divided the agricultural system into two groups, the first not making use of a plough and the second using the plough.

It is not to be wondered at that in these two groups, classified in relation to the landscape in which agriculture is practised, the most divergent types are brought together. Systems differing as much from one another as: primitive agriculture in temporary forest clearings, agriculture in inundation basins after the water has flowed off, grain culture in prairie regions, rice culture on terraced irrigated fields, and agriculture in desert oases, are all put under one heading as not using a plough. His classification becomes still more complicated as he also takes into account in which time of the year crops cover the ground and so distinguishes between: rainy season—dry season—and summer farming and farming the whole year round.

But, does it make any difference in the practice of farming or in its underlying principles, if a forest plot is cleared in the dry season and planted with rice in the next wet one, or by lack of dry season in an arbitrary part of the year ?

Also Eckardt and Wohltmann are aware of the influence of natural conditions on the character of agriculture. But the former pays very much more attention to the different agricultural plants and their adaptability to different conditions, than to the agricultural systems of which they form a part. And Wohltmann tries to give a valuation of tropics and sub-tropics according to their productive capacity and classifies them according to rainfall. But he does not indicate how farmers in these different regions managed to get their systems in accordance with it.

When agriculturists have given descriptions of farming of certain areas these have been almost always of limited extent. And although agricultural practice in such areas does not differ so much as in remote parts of the world, they always succeeded in showing the relation between agricultural practice and its surroundings. Many brilliant studies of French, German, and American agronomists show the possibility of a study of this subject based on agricultural principles, and recent English publications on agriculture in the British Isles prove it again. These studies are not concerned with the influence of climatic and other environmental factors on different crops but with the practice of farming and its adaptation to environment.

Agriculture cannot be divided according to a simple set of complementary properties; it is too complicated. It is therefore necessary to ask in the first place, what is the most characteristic farming practice.

It may be asked if it is of more than theoretical value to discuss the question of farming systems. Instead of discussing the question at length it will be better to give some quotations from a report of Stockdale on agriculture in Sierra Leone.

After having given a description of existing conditions Mr. Stockdale remarks: "Sierra Leone can be pictured as a country passing through those evolutionary phases which similar wet and undulating countries in the East must have gone through in the eariler stages of their history. Cultivation of rice is passing from the hilly lands after exhaustion to the lower swampy areas. The latter cultivation is the more permanent and should be encouraged. The cultivators can be assisted greatly by lessons which can be translated from the East and it seems very desirable that matters concerned with drainage, terracing, cultivation and regulation of water should be investigated in Sierra Leone." . . . . "Sierra Leone has an indigenous high land coffee, which is of good quality. Liberian coffee does well and the growth of Robusta types is promising. More has to be learned, however, in regard to the cultivation of the latter coffees in Sierra Leone, as such questions as shade requirements and the treatment of the soil have not yet been fully investigated."

In the first quotation Stockdale expresses the idea that experience of Oriental farmers may be of use for Sierra Leone. The lessons of the East should be translated into West African language, that is to say, it should be investigated how far the Oriental farming system could be applied in West Africa and what adaptation to the new country would be necessary. Stockdale does not speak about an investigation of rice, or peanuts, or irrigation, or ploughing, but about a certain farming system of which those other subjects form part.

But to start such an investigation, to translate the lessons from the East, it is necessary to know that Eastern system, to know what characterises it, to know the language of the East.

Stockdale is quite right in borrowing from the East and not from Europe. Europe too is rich in experience, but its experience is of small value for West Africa. It is from the East that the lessons have to come.

It might be useful to point out a difference between the ideas expressed by Chevalier and the advice of Stockdale. In the classification of the former there is place for a "complete system", in which plough, draught animals, fertilising of the soil, etc. have found their place. European agriculture has been the standard by which other systems are measured, being regarded more or less as the ideal system. Stockdale's advice is based on the idea that there is no such thing as an ideal or a complete system. There are several systems, which are of the same value, and each of them may be complete in itself.

The second quotation in regard to coffee-growing does not mention the lessons from the East, but concerns investigations in relation to shade and soil management. However, it is not European agriculture that will be able to give advice in these matters. Perhaps experience gathered in the practice of tropical plantation agriculture may be of value in this case. But this experience has not much in common with that of the farmer of the Orient. It is another system, differing from Eastern agriculture as well as from European, that will find a place on the hills of West Africa. These few quotations may suffice to show the practical importance of the question of agricultural systems.

Wherever man occupies himself with plant production, either for direct use or to be converted into animal products, his labour and efforts are directed to the establishment of a crop and to the protection of that crop against anything unfavourable to it.

It may be that adverse conditions predominate and that it will not be possible to gain a livelihood in this way. The only method by which it may be gained is then to take the natural vegetation and to convert it into animal products. The aim of the stock farmer is to get sufficient grazing grounds for his cattle and to protect them against adverse conditions.

Both classes may live together in the same part of the country, the arable farmer occupying the localities more favourable to plant production.

It may be that the arable farmer makes use of animals to facilitate his labour, to make it possible to plant a larger acreage, or to get better crops from the same acreage. It may also be more profitable to turn his produce either partly or entirely to his cattle. But this makes no difference in principle: this farmer is occupied first and foremost with crop production.

It may be profitable to the stock farmer to produce crops, to provide food for his cattle when nature does not produce sufficient, and to protect in this way his stock from heavy losses.

Economic and social conditions may change so that it will pay to have more cattle on a certain acreage or more productive cattle, and this may induce the stockbreeder to occupy himself with native vegetation, to ameliorate it and to make it productive.

There is a tendency under certain advanced social and economic conditions to make stock-breeding profitable to the arable farmer and to force the stock-breeder to occupy himself with crop production. The result is that a class of men, formerly not interested in crop production, or only to a less extent now, also becomes interested in it.

The development of agricultural machinery has made it possible to gain a livelihood by crop production where it was impossible to do so before this machinery existed. Large acreages formerly only adapted to grazing are now in use for grain production. Yield per acre is low and uncertain and the old implements did not permit a man to cultivate a sufficiently large acreage to subsist on. New machinery made it possible for the same man to plant a large multiple thereof. And so grazing land formerly only occupied by the stock-breeder has now been added to the grain fields.

But all these alterations have not changed the principles of crop production. Different plants may be cultivated or plants may be grown where they were not before; simple implements may have been supplanted by more complicated machinery, thus enabling men to produce more in the same time, or to do the work more efficiently; the aim is the same to bring the soil into such condition that the plants will thrive and to protect them against adverse conditions.

It has no influence on the growth of plants if the soil is brought into that condition by hoe, or spade, or plough; or if that plough is drawn by animals or tractor. Nor has it any influence or production if weeding is done by hand or by the use of implements or machinery. The only thing that matters is the condition of the soil and if man has succeeded in his endeavour to provide the best condition.

Every farmer knows by experience that yields diminish after his soil has been planted for a certain time with a crop or a succession of crops. This is put down to the soil and it is said that its fertility has diminished. Everywhere one tries to restore that fertility by one means or another. These measures to maintain the productivity of soil form an essential part of every system of agriculture.

We may say therefore that agricultural systems are characterised by:
(a) the condition into which the soil is brought to produce a crop.
(b) the method used to restore, maintain or improve its productivity.