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THE ROLE OF THE FORESTS IN THE AMELIORATION OF THE NIGERIAN ENVIRONMENT¹

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The forest according to the Food and Agriculture Organisation is "any vegetal formation with a minimum of 10 percent crown cover of trees (minimum height 5 metres) and/ or bamboos, generally associated with wild flora, fauna and natural soil conditions, and not subject to agricultural practices" (FAO, 1991). Going by this definition, forests are predominantly trees and woody vegetation growing more or less closely together. The world as a whole is blessed with wide expanses of forestland. These forest areas provide the means of livelihood for nearly 500 million forest dwellers and nearby residents or settlers who depend directly on food, fibre, fodder, fuel and other resources taken from the forest (World Bank, 1991, p.24). Besides the production of biological resources, one other function of the forest is its significant role in the sustainability of our environment.

Within the last few decades, especially since the Stockholm conference on the environment in 1972, concern for the environment and the protection of its quality has been an important issue in international polity and in the affairs of man. This is because unclean water, along with poor sanitation, kills over 12 million people each year while heavy metals and other contaminants kill nearly 3 million more (population reports, 2001). Also the continual production of green house gases, ozone layer depletion and climate instability have all been threatening the future existence of man on the earth's surface.

In this part of the globe, droughts have become more frequent and more devastating (Sagua, 1987). Desertification, a close associate, seems to defy solution as we continue to exploit areas of marginal climate and delicate soils in a desirable attempt to see that more people cease to live on the poverty line.

Sadly, however, the Nigerian Government is yet to take any appreciable measure at halting the decline in our environmental quality (Mohammed et al, 1996). To this end, Nigerian forests have been left to the fate of taking care of themselves, a responsibility they cannot shoulder while under the onslaught of logging.

The forest protects and regulates water resources, protects against soil erosion, serves as carbon sequestration, stores and cycles nutrients, breaks down and absorbs pollution and

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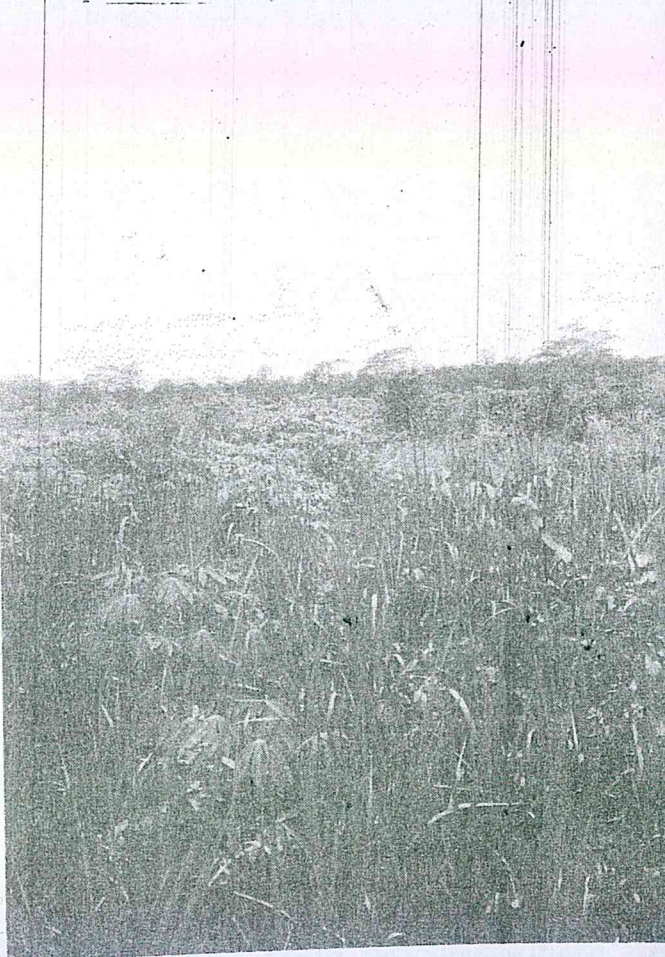
performs other functions such as stabilising the climate. How the forest accomplishes these tasks in the face of growing pressures is of utmost importance to the Nigerian environment.

Nigeria's geography

The Federal Republic of Nigeria is the largest single geographic unit along the west coast of Africa. Lying between latitude $4^{\circ} 20'$ and $14^{\circ} 00'$ North and longitude $2^{\circ} 20'$ and $14^{\circ} 30'$ South, the country has an area of almost one million square kilometres ($> 356,669$ square miles) and lies entirely within the tropical zone. Nigeria is divided into three major and unequal geographical sectors by the River Niger and the River Benue. With a population of about 120 million people (World Bank, 1999), the country is the largest West African state and contains more than 350 ethno-linguistic groups.

Within the country's broad ecological zones, the distribution of major soil types is largely related to the parent rock, which influences such properties as soil depth, texture, moisture condition, nutrient status and the proportion of weatherable minerals. There are ferruginous tropical soils, ferralitic soils, ferrisols, weakly developed soils and hydromorphic soils.

The climate of Nigeria is tropical with variations mainly due to differences in latitude, topography and vegetation between the South, which is hot and wet, and the North, which is hot



Clean clearance of forests for agriculture is now resulting in severely degraded land which is becoming *chromolaena odorata* and grass lands in the high forest area (Omo, Ogun State, Southwest Nigeria).

and dry. In general there are two seasons, a wet season often referred to as the rainy season and a dry season, intensified briefly by the harmattan, a cold, dry wind blowing from the Sahara.

Nigeria also contains a striking range of natural vegetation, from mangrove, swamp and lowland rainforest near the coast to low savanna scrub in the extreme north. Each of these has many variants, affecting both the floristic diversity and the structural appearance of the plant community. The plant community is often organised into a cover, especially in the southern part of the country. This forest cover has continued to mould and shape the dynamics of the Nigerian environment both in process and behaviour.

Status of the forest and environmental crisis in Nigeria

Forests constitute the greatest celebration of nature to appear on the face of the planet since the first flickering of life (Myers, 1985). They are exceptionally complex ecologically, and they are remarkably rich biotically. According to the Food and Agriculture Organisation (FAO), about one-third of the world's land area is forested. With respect to the Nigerian environment, the total forest area of all types in the country was estimated at about 360,000 km² or about one-third of the country's total land area of 983,213 km² of which 773,789 km² is savanna, 75,707 km² is derived savanna and 133,717 km² is rainforest (Nigeria Yearbook, 1975). Generally, forests are found as a climatic climax in the southern part of the country which then changes into savanna woodland and ultimately grassland as we move northward. Nigerian forests are grouped into three different formations: mangrove forest, fresh water swamp forest and lowland rainforest. (Table 1).

Table 1: Area of vegetation types in Nigeria

Vegetal Type	Area (km ²)	Percentage of total land area
Mangrove/ Coastal Forest	12782	1.3
Fresh Water Swamp Forest	25563	2.6
Lowland Rain Forest	25372	9.7
Derived Savannah	75,707	7.7
Guinea Savannah	400, 168	40.7
Sudan Savannah	342,158	34.8
Sahel Savannah	31463	3.2

Source: Edmund O. Egboh (1960): *Forestry policy in Nigeria*. University of Nigeria Press

Forests play many diverse and complicated roles in our life. Beside the production of biological resources and provision of social benefits, the forest also provides us with environmental services.



Deforestation and habitat changes are causing sensitive plant species, such as the *Thaumatococcus daniellii* to die off at an alarming rate.

However, since the forest ecosystem itself is a component of the environment within which the biosphere subsists, our various interactions with the natural world and occasional natural cyclic fluctuations have had debilitating effects on our environment. The publication of the Federal Ministry of Science and Technology in 1987 and 1989 on environmental disasters in Nigeria, show many of the deplorable situations in our environment. According to Mortimore (1989), drought incidence is on the increase everywhere in the country as aridity is intensifying in areas north of Latitude 11°N. Former fixed dunes are being mobilised; agricultural lands are becoming less productive as desertification spreads its wings; Fadama lands are drying out; gully erosion is defying solution; floods are becoming more frequent and more devastating. Waters and land in crude oil producing areas are becoming increasingly polluted by oil spills; the continuous flaring of gas and bush burning add to the problem of green house gases in our immediate atmosphere, while our industrialists continue to discharge poisonous gases, toxic solids and dangerous effluents into our air, land and watercourses.

Akinsanmi (1999) states that Nigerian environmental problems vary depending on the region and geographical location. While the arid North's environmental problems include desertification, shortage of water, dust and sand dune encroachment, the environmental problems in the south include deforestation, coastal erosion, urban sanitary problems and oil pollution. Whereas water and air pollution are mainly featured in industrial and urban areas,

land degradation and soil erosion are common problems in many states of Nigeria. A World Bank environmental report in 1990 identified the principal environmental problems facing Nigeria and which required immediate attention as: land degradation, vegetation and forest degradation as well as air and water contamination.

Nonetheless in 1991, the Nigerian Environmental Study Action Team (NEST) came out with a publication stating that the Nigerian environment is threatened not only by natural changes and human misuse, but also by desirable activities designed to combat some of the environmental problems arising from such changes and misuse. In the cry to save the environment, foresters have been in the forefront. Their programmes, philosophy and perspectives have hinged on the role of the forests in ameliorating our environment.

Forests and the protection of biodiversity

Mc Neely, J. (1990:17) defines biodiversity as an umbrella term for the degree of nature's variety. It encompasses all species of plants, animals and micro-organisms and the ecosystems and ecological processes of which they are part. The diversity of life to be found in our forests and the intricacy of the interactions among the different life forms are the greatest wonder of our environment. Wild plants and animals have two principal uses. One is concerned with sustaining our food production and the other with protecting our health.

Nigeria is blessed with numerous wild and domesticated plants that contribute immensely towards food supply, fibre for cloth making and raw materials for building purposes (Akinyemi et al. 2001). Though the number of major crops is small, their continuing productivity is underpinned by a reservoir of genes present in a much larger number of related wild species. Domesticated and wild plants and animals provide the majority of the food for our teeming population. In addition to food presently used and species with potential food uses, other species are becoming increasingly important as sources of better productivity in agriculture.

Biodiversity also provides medicinal resources—traditional medicines based on plant and animal species form the basis of health care for 80% of the nation's population. These resources are also the origin of many chemical compounds, which are now being produced synthetically, e.g. aspirin. Apart from this, raw materials such as woods, fibres and ornamental blooms are supplied by most forest species.

Unfortunately, these countless species of plants and fauna found in our forest are becoming endangered or extinct with the destruction of their habitat. For instance, it has been estimated that undisturbed forest in Nigeria decreased from a 2.9% area of the nation in 1976/78 to 1.3% in 1993/95 (Akinsanmi, 1999). This has great and profound implications for the scientific, aesthetic ethical and economic value of our biodiversity.

As a corollary to this, the extent to which the preservation of biological resources may be compatible with different kinds and intensities of forest use and management is of immediate concern. Yet Nigerian forests provide a habitat for millions of species of flora and fauna.

Climate regulation

Climate has an overwhelming influence on all the processes in our natural environment. For instance, in the Nigerian forest area, moisture from the Atlantic Ocean falls as rain on adjacent coastal areas. This is then sent back to the atmosphere through transpiration of the foliage to fall again on forest areas further inland. This recycling of water occurs several times so that the harmattan period and rainy season in the country are regulated.

The Nigerian environment benefits in yet other ways from the forest cover, notably its famous "sponge effect. Forests soak up rainfall during the wet season and then release it in regular amounts throughout the dry season. In one context, however, deforestation has been seen to change part of the country's rainforest into derived savanna. In another case, the destruction of our forest cover is fast contributing to global warming. Daily and seasonal temperature extremes have been found to increase dramatically in areas where tree cover is being removed (Harrison, 1966). This is mainly due to the large quantities of carbon dioxide and other green house gases (e.g. Chlorofluorocarbons CFCs) being released into the atmosphere from burning fossil fuels and other modern industrial and agricultural practices. These green house gases trap thermal radiation, redirecting some of the heat back to earth, causing the temperature to rise (Flavin, 1989).

Despite this, our forests constitute a significant factor in carbon sequestration and also serve as a carbon sink through the living trees that store carbon dioxide from the atmosphere using it in their process of photosynthesis. Generally, vegetation cover plays an important role in modifying the microclimatic conditions of an area (Young, 1989)

Preventing or halting desertification

In dry areas where vegetation is relatively sparse, trees and open woodlands play a vital role in stabilising soil and water and giving shade to people and animals. When the trees are removed, croplands and rangelands become more exposed to the many elements of desertification.

Desertification is the reduction or destruction of the land's biological potential, finally resulting in the appearance of desert conditions. It is one aspect of the generalised degradation of the ecosystem under the combined pressures of adverse and uncertain climatic conditions and over exploitation. This over-use has reduced or destroyed the biological potential, that is to say the plant and animal production for multi-purpose

use, at the very moment when increased production was needed to meet the needs of growing populations aspiring to development' (UNCOD, 1974).

During the late 1960's and early 1970's some observers claimed that about 10 million cattle perished and between 100,000 and 200,000 lives were lost as a result of the Sahelian drought and famine, an aftermath of serious hostile environment (Rhodes, 1991). The United Nations Environmental Programme (UNEP) suggests that there has been a continued 'southward march' of the Saharan desert by about 100 kilometers between 1958 and 1975 (Forse, 1989). This poses a great threat to the semi-arid regions of Nigeria resulting in water shortage, reduced soil productivity and soil erosion.

Ever since, the growth of wind breaks and screen shelters increased crops on the soil. Thus the establishment of green belts and similar tree plantation, including agroforestry, are seen to be the only remedy for halting desert expansion.

Prevention of soil erosion

Forest cover not only plays a vital role in pedogenic processes by which soil is formed (Bout et al, 1976). It also serves as one of the most important factors that influence the extent of soil conservation after it has been put to use. One basic way by which soil condition deteriorates is through erosion. Agricultural soils of Northern Nigeria constitute a very serious problem due to wind erosion (Ologe, 1988), especially during the dry season or early rainy season (Kalu and Goodwill, 1985). The removal of farm residues, a practice among Southern farmers, easily leads to accelerated soil movement by many factors.

Forest clearance is also associated with increased run-off of rainfall and intensified soil erosion. If trees are felled mechanically and skid roads are used to transport the timber, it greatly increases the risks of serious erosion. (Hamilton, 1988). The erosion of fertile topsoil not only leads to reduced yields but also requires increased labour by peasant cultivators (Solon and Krishna, 1995). Apart from this, the loss of topsoil is accompanied by increased troublesome sedimentation in rivers and reservoirs, the aftermath of which is flooding and damage to irrigation systems and hydroelectric stations.

Given the fact that forest clearance is a major factor contributing to soil erosion and flooding, forest litter and under storey vegetation are the most effective parameters in reducing soil erosion. Also, the tree canopy and root systems of large trees help in soil moisture absorption and in deterring erosion.

Ecosystem services

Ecosystem services are broad natural systems and functions. The forests provide and regulate water resources, the soil, nutrient storage and cycling, pollution breakdown and absorption, and fulfil other functions such as recovery from unpredictable events.

An average Nigerian relies heavily on these services. For instance, water supply, especially to rural dwellers, is affected by whether or not catchments are vegetated. In the same vein, forest vegetation not only plays a vital role in pedogenic processes by which soil is formed, it also determines soil health, which is of significance to agriculture.

Beside all these functions, the pollution breakdown and absorption capacity of our forests is essential to deal with our wastes. This occurs through the various biogeochemical processes taking place in the forests.

In addition to this, the processes of industrialisation and development being simplistically equated with economic growth have seen the forests provide us with opportunities like forest based crafts, industries and related activities. This last point however, has brought with it a massive degradation of the Nigerian forests, threatening the future supplies of its numerous biological resources and ability to meet the challenges of ameliorating our environment.

Pressures on our forest

Deforestation, defined as "the degradation of entire forest ecosystems involving wildlife species, gene pools, climate and biomass stocks" (Myers, 1989) has reduced greatly the extent, diversity and stability of the Nigerian forest. The Food and Agriculture Organisation estimates that Nigeria destroys about 600,000 hectares of her natural forest every year through careless exploitation of fuelwood, timber and slash and burn agriculture (Okafor, 1988).

The amount of forest area per capita fell between 1952/3 and 1991, reflecting the relationship between population growth and the disappearance of our forest cover. Likewise, the waves of urbanisation and industrialisation processes have seen increasing demands on forest products for building, construction and for recreational purposes (Chup, 1996).

The most significant factor contributing to the diminution of the entire forest resource base of Nigeria is unrestrained fuelwood harvesting (Ogbonna, 1996). In this country fuelwood and charcoal account for over 80% of natural energy consumption (Foley, 1986). Therefore, as more and more people depend on the use of fuelwood as a source of fuel and energy, the impact on forest diminution and environmental degradation increases.

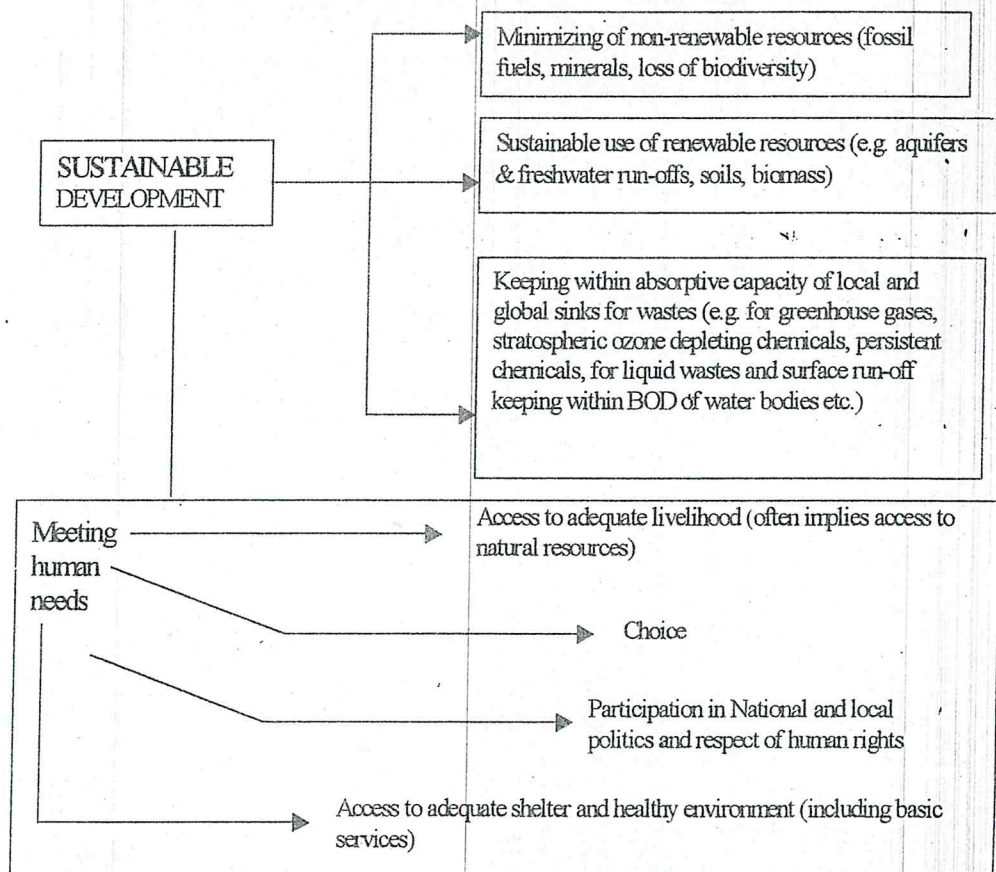
What can be done?

As population grows and per capita consumption of forest products increases, the style of exploitation of our forests will determine the sustainability of our environment. In situations where exploiters are not controlled, however, population pressure, urbanisation, industrialisation and deforestation will lead to further degradation and bankruptcy of the environment. To meet the challenges of ameliorating our environment, therefore, our forests need to be rationally and functionally utilised within the framework of sustainable

development (see fig. 1)

Fig 1: Components of Sustainable Development

Source: Hardoy, Mitlin & Satterthwaite, *Environmental Problems in the Third World*, Fig. 6.1, 1992: 181.



According to Barrows (1994), sustainable development is "any activity that raises social welfare with the maximum amount of environmental degradation allowable within given economic, social, and technical constraints". To achieve this, the following are suggested;

First, there is the need to re-enact and enforce all existing forestry regulations. This would go a long way towards restricting all environmentally negative human activity while safeguarding our wild plants, trees and animals. Moreover, adopting a system of forest

product certification that identifies forest products which come from sustainably managed forests, could support efforts toward sustainability.

Secondly, the establishment of strictly protected areas such as National Parks and Forest Reserves has proved an effective means of forest conservation. Apart from protecting plants, animals and micro-organisms from indiscriminate exploitation, it also brings about a wide range of environmental benefits such as watershed protection, preservation of biodiversity, climatic regulation and consumption values, as well as direct financial gains through tourism. Thus, our government should do more to encourage the establishment of such areas.

Thirdly, technological improvements, including the use of recycled paper and paperboard, will reduce the pressure on our forests and consequently the impact on our environment. Beside this, our vast petroleum and natural gas resources should offer ample opportunity and leverage to implement a sustainable energy programme that includes affordable, attractive and convenient alternatives to fuelwood which is ecologically speaking under extreme pressure. This requires immediate changes in technical development and orientation.

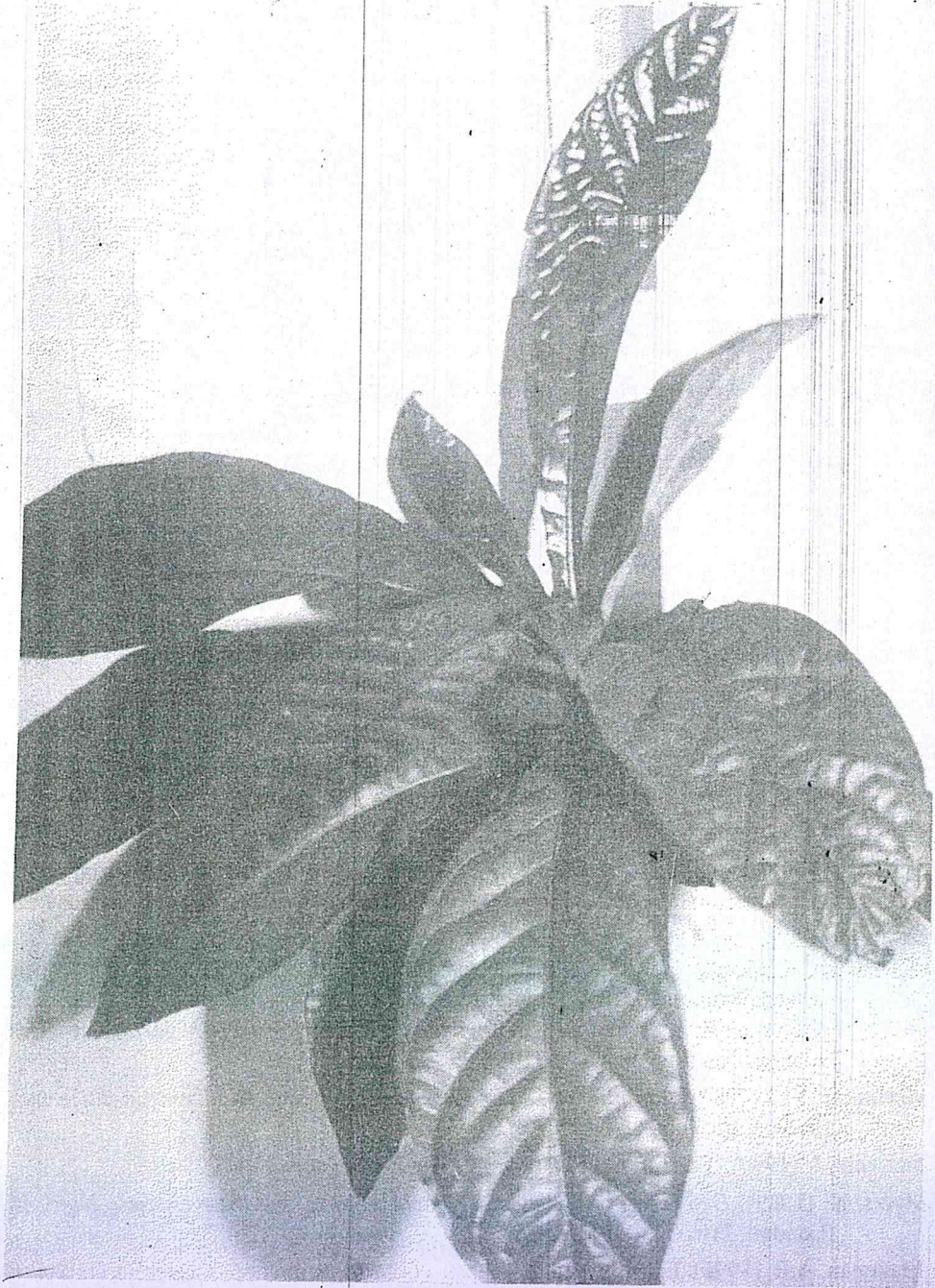
Lastly, non-governmental organisations should assist in educating and enlightening Nigerian citizens on the dangers of many actions and activities of theirs and why some respect should be given to the ecosystem. The reason behind this is that the fundamental changes required to prevent a wholesale destruction of the nation's natural resources will come about only when people are adequately informed and given powerful incentives to rethink and reform their behaviour toward the environment.

Conclusion

From the foregoing, it has been shown that forests play an important role in the amelioration of our environment. However, since the forest itself is a resource base, the utilisation of these resources poses a severe ecological threat to our environment (Mamman, 1996). The use to which the forest is put must not be incompatible with environmental sustainability. So, while we focus on the benefits derived from using the forests, we must not undermine the controlling or limiting of the harmful impacts of such activities on the environment. An application of forest protection initiatives and the consequent influence on the amelioration of our environment can be of great benefit.

Acknowledgement

The photos in this article were supplied by CENRAD. CENRAD is collecting stumps of *Mascularia acuminata* (photo next page), raising them on-station and producing fruits by hand pollination. Over 20,000 seedlings have been produced and distributed to farmers for planting in agroforestry systems in order to control natural forest depletion.



Overexploitation of specific species, such as *Masularia acuminata* (Pako-ijeju), a chew stick species, is causing the disappearance of this plant.

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