GUEST EDITORIAL

Perspective in the Tropical Rain-forest

In their pictures and otherwise the media often give the impression that individual trees of the rain-forest have been standing for thousands of years, but that is fanciful. In 1961, while I was Director of Forest Research in Nigeria, I published a paper on the growth-rates of trees in the Okomu Forest Reserve, part of which is now a Wildlife Sanctuary. That paper (Keay, 1961), as others from various rain-forest countries, showed that the growth-rates of the various species varied considerably; estimated ages of trees with trunks one metre in diameter at human breast-height varied from 47 years for *Triplochiton scleroxylon* to 260 years for *Lophira alata*. I cannot, of course, rival the *Lophira*; but it is just 47 years since I first saw rain-forest in what is now Bendel State and other parts of Nigeria. In those days we had no Land-rovers — let alone satellite imagery — to help us as we studied the forests and their peoples, on foot or bicycle, often for weeks on end. In 1962, however, I decided for family reasons to return to the United Kingdom, and it was my administrative experience rather than my knowledge of tropical forests which took me to positions in the Royal Society. Since retiring as Executive Secretary in 1985, I have renewed contact with Nigeria and have been striving for some sense of perspective amongst the mass of materials about rain-forests which now features so prominently in the media and even in politics.

In 1989 I attended a conference of the Forestry Association of Nigeria to mark 100 years since the establishment of the first forestry office in the country. The forestry services there, like those of other British Commonwealth countries, were developed on the model of the Indian Forest Service. That was formed in 1855 largely as a result of a report (1851) of a committee of the British Association for the Advancement of Science which had been set up to consider 'the probable Effects in an Economical and Physical Point of View of the Destruction of Tropical Forests'. People tend to think these days that 'sustainable use' is a new idea that has been introduced by conservationists, but in fact it has long been a basic tenet of the forest services. In India and elsewhere, the perceived duty of the services has been to establish legally-gazetted and clearly-demarcated forest reserves from which wood and other materials for local use might be produced *in perpetuity*.

Amazonia Different but not Alone

Most of the publicity about rain-forest today refers to Amazonia, where there is no tradition of forest reserves on the Indian model but where biodiversity is exceptionally high. There are, naturally enough, differences between the rain-forests of the continents possessing them, which are related *inter alia* to taxonomic composition, soils, and other factors; an important one between the forests of America and those of Africa should be noted. Put simply, it is that the moist evergreen forests of Amazonia are surrounded by large areas of so-called Dry Forest which has a closed canopy, a shrubby understorey, and virtually no grass. If, in the dry season, fire is introduced, the standing forest is destroyed and becomes replaced in time by a savanna or *cerrado* type of vegetation. In tropical Africa the moist evergreen or partly deciduous forest is surrounded directly by extensive areas of savanna with tall grass.

Most ecologists have assumed that the equivalent of the American dry forest was largely destroyed long ago by Man and fire, although vestiges remain in protected areas. However, studies by Kortlandt (1984) on the 'bull-dozer herbivores' of Africa indicate that large herbivores, such as elephants and buffaloes, have created — especially on the drier margins of the rain-forest — a mosaic of high forest and secondary regrowth including grassy areas, and that this influence goes back to long before Man came on the scene.

In Amazonia the situation has been different in both of those respects; there are no elephants and other large herbivores to trample the forest, and Man with fire arrived much later and in smaller numbers than in Africa. This seems a reasonable explanation of an important continental difference; the situation in India has, presumably, been like that in Africa, as large herbivores and Man with fire have been around there for millennia. Now the Amazonian rain-forest is being attacked by modern machines and large corporations in a way that India was not.

Biodiversity Important

The great biodiversity of the tropical rain-forests is certainly one good reason for the conservation of as much of what remains of them as possible, and increased efforts are needed for studies at the taxonomic level especially in relation to potential uses, particularly in medicine. Although such studies have been going on for many years, the numbers of species for study are so great that a proper strategy, aimed at groups in which at least a few members are known to contain useful active principles, is essential. Amongst plants, it is also important to focus on those that are restricted to the rain-forest rather than on those, such as the Madagascan Periwinkle (*Catharanthus roseus*), which are commonly found in villages throughout the tropics.

We hear that the Yanomani people of Brazil and other semi-nomadic hunter-gatherers have lived for thousands of years in perfect harmony with the forest, but tend to forget that these species-rich ecosystems

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include many pathogens and their vectors which afflict Man with many debilitating and deadly diseases. The natural ecological balance includes mechanisms to keep human populations at relatively low levels. David S. Wilkie (1988), an anthropologist, writing about the pygmies of Zaire, reported that rain-forest life 'is not a paradise and can at times be desperate and brutish in the extreme. Mortality and morbidity among children are very high. Many children do not survive to [the age of] puberty and few adults reach the age of 50 or 60'. Although — as the media present life in the rain-forest today — there seems to be a revival of the 18th century idea of the 'Noble Savage', the truth is nearer to the situation described by Thomas Hobbes (1651): '... solitary, poor, nasty, brutish and short'.

Certainly we should do what we can to help these people to continue their traditional way of life in the forest, at least if that is what they want. We should not, however, deny them modern medicine and education, which will almost certainly lead to great increases in population and consumption of food, wood, and other biological produce. For all its interest and potential, it has not been traditional medicine that has been responsible for the enormous increases in human populations in the tropics over the past 50 years!

Human Population-growth the Basic Problem

I have been looking at some of the increases in population that have taken place during the past 45–50 years — the period over which I have known tropical Africa and the time that it takes a *Triplochiton* to grow to one metre in trunk-diameter. They are well illustrated by the following table that shows, for the period 1938–88, the factors by which some human populations have grown:

UK	X 1.2	W Malaysia	X 2.9
USA	X 1.9	Zaire	X 3.1
China	X 2.4	Brazil	X 3.2
India, Pakistan & Bangladesh	X 2.6	Nigeria	X 5.5
		Kenya	X 7.1.

With this sort of population growth, it is hardly surprising that rain-forests, which for centuries remained difficult of access and laden with disease, are now disappearing at such an alarming rate. In considering pressures upon the forests, we must also recognize that *per caput* requirements of wood in the tropical countries themselves have increased enormously in the past 50 or so years. In the idyllic life of the aforementioned Yanomani, consumption of paper is presumably negligible; but for countless millions of people in other rain-forest areas it is now considerable. For instance, annual *per caput* consumption of paper in Nigeria rose from 0.29 kg in 1960 to 5.2 kg in 1988, and this, with a more-than-doubling of the human population in the same time, meant a 30-fold increase in total consumption (Adegbehin & Omijeh, 1989). According to Myers (1980), the average annual *per caput* consumption of paper in developing countries is 5 kg, but that for developed countries is, on average, 155 kg, with the United States far ahead at 325 kg. This illustrates the alarming fact that, as living standards improve, the demand for forest produce increases considerably more than even the demand for food.

So what, I ask, have the forestry services in those tropical countries that have had them for many years been doing? Certainly many efforts have been made to manage and regenerate the forests, and techniques exist for replacing felled forest with plantations. Although the forestry services, by and large, have a good record for studying the taxonomy of the trees in their forests, I believe more effort should have been made in the early days to find uses for far more of the species which were then considered 'uneconomic', and were burnt when forest was cleared for roads and farms. In the early years of this century, for instance, the value of indigenous timber was so poorly known in West Africa that offices and houses for the Colonial Service were built from imported coniferous timber. Until World War II, only a few of the many large trees in the rain-forest were considered to be of economic value; but thereafter an ever-increasing number have been cut for local use and for export, inflicting increasing damage on the natural forest.

Regeneration Efforts Needed Widely

Efforts have certainly been made to regenerate rain-forest without clear-felling, starting in Burma in 1865 and extending later to India and other tropical countries. Although partially successful, it is now evident that lack of appreciation of the value of many species, and inadequate ecological understanding, led to mistakes — for instance, the poisoning of trees that are now known to provide very valuable timber. More seriously, however, rain-forest under natural regeneration appeared to the general public (farmers, civil servants, and influential politicians alike) to be unused and therefore available for conversion to apparently more profitable use — for instance, for growing rubber or cacao. This 'presentational' factor in some places encouraged foresters to replace natural forest by plantations, of which the economic uses of the products are apparent to all. Certainly in parts of Africa that I have known, and probably more widely, local farmers respect the integrity of another person's farmland but regard the natural forest as free for all; this attitude has worked in favour of plantations and against natural regeneration projects.

It is clearly essential that, in all tropical countries, adequate lands should be legally set aside and managed on a sustainable basis, primarily for local needs which are bound to increase. In most places this will require plantations which, ideally, should include a variety of indigenous as well as exotic species. If carefully planned, established, and managed, such plantations will quickly re-establish forest cover and yet leave room for many indigenous species of plants and animals. Biodiversity will generally be less than in the natural forest but, under the moist tropical climate, it will be far greater than in, say, a coniferous plantation in temperate regions. On a recent visit to Nigeria I noticed, on arrival at the rest-house in Okomu Forest Reserve, what looked to me like a reasonably mature piece of forest; I lost no time in looking at it more closely and it was some minutes before I realized that it was a plantation of *Terminalia ivorensis* some 20 years old; it was quite different from the popular idea of a monoculture.

'Guardians of the Forest'

In some places and for a time the forestry services have been able to control exploitation and regenerate their forests in conformity with the sustained-yield principle. Regrettably, however, political and economic pressures have overruled this control in many countries and to a large extent. Within the forestry services, contact between the professionals and the forests and their people seems less than it was, and a new race — the 'desk-forester' — has emerged. Conservationists and foresters in rain-forest countries should recognize that they have a common interest, and that both must establish good relations with the people who live in and near the forests, always encouraging their role as *guardians of the forest*.

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