Social Organization and Land Use Pattern.

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THE various theories on the interaction of heredity and environment in the development of the individual are fairly well known and have received considerable publicity. Much less attention has been paid to the question of possible influences of hereditary and environmental factors in the development of a society as an organic unit, and further, on the action and reaction of society in a given environment in developing or evolving a social and land-use pattern appropriate for the circumstances. Another way of describing this situation would be in terms of social challenge. A society is faced with a challenge in the form of a certain physical environmental pattern—how does it respond to this challenge ? Does it try to adjust its way of life to the environment or is it trying to adhere to its customary way of life within the possibilities presented by environmental factors ? Or is it trying to develop and utilize its environment according to its social pattern ?

Botanists and ecologists see the development of the flora as a result of geological, pedological, topographical, climatic and other factors. That is : the type of flora developing in a certain region is considered to be influenced, if not determined, by the interaction of physical and environmental factors. Similarly the agriculturist generally considers that man with his genius for adaptability and invention has developed a system of agriculture and land use within the context of his environment. That, generally speaking, the development of a pattern of agriculture and land use depended on the physical environment, topography, soil fertility interacting with the climatic factors of temperature, rainfall and humidity. Given certain environment and climatic conditions, the ecologist and agriculturalist will expect to find certain agricultural patterns. The human factor in the development or utilization of land resources is usually taken for granted, although naturally, allowance must be made of the fact that what appears to be the logical use of natural resources is delimited by the norms of human society in that particular region. In other words, little attention has been paid to the social organization of man, his food habits, his traditional form of agriculture, and consequently his pattern of settlement and land utilization.

The existence of large areas of grasslands within the humid tropics is usually considered to be the result of fire, i.e., the activity of man. The original vegetation was probably rain forest in the higher rainfall areas tapering to savannah with decreasing precipitation. This original forest vegetation was destroyed by man and regeneration of trees prevented by fires. In most parts of the tropics the large areas of grasslands are the result of the association of man, use of fire and livestock. Under tropical conditions the growth of grass is rapid and coarse and quickly becomes unsuitable for stock food. Therefore, it is customary, and probably has been so for many centuries, for the owners of stock, people whose way of life is associated with cattle raising, to burn the tall grass during the dry spells which occur even under tropical conditions. The fresh growth of grass following the fires is more suitable for feeding stock, but in this process the young tree seedlings are destroyed, preventing the regeneration of the forest and the trees bordering the grasslands are killed, thus further extending the grass areas and encroaching on the forest vegetation. These theories and procedures do not apply to New Guinea where cattle do not form part of the agricultural system, in fact were not introduced until the commencement of European settlement, less than 70 years ago. Yet there are extensive grasslands at all altitudes and under varying rainfall conditions (i.e., with or without a pronounced dry season). They too are man-made grasslands

and are the result of the extensive use of fire in clearing land for the shifting agriculture practised by the people or for facilitating hunting expeditions for killing small marsupials, rodents, etc. Whatever the purpose of the fires, the result is the same, the pushing back of the timber line, preventing the regeneration of the forest and the extension of permanent grassland areas.

The activity of man in using fire may be taken as his natural function in trying to exert his influence over his environment in creating an ecological pattern more suited to his purposes whether it be to provide fresh feed for his cattle or to facilitate hunting. The latter, as occurring in New Guinea, is exceptional, fire and grasslands being usually associated with stock (principally cattle) raising in most parts of the world. On seeing the extensive grasslands to-day, one may be inclined to think that stock raising developed in areas where grasslands occurred. That the presence of grazing lands, particularly in areas with a pronounced dry season where permanent agriculture would be difficult, have provided the natural "medium" for the multiplication of cattle and therefore a society evolved based on pastoral pursuits. However, it would be difficult to apply this theory to grasslands occurring in high rainfall areas where grass is not the natural vegetative cover, and as we have seen before, in the tropics, grasslands follow the activities of man ; he is responsible for creating the new environment through the introduction of stock. In other words, man in the course of his migration has brought with him his traditional agricultural techniques, whether stock raising, shifting agriculture, or intensive culture of the soil, which in turn established the pattern of agriculture and created a secondary ecological association (grasslands).

Many examples of this could be found in Indonesia with its multiplicity of peoples each with its own social organization and method of land use. An outstanding example can be noted on travelling from Central Sumatra, the Minangkabau area, to North Sumatra the home of the Bataks. The Minangkabau are agricultural people, they have their intensively cultivated irrigated rice fields reputedly returning the highest yield of rice in Indonesia. This is probably due to their technique of applying compost from the forest to the roots of rice seedlings as they are being transplanted to the field. But the whole Minangkabau area represents a forested appearance—much of it is under rain forest and there are also extensive groves of economic crops, rubber, cloves, cinnamon, nutmeg, etc., which are the source of considerable wealth to the people. But as soon as one approaches the Batak areas, the appearance of the whole landscape changes drastically and dramaticaly. The tree cover disappears, except in some steep gullies, and is replaced by open grassland, both on the mountain sides and on the upland plateaux. This is an area with high evenly distributed rainfall which one would expect to support a dense rainforest and intensive rice culture, as Central Sumatra does. But the difference in land use and the whole consequent appearance of the landscape is due to the influence of the inhabitants ; the Bataks are pastoral people who own large numbers of cattle and water buffaloes and are responsible for the extension of grasslands at the expense of forests. The fires are obviously a permanent feature of husbandry—one can even see large areas of steep mountain sides planted with *Pinus Merkusii* by the Forest Service in an attempt at reforestation, but most of the seedlings having been destroyed before reaching an age at which the species becomes tolerant of fire. In certain parts of the Batak region, particularly overlooking Lake Toba, there are now irrigated rice fields worked intensively with hoe or plough, but they are a comparatively recent development. Elsewhere in the region one can still see the ancient techniques of turning the grass sod with digging sticks and the puddling of the flooded land by driving round and round a team of water buffaloes until sufficient mud has been stirred up to form a seed bed.

The extensive grasslands of many islands in the Lesser Sunda group are also associated with stock raising, e.g., on Sumba and Flores and the savannah vegetation of Timor. This part of Eastern Indonesia has generally a fairly pronounced dry season which favours and assists the annual fires which have largely exterminated the original forest cover (still seen on Flores capping some mountains). So in this area, too, and many other examples could be cited, the evidence is clear of the effect on the land of man and his choice of land use following his traditional pursuits of agriculture. In other

words there is a correlation between the type of people on the one hand and the induced ecology of the land they inhabit.

In considering these problems, attention should be drawn to the work of Terra (1952-1953) who has studied in detail the agricultural pattern and social organization of the many peoples and societies throughout Indonesia. These studies were extended to include the sociological aspects of agriculture in South-East Asia and he reached conclusions of extreme interest and of far reaching implications in elucidating the interaction between man and his environment. His studies confirm the thesis stated above that man is responsible for the creation of grasslands in the tropics, moreover that these grasslands are associated with people who keep stock as their primary occupation. However, Terra was able to pursue his enquiries one step further and establish a link between the social organization of the people and their method of agriculture. He claims that throughout Indonesia and even in other parts of South-East Asia having related people, evidence can be found that the keeping of stock, cattle and buffaloes, as a predominant form of agriculture is associated with a patriarchal (perhaps he means patrilineal) society. Following this line of thought, he traces the development of these forms of society in various parts of Indonesia and shows that the social organization of the people seems to be the determining factor in their way of life, including their agricultural practices. A patriarchal (or patrilineal) society can be expected to be based on stock keeping and as a result, the land it occupies is characterized by grasslands. This occurs irrespective of whether the land is in a high rainfall area, suited to other forms of agriculture, or in a dry region where the establishment of a permanent system of agriculture may be difficult.

On the other hand Terra shows that a maternal, matriarchal or matrilineal society is associated with or perhaps results in an intensive form of agriculture with the hoe as the basic tool. These forms of society were responsible for the introduction and extension of irrigated rice fields and the culture of mixed gardens. The typical example of such a society is the Javanese, but other representatives can be found in various parts of Indonesia, e.g., the Minangkabau of Central Sumatra. Naturally there are exceptions, due to acculturation and the influence of neighbours or social pressures and population growth. The outstanding example of acculturation are the Sundanese in West Java, originally a patrilineal society, which has adopted the sawah rice culture of the Javanese, although many examples of their former system of agriculture can be seen, especially in Bantam, in West Java, i.e., furthest away from the Javanese influence, but is even noticeable close to Bogor where, despite the heavy evenly distributed rainfall, rice culture is not as extensive as one may expect. Terra considers that the Javanese " Malaisiens " must have reached Central Java at about the time of Christ, some three hundred years after the Sundanese (" Indonesiens "). They were cultivators of irrigated rice fields and gradually extended their influence east and west. The pattern of the extension of rice culture can be clearly seen on flying over Central Java. It is clear that what might have once been small valleys or watercourses were first dammed and check banks erected in terracing the land. As land use extended, further areas on either side of the central band of rice field were brought into cultivation, eventually leaving the village sites with their characteristic gardens of fruit trees as islands in the surrounding rice fields. Until one sees the pattern from the air, one does not realize that the villages are virtual islands, occupying the higher sites in the landscape. But curiously enough this is a relatively recent development. In about 1800 Java still had a population of about five million people (against 52 million in 1959) and the intensification of irrigation farming including the Javanisation of Sundanese areas occurred only in the past 150-200 years. South-west of Jogjakarta in Central Java one can still see the progress of this process where rough log barriers are erected across small rivers to divert water for new irrigation blocks. A further step, following population pressure in Java, has been the cultivation of dry, unirrigable hillsides, with dry rice and a very recent introduction, tapioca *Manihot utilissima* as the principal crops. The contention of Poggendorff (1953) that irrigation followed and displaced the culture of dry rice cannot be substantiated by examples from Indonesia.

Perhaps the conclusion of Terra (1953) could be best illustrated by quoting him.

" It appeared that all regions with a sedentary population and ecologically suited for mixed gardening, where mixed gardening was never-

theless lacking, had father-right (Gajo, Alas, Batak, Nias, Mentawai, Pasumah, Moluccas) or a parental system probably based on a past with father-right (Toradja) .... On the other hand, all regions suitable for and used for mixed gardening had mother-right or parental customs based on a past with mother-right. As already stated, some people in regions not suited to mixed gardening (the South Belu and the peoples of Wetar, etc.), nevertheless have mixed gardens and at the same time, mother-right. Thus in Indonesia there is a strong correlation between mixed gardening and mother-right.

"Thus, we see that in Indonesia, all regions with extensive grasslands are, or have been, inhabited by patriachal cattle holding peoples or peoples with almost the same type of culture (Toradja).

"With the Indonesian peoples their cultural inheritance appears to have determined their type of agriculture, almost independently of their hereditary character and of ecological circumstances ; cattle holding and grasslands in regions where the natural cover should be tropical rainforest ; hoeing culture and mixed gardens in regions so dry that they are much more suited to cattle holding."

The above pattern of development draws its examples mainly from Indonesia and applies to conditions existing there, It cannot be applied to Papua and New Guinea where cattle or buffaloes have not been part of the traditional form of agriculture. A food gathering and hoeing agriculture is found over the whole area irrespective of the type of social organization, e.g., the people of the Highlands of New Guinea representing probably the most intensive form of agriculture and land use based on the sweet potato *Ipomoea batatas* are generally patrilineal. The Trobriand Islanders, who also have a fairly intensive system of land use, involving the utilization of compost for Yam, *Dioscorea* spp. culture, are matrilineal. The Tolai people on the Gazelle Peninsula of New Britain having a staple diet of taro and *Musa* sp. are matrilineal, so are most of the Melanesians along the Papuan coast, one of the exceptions being the Motu at Port Moresby who are patrilineal. The people of the Western District of Papua (Sago staple) and most of those in the Sepik (Sago and Yam staple diet) are generally patrilineal. Thus, it would appear that the "Papuans" and the Melanesians inhabiting Papua and New Guinea represent earlier cultures than those found at present in Indonesia, and cultures in which, perhaps due to the absence of stock raising, the same degree of specialization has not developed. The relics of older cultures based on grainless hoeing agriculture can, however, be found in many parts of Indonesia, e.g., Nias and Mentawai with a taro *Colocasia* sp. staple, Mandar on Celebes and the Halmaheras with a basic diet of *Musa* sp., and Ceram where a mixture of *Musa* sp., *Colocasia* sp. and Sago *Metroxylon* sp. is found. Rice is not usually found in these areas, and if it is, it is only a very recent introduction as are some of the new world plants, maize *Zea Mays*, sweet potato *Ipomoea batatas* and tapioca *Manihot utilissima.*

The investigations of Terra in tracing a correlation between social organization and land use are not only most interesting, but are also valuable in removing much of the "inevitableness" from land utilization and ecological environment. If the system of agriculture and indeed the present vegetative cover of inhabited regions is so greatly influenced by man and is merely the result of the accident of a form of social organization, then there must be hope for the possibility and success of effecting improvements to agriculture and inducing man to adopt practices leading to the preservation and improvement of the land and other natural resources.

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