

crops and improvement of subsistence crops and at the present moment much work is being done with rice in the Mekeo, Madang and Sepik Districts.

The Native cocoa project in the Gazelle Peninsula is now estimated to have half a million trees planted and this industry, when the trees reach maturity, will provide an income of hundreds of thousands of pounds to the Native producers. Native coffee is also being produced in the Northern District, the Morobe District, and in the Highlands, and there is every indication that the Natives of these and other areas will increase their planting of cash crops to improve their economic standing.

The production of peanuts by Natives on a commercial scale is comparatively new in the Territory; however, there have been several tons produced in conjunction with rice growing which has sold well on the Australian market.

The production of vegetables is a major cash earner for the Native peoples in Rabaul and Lae, who supply most of the population with their requirements of European vegetables, through local Native controlled markets. Production of Native root crops, such as sweet potatoes, taro, etc., is also a great money earner when they are sold to plantations and other private and Government institutions for Native rations.

The introduction of new and nutritionally desirable crops to the Native people is the responsibility of the Department of Agriculture, Stock and Fisheries and work is continually going on in the extension service to bring approved crops to Native peoples.

It is appropriate in concluding this talk to say a few words about the future for the Native agriculturalists in this Territory. At the present time, generally speaking, the Native farmer is neither a true peasant with permanent cultivation on a relatively limited subsistence area, nor is he a truly nomadic cultivator although the principles of rotation, which he follows, involve the movement of his gardens over quite wide areas and long periods of resting fallow. His holdings of land are relatively high for Native peoples in the tropics and will remain so even if considerable areas are devoted to European development. We feel that his future as an agriculturalist will depend largely on what both private enterprise and the Government can do during the next two or three decades to teach him to employ more efficient methods of land use than he has at present.

The big danger from the point of view of efficiency is that with the extension of Public Health facilities resulting in population increase, if no forward steps have been taken in the meantime and the present system is still the best one available then the result will be fragmentation of agricultural holdings to such small size units that it will be impossible to improve their standard of efficiency. This is the position and the tragic one throughout many parts of the tropics at the present time but in this Territory there is an excellent opportunity to avoid it.

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## II.—LAND TYPES AND THEIR USES IN PAPUA AND NEW GUINEA

WE are introducing here a very wide subject and one about which it is never possible to be dogmatic. It is a subject, however, which would well repay careful attention both by established planters and farmers and by people intending to settle on the land in the Territory. In a previous broadcast on agricultural development, we pointed out that the Territory with its many

islands, its towering mountain ranges and its great river systems, provides an extremely wide range of environments and accordingly diverse opportunities for agricultural and pastoral development. It is this very diversity which makes our present subject a difficult one in which to generalize. It is necessary to find some sort of a basis for classification in order to gain an approach to our discussion and first and simplest is by altitude, into lowland regions, mid-altitude regions and mountain regions. Any boundaries chosen are arbitrary and will never be found to result in climatic or other environmental conditions which are fixed or predictable for a given altitude, but generally lowland areas are considered to range from sea-level to various altitudes from 500 feet to 1,500 feet, mid-altitude or mid-mountain regions from these upper limits to about 3,500 feet and mountain areas above 3,500 feet. It is interesting to note that a fourth type of region, the alpine, is found on our highest mountain ranges on the great peaks such as Victoria, Albert-Edward, Saruwaged, Wilhelm and Hagen. In the adjacent Territory of Dutch New Guinea there is an area of permanent snow-line with a small glacier.

Taking the lowland region first, we can divide this into the tropical forests which are of the rain forest and monsoonal forest type, grass plains and the swamp land. The lowland forests are characteristically tropical in the generally accepted sense and give us the typical plantation setting, such country being usually best adapted for the cultivation of tree crops such as coconuts, cacao, rubber, robusta coffee, oil palm and Manila hemp. They are indicative of high rainfalls generally without a very clear season.

Deforestation and the annual crop type of farming as a permanent industry is to be avoided in this sort of country. Annual crops may be considered as pot-boilers, or, as they are sometimes known, as catch crops, to provide some money income from cleared forest land while tree crops are coming into bearing. However, they do not provide the soil protection that one gets from the canopy formed by a permanent crop or from accepted cover cropping practices, and under the high rainfall conditions soils will leach and lose their fertility very rapidly.

Care has to be exercised in selecting plantation land in rain forest country as the overall forest cover tends to mask such undesirable characteristics as thin soil over rock, very heavy clay soil or an excessively sandy soil. The best plantation lands in this zone are usually found in the alluvial areas along river valleys, the volcanic belts such as on the North Papuan Coast and in New Britain and Bougainville and on the coastal coral limestone platforms. This last category of soil, the coral limestone, often proved suitable for coconut production but must be regarded as a dubious type for many other crops. In some cases, as in the coastal areas between Madang and Bogia, the soils near the coast consisting of old beach sands, are fertile, due to the action of off-shore volcanoes.

In the major inland valleys such as the Markham, Ramu and Sepik, and in those parts of the coastal region where a flat or gently sloping plain tends to stretch for some distance inland, as is found in places along both the North and South Coasts of Papua, the climate tends to be drier with a sharply marked dry season, and extensive grass plains occur. These have the attraction from the point of view of development, that clearing costs are minimized, and that the Native grassland will support grazing stock, in particular, cattle. Very little is known of the possibilities of these grasslands for permanent cropping, and the experience we have to date is not encouraging. However, they do seem to be a natural site for the development of grazing industries, and of farming with annual crops such as sorghum, rice, peanuts, castor bean, kenaf, cotton and maize.



where land conditions are suitable must be regarded as permanent crop areas and annual crops must have a short term function in their development.

There are extensive true mountain or upland belts, associated with the great ranges of the Territory, and particularly in the area known as the Central Highlands, that is, the mountain country from the Ramu headwaters, through towards the Dutch border to the west, there is an extensive development of valley and plateau formations giving country suitable for agriculture and stock raising. Coffee of the Arabica type or Highland coffee thrives in these regions, and a small industry has already grown up there. More temperate types of crops, such as Passionfruit, will also grow well, and an industry is developing rapidly, under stimulus of demand by Australian cordial firms.

Other temperate crops, such as various types of European vegetables, also do well, while pasture improvement and selective weeding of pastures, pays dividends, and it is possible to establish a fine grass sward of the type found in temperate zones. Particular care must be exercised in selecting land for cropping or grazing in these upland regions and all but the gentlest slopes should be avoided as should also the heavier clays and coarse sandy soil, since wind blowing on top soils, water erosion and consolidation of clays into pugs, are possible dangers at these high levels.

The Highland areas in the Territory are the only ones where there is a development of the peat type of soil and the possibility for cropping this must receive attention. Shallow drainage and cultivation giving aeration would probably make a great change in the cropping capacity of such areas and in other parts of the world it has been found that the application of small quantities of certain minor elements, notably copper, greatly assist in improving the general fertility.

Tea is another crop which is receiving attention for possible development in the Highlands although it is regarded as something more for the future than for immediate widespread development. The labour potentiality has to be built up and educated before there can be any major tea growing industry. Superior quality teas can be grown only in the Highland areas and the present position of tea on the world's market is that the bulk or lowland type is fully supplied but there is a strong demand for the superior quality highland grown types.

Rounding off our all too brief discussion on the subject of land types and their uses, it should be stated that areas other than those which are level or gently sloping should be considered very carefully before any type of development is contemplated. Then the location itself needs careful consideration in relation to the soil type, vegetation and the local climate, to determine its potentiality for any particular crop or crops or for other forms of land use such as grazing.

The Department of Agriculture, Stock and Fisheries will always be ready to advise on such matters to the fullest extent of its knowledge and experience.

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