Man and Plants in the Tropics: an Appeal to Micronesians for the Preservation of Nature

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Man's influence on vegetation and flora is, and has always been in some way, destructive. *Homo destruens* has, at least in the palaeotropics, influenced vegetation for over one million years and has left traces and scars almost everywhere. We should consider present vegetation as a result of the dim past, see it in Time.

It is sometimes assumed that primitive man hardly influenced the overall aspects of tropical vegetation. This may be so for rain-forest dwellers, as Negritos, who are powerless against the forest, but the idea is fallacious for nomadic food-gatherers hunting with fire in semi-arid or seasonal regions. They are, even in very small numbers, capable of influencing vegetation wholesale, such as has happened in tropical Africa and Australia. Immense changes in the composition of vegetation must there have taken place in the past, and parallel with those changes, degradation of soils by wind and surface erosion. Even in subhumid regions vegetation may suffer severely and over large areas during exceptionally dry years at intervals of decades or a century.

In the last five odd millennia husbandry and agriculture of more advanced settled civilisations have in many areas replaced the nomadic food-gathering hunting way of life. This led to intensified destruction or change of the original plant cover, more in particular in the seasonal countries where Man was master of the situation and not powerless against the forest or other ligneous types of plant cover. In fact these very seasonal areas were probably the major sites of ancient civilisations and the birth-places of the selected staple foods, making more advanced forms of civilisation possible. Thus it is, that in hardly any part of the semi-arid and seasonal regions of the globe, and in many subhumid areas as well, can a true climax vegetation be found and studied; we can only make a guess towards its pre-Man composition. In many parts of the world forests have degraded to shrubbery or savannah-like types, or simply to grassland, steppe or semi-desert. Soils are depauperated through the ages, in no mean degree through wind, sometimes developing into dust-storms, and the degradation spiral has set in, resulting in the desiccation or desertification of the land.

The sequences of this spiral are: accentuation of the extremes of the micro-climate, and possibly, even of the macroclimate—encouragement of fire-resistant pioneer plants—increase of the annual fire-staple—exposure of bare soil—removal of finer fertile soil particles and humus—degradation of soils—sparser vegetation with steadily slower recovery, and so on.

All in all, my estimate is that onwards of his coming, Man has influenced vegetation in the tropics over a surface of similar cosmical magnitude as that over which the Pleistocene Ice Age wrought havoc in the cold and temperate zones of the northern and southern hemispheres.

This brings me to another point, viz that these destructions have influenced

the evolution of the plant kingdom, cut off certain lines of affinity through extermination, but also through the origin of new, sometimes extreme, environments stimulated the creation of new species or even genera. Experience shows that it is precisely in the disturbed areas, in the Arctic, in the North American temperate zone, in the Mediterranean and in the tropical savannahs and secondary growths that the systematist frequently encounters great difficulty in delimitation of species. This situation is of course nothing innate to Man's interference; it must have taken place in a similar way in uninhabited nature, and still takes place where natural forces change environment, by mountain uplift or decay, by volcanism, by transgressions and regressions. Island floras which have no escape-possibility in a changing physical environment are particularly vulnerable in this respect.

In vegetatiography the very long preceding period of destruction is often not sufficiently realised and through this it not infrequently happens that a direct correlation is made between climatic or edaphic conditions and the present plant cover whereby it is concluded that the first are the cause of the occurrence of this or that vegetation type. For example grassland on a leeward, rain-shadow slope versus forest on the windward slope, or, heathland on sandy expanses and forest on more fertile soils. Such simple conclusions have in my experience almost always proved completely, or at least partly, erroneous. No such rash interpretations are permissible unless certain axioms and criteria have been carefully taken into consideration, especially the golden rule not to confuse condition and cause. Mostly the environment is the condition, but Man is the immediate cause, the active agency.

As said before, even sparse populations have through the human era influenced vegetation in the tropics, their seasonal parts in particular.

Through medical and agricultural improvement during the colonial epoch, there has been a tremendous increase in the population-density of the tropics, resulting in an alarming increase in land hunger. Moreover, the development of powerful techniques for digging, road-making, levelling ground, drainage, setting up of power stations, etc. has made it possible to attack and penetrate great surfaces of land. This march on the equatorial jungle has still more extended on the vegetation of the seasonal regions, or what is left of it, and even encroached on the everwet rain-forest areas which were up to some decades rather safe, native shifting cultivation excepted. In Brasil even the new capital is set up amidst the ruthlessly destroyed rain-forest, which will here never be regained.

This brings along a new danger for the future land-use of the humid tropics not sufficiently realized by those who regard the soils of the "luxuriant" tropical vegetation as rich. In fact, soils under everwet rain-forest conditions are generally poor or very poor by the leaching effect of precipitation throughout the year exceeding evaporation, resulting into the laterisation of the soil. As a forest officer in Malaya expressed it "our timber grows on a desert." This was precisely the experience of ancient cultivators who took by necessity to the shifting cultivation system. The only natural fertilising agency on these poor tropical soils is the roots bringing up minerals to the topsoil and the dropping of leaves and fruits producing the humous litter. The regular or definite removal of this

agency is the poorest way of land use and will result in an immense, almost irrestorable loss and lead to poor waste lands with grass or other stunted regrowth.

Our subject inevitably leads us to consider the future of tropical vegetation and environment under that aggressive greedy agency: Man.

To me this future, thinking in terms of one or two centuries from now, looks very bleak indeed. It is not only that scientific botany in its endeavour to unravel the mechanism(s) of evolution will be deprived of essential study material, but that genera and species may disappear as living entities, sometimes even before they might have become known.

To some this may, at first sight, appear to be the mere whim of a botanist. It may come closer to the man in the street, if I add that this also concerns the destruction of the fauna as well. It may come closer if I recall to mind that the big animals are at present seriously menaced. Elephant, tapir, rhino etc. become scarcer and scarcer, and that only partly by hunting. Mrs. Harrison made in Borneo a scientific field study of that large mammal, close to ancestral man, orang utan, and found an alarming retreat in numbers in many areas, not because it is especially hunted, but because its environment is becoming occupied by man, its living space is destroyed and becoming unsuitable for its living conditions.

The situation is far more serious than that: Man's influence on tropical vegetation, if going on by the increasing rate of today, is a major problem of Mankind itself. Man is taking the fat of the earth, a greedy ruthless predator on his own environment.

I realize that the subject leads automatically to a perspective which is not restricted to the tropics, although more urgent and obvious in the tropics than in the temperate parts of the globe.

In fact, this is the core of the problem: Man is changing the ecosystem of the whole world for his own purpose without regard for the immense creation of Nature, the result of a slow development from an arid planet to the present unique plant and animal life during the immense period of a thousand or more million years.

As a penultimate result of this unique biological evolution Man evolved. By his intellect he has gradually increased his power over this creation. But he is also endowed with ethics, with religion, and these most intimate human feelings must prevent him for being a ruthless automaton of destruction.

It is not only his increase in needs, it is particularly his increase in number and thereby the necessity of encroaching upon more and more land to feed more and more people. As no living human being can be denied the right to live and to eat and to occupy soil for his purpose to have his family and his happiness, no Government can afford to set suitable land apart in considerable surface if population pressure urges its occupation. It is unrealistic that this could be done. Therefore, the only safe nature reserves will ultimately be restricted to completely inaccessible, unhabitable places: to rock deserts, the glaciated parts of the globe, bare rock faces in the high mountains, and the depths of the sea.

Never before, in human history, it has been realized that there is an end to space Man can occupy.

He has to face that there is an end to extending his numbers. He is "cor-

nered" on the planet Earth and the unprecedented challenge to him is to face this unshakeable fact and look ahead to visualize what must be done in order to keep such conditions that the life of the masses remains safe, that they live under human conditions, that is, human dignity and the enjoyment of life.

Up till now the solving of this problem by Governments and scientists has mainly been focussed on the increase of food and anti-hunger campaigns.

This is, however, only a measure to postponement, it is mere delusion. Increase of food production has, in all underdeveloped countries, temperate and tropical, hitherto only led to a proportional increase of people but no to an elevation of the standard for each person.

It is postponement anyway, because whatever increase of food can be attained, there is an end to the food production and to the penultimate possible number of people on the earth, whether it may be estimated at 3000 million, 6000 million, or even more. At some time in a rather near future he will have to face hunger with no escape.

Even the temporary postponement brings along great danger because the number of cultivated crops of high yield is restricted. The feeding of mankind rests on a very limited number of staple foods, that is monocultures of a few kinds.

This is however an extremely narrow balance. Newly evolving pests and plant diseases may cause wholesale crop failures. In addition, small changes in climate may lead to disastrous results if the maximum food production is tuned to the maximum population density, that is, when there are nowhere in the world surplus supplies or space to grow such surplus supplies.

The great danger is, that if the simpleton remedy of producing more food goes on for another century, all available ground for production of food will be occupied and reversely all natural vegetation will be destroyed. The 6000 million odd people will then have to live in an artificial ecosystem of villages and cities amidst intensely cultivated land planted with selected crops of highest yield with no natural vegetation left.

The loss of nature will involve the loss of an irreplaceable array of gene pools which evolution has built up during an immense past: gene pools which are essential to maintain and preserve.

Besides food, however, man is in essential need of recreational space. But apart from deserts, cold and hot, no recreation area will then be available. It needs little imagination to visualize that under such conditions man becomes a mere feeding automaton only concerned with a craving for food. This will inevitably lead to an unbearable mental stress, which in turn will lead to serious conflicts, locally and internationally.

The only real approach towards achieving a liveable world where each human being can enjoy a decent living is, in my opinion, to face a challenge in his ethics. At present it is ethics or religion to reproduce in a most careless way. To many it is ethics to have as many children as possible. To-morrow it should be against social ethics to have more than three or four children. Intensification of agriculture and husbandry on the presently cultivated areas together with restriction of his numbers will enable Man to have all the pleasures of life and live in dignity and in peace. Destruction of nature should be called to a halt.

Frankly, the only possible measure seems to me if Man really shows himself to be "sapiens" he will decide that it is necessary to restrict his number in order to gain a liveable balance with natural vegetation and fauna, that is, with his ultimate resources. May wisdom prevail with Mankind and its Governments to take this unprecedented, rigorous step for the benefit of all. Sapience brought Man to power, let sapience prevent him from destroying the environment he will need in future.

Fortunately there are signs that in some Government circles and in the United Nations organisations the alarming increase of Man's influence on tropical vegetation is raising anxiety. Not long ago Unesco devoted a special symposium to this subject at Lae-Goroka in Papua on the instignation of Mr. John Womersley.

Conclusion

The Pacific Islands harbour a most unusual flora on land specks in an immense expanse of ocean. Their flora must have undergone a multitude of changes by natural causes before the advent of Man. They still bear witness of ancient nature and its evolution in their isolation position and possess unique plants and animals, and curious assemblages of these as a token of the far past, millions of years ago. Man should respect these achievements of Nature which are really unique on our globe. I mention here the tragic fate of the flora of the Oceanic island of St. Helena which was in a few years time almost destroyed by sheep and goat. A similar fate seems to threaten the unique flora of the Juan Fernandez Islands; Rapa, Pitcairn, and Easter Island have suffered from early devastation. Devastation is making rapid propress in New Caledonia.

The Micronesian Islands are no exception to this dangerous situation. Three things will be needed:

First: an intensified botanical investigation to make at least an *Inventory* of what is left of their flora for the sake of biological science and depositing duplicates in representative botanical institutes in the world.

Second: the laying out of a living collection of threatened and remarkable species in one or more *Botanic Garden(s)* and distribution of living material to other botanical gardens in the world, in order to remain able to study them alive; their morphology, mode of reproduction, their physiology and phytochemistry.

Third: to lay out *Nature Reserves*, safe from fire, from cattle, and from woodcutters, to preserve as many biocoenoses or life communities as are found in the Micronesian islands, provided that a proper control can be maintained. Micronesia should be aware of its own resources, and adequate means should be taken to teach this in schools as well as to Government officials. All people should be nature-minded and find satisfaction and pride in it.