



WHAT HAS TO CHANGE FOR FORESTS TO BE SAVED: AN EXAMPLE FROM NIGERIA PIUS AKINDELE ADENIYI

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ABSTRACT

The role of forest resources in rural livelihood and income generation in Nigeria cannot be overemphasized. The ecological, social, economic and environmental roles of the forest could not be dispensed with. The rate of increase in Nigeria population is very high. As a result, there is also increase in the demand for forest resources and land for agricultural purposes. This has led to the wanton removal of the forest ecosystem. This paper considered forest reservation efforts in Nigeria. It also looked at the rate of deforestation and its implication on man and animals, the environmental and biodiversity conservation. The various causes of indiscriminate forest removal were examined and recommendations were highlighted on how to preserve this essential and versatile natural endowment in perpetuity.

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INTRODUCTION

Nigeria covers an area of about 983, 213km² and about 1/3 of this was classified as forest (Pius Akindele Adeniyi, 2016; Adekunle *et al.*, 2009). The area under forest is continually diminishing, mainly due to conversion into agricultural uses. In order to conserve this forest from total depletion, about 96,061 km² of forestland, or 10% of Nigeria's total land area, was set aside as forest reserve. This reserved forest has diverse vegetation types that may be broadly divided into two namely savanna and rainforest. Savanna occurs largely in Northern Nigeria and covers an area of 75, 297 km². This is about 78% of total reserved forest. The rainforest accounts for only 2% of the country's total land area and constitutes the primary source of timber supplied (Pius Akindele Adeniyi, 2016; FAO, 2016). Forest reserves are portion of forest estate constituted by law and gazetted by the State or Local Government. Laws are used to protect these forest estates and activities are controlled by the government.

It was lawful for a Governor to constitute as Government forest reserves or local government forest reserves any of the following lands. (a) lands at the disposal of government (b) any communal or other lands in respect of which it appears to the governor or council on advice of the chief conservator of forest that the forest growth on such land should be protected or reserved or forest growth be established (forest law Cap 40 part 3 No. 6).

Three other criteria used by the colonial administrators in the reservation exercise are as follows

Population density: Area of low population density such as Ondo and Benin provinces were to reserve 45% and 60% of their land respectively while the highly populated areas were to reserve 25%. Reserves were created in some area by mutual agreement and where land tenure was not in conflict with reservation, iii. Lands where much revenue was not derived from the forest products and where plantation crops such as cocoa, kola, coffee and oil palms were absent.

History of forest reservation in Nigeria: The policies for forest reservation came as a result of the economic interests in forest products and conservation of surface water for domestic uses. Food production by shifting cultivation had destroyed

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most of the economic species that were of high demand. Intensive grazing by livestock, indiscriminate burning of vegetation and cutting of tree branches had also destabilized the environment. In 1902, it was discovered that shifting cultivation had caused erosion and gullies in Udi-agulu-nankanobi plateau in the eastern region of Nigeria. There was also the problem of water siltation in the savanna zones as noticed in Ogba River. noted that the rate of deforestation in the high forest zones for local production was over 5180 km² per annum and that shifting cultivation had denuded over 2 2590 km² of tree growth. These problems further resulted in sand dunes, destruction of farm crops and loss of soil fertility. Lands were rendered marginal for agriculture (www.worldagroforestry.org/downloads/Publications/PDFS/B15713.pdf; www.worldagroforestry.org/downloads/Publications/PDFS/B15713.pdf) Therefore, the need for forest reservation became very obvious. As a result, Forestry Department was established and successfully organized for Southern Nigeria in 1899 by one Mr. Thompson, a serving British Forest Officer transferred from India to Nigeria and he also began the forest reservation plans 4, 25 By 1901, Forestry edict No. 28 was passed. In 1904, the administration considered it necessary to reserve some of the good quality forest so as to stop their destruction and conserve biodiversity. In 1908, The Forestry Ordinance was enacted as legal instrument for the constitution of forest reserves (3, 23 A target of 25% of the country's land area was proposed for reservation but little was achieved in forest reservation due to stiff resistance of local communities who rightly established their claim to the land.

It was noted that the primary management task during the first phase (the reservation phase between 1899 and 1930) was to demarcate and establish tracts of forest land as reserves, provide for their protection and control the removal of forest products. Only 9% of the country was diplomatically put under reservation in 1915 and another 1% reservation area was achieved latter, bringing the proportion of forest reserve to 10% of Nigeria's land area. Such areas were surveyed and gazetted. The forestry Department was then charged with the responsibility of ensuring the protection of such areas. (Pius Akindele Adeniyi, 2016; Daniel D. Chiras and John P. Reganold, 2009; Susan Clayton and Gene Myers, 2015). Table 1 shows the area of forest reserves in Nigeria by vegetation types while Table 2 reveals the trend in forest reservation between 1900 and 1983. The reservation areas were achieved according to the criteria laid down by policy.

Table 1. Reserved Areas in Nigeria according to Ecological Zones

Ecological Zones

Area of Reserve (knr')

% of Reserved area

Sahel Savanna	2,571	2.6
Sudan savannah	31,247	32.4
Guinea Savanna	38,271	39.7
Derived Savanna	3,208	3.3
Rainforest	20,443	21.2
Fresh water swam p	256	0.3
Mangrove forest	522	0.5
Total	96,518	100
		3.3

Source: FAN (1989)

Table 2: The trends in Nigeria forest reserves between 1900 and 1983

Year	Area(km ²)	% of reserved forest total land
1900	97.13	0.01
1910	25.90	0.30
1920	12,145.51	1.34
1930	29,878.24	3.29
1940	59,549.28	6.55
1950	73 320 31	8.07
1983	99 991 92	10.99

Source: Onochie (1984)

Problems of forest reservation in Nigeria: Forest reservation faced some challenges during this period. The local people saw reservation as an attempt to take over their traditional lands for public use. There was the fear that the reservation might remove their right of access to the forest and prevent them from obtaining the necessary forest products to meet their daily needs. It was noted that due recognition was given to the right of the local people in constituting the reserves. And they were made to realize that the reserved areas were for their own good. So, herdsmen were permitted to graze in the reserves. Some landowners were given right to farm, settle in enclaves and collect some minor forest products like snails, firewood, ropes, fruits, leaves etc for domestic uses only. The belief of the local communities that the forest was reserved for their interests and the dual control of the forest (by the government and the local people) was the beginning of forest management problems in Nigeria. There was indiscriminate use of the reserved forest by the rural communities as a result of this liberty (Jamnadass, 2013; Daniel D. Chiras and John P. Reganold, 2009; John Glasson *et al.*, 2012; Rodolfo Tello, 2016). The local people's ownership right of the reserves was removed at independence in 1960 and the reserves were taken over by Regional Governments. So, forestry administration was under the regional governments between 1960 and 1967. The regions (Western, Eastern, Northern and mid-western regions) were responsible for the administration and management of the high forest areas in the country.

This new administration denied the local landowners most of the benefits they were deriving from the reserves such as royalties and collection of minor forest products. This generated conflicts and led to illegal exploitation and encroachment of the reserves. Hence, there was massive exploitation and removal of the forest resources from these reserves that were very rich in economic timber species. This subsequently led to the loss of biodiversity. The second phase of natural forest management (exploitation phase) was the between 1930 and 1960. During this phase, exploitation of the wood resources was increased in order to meet the wood shortage in Europe. There was increase in timber extraction from Nigerian high forest to meet the growing demand for wood in the international and local markets. This was also a set back to the reservation plans (Jamnadass, 2013; Chris Maser and Carol, 2011; William Blackburn, 2007). In recent times, there has been increase in the de-reservation of the forest reserves. Those near urban centers are worst affected by the threat of de-reservation. Also noted was that only 10.02% of land area in all the States of Nigeria is presently under forest reservation. With the current rate of dereservation, indiscriminate forest exploitation and encroachment in Nigeria, this value will continue to reduce except some steps are taken urgently. This will lead to biodiversity loss. The

ecological, social, environmental and economical benefits of the flora and fauna of the natural forest ecosystem will also be lost. The destruction of the natural forest ecosystem is ecologically and economically very difficult to rectify. So the conservation of biodiversity is absolutely essential to avert these disasters. (Rodolfo Tello, 2016; Sivasubramanian, 2016; www.cfa-international.org).

Biodiversity conservation: The need for biodiversity conservation has aroused the interest of several individuals, national and international organizations. These include Food and Agricultural Organization of United Nations (FAO), United Nation Educational Scientific and Cultural Organization (UNESCO), International Plant Genetic Resources Institution (IPGRI), International Union for Conservation of Nature and Natural resources (mCN) and a lot of Non Governmental Organizations. At the United Nation Conference on Environment and Development (UNCED (referred to as the Earth summit) in June 1992 at Rio de Janeiro, biodiversity was defined as the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within and between species of ecosystem. Biological diversity is defined as the total genetic variability and their relative frequencies within a living organisms and the ecological complexes they inhabit. It refers to the multiplicity of life forms that include plants, animals, viruses, bacteria and other microorganisms. It is the number of tree species present and the distribution of individuals among the species (Susan Clayton and Gene Myers, 2015; James Rasband *et al.*, 2009; Hansen, 2014). In a forest stand, composition of tree species, their size and age distributions and their horizontal and vertical order are the key values to determine diversity. Crow *et al.* 1994 portray it as a broad concept and

Subdivided it into three groups: Compositional diversity, which is the variety of species within an area. Structural diversity which can be characterized by vertical, horizontal or age distributions in an area, and Functional diversity that deals with ecological processes such as nutrient cycling, decomposition, energy flow and tropic-level relationships. Natural forest ecosystem in the tropics contains many wild plants and animals with great potential to meet the needs of present and future generations in terms of food provision, ethno medicine (herbs for curing various ailments), oil and soup condiments, beverages, fruits, timber and pole. It is therefore essential to preserve and maintain this gene reservoir of the natural heritage in all their communities for them to be sustainable.

Methods of Biodiversity Conservation: There are two main methods of conserving tree species diversity namely in-situ and ex-situ.

These are further discussed as follow

In-situ conservation: This involves the maintenance and regeneration of the forest communities in their area of origin i.e. on soils and sites of occurrence of the particular species. In-situ conservation can be successfully achieved where pressure on forest is light. Most of the constituent species of Nigerian natural forest are indigenous that have not been domesticated. Therefore, their continued existence depends on the continued existence of their natural habitat. Also, the

ecology and genetic make up of tropical forest ecosystems allow the interdependence of flora and fauna in the stable ecosystems. This brings about the difficulties that could be encountered in trying to conserve the species outside their natural ecosystems. Permanent Sample Plots, Strict Nature Reserves, Game Reserves, National Parks and Forest Reserves are means of conserving most of the constituent species in a habitat. All these were located within the gazetted forest reserves and this is supposed to ensure their adequate protection. But, unfortunately, the various conservation plots have been tampered with especially through illegal felling and encroachment aided by the unethical behaviour of some forestry staff. Another successful means of in-situ conservation in Nigeria was the use of traditional laws, taboos and practices in conserving the forest. This was achieved through the creation of sacred forest (Juju shrine or sacred groves), bad bushes and dedication of some tree species to deities by rural communities. Some trees were believed to house some gods and evil spirits e.g. *Adasonia digitata* (Baobab tree), *Ceiba pentrandra*, *Milicia exelsa* and *Igi-Nla*. Entry into such groves for farming, hunting and collection of non-timber forest products was normally prohibited with taboos and local laws. Cutting or destruction of the tree species believed to be the home of some gods or evil spirits was not also done because of the belief that the spirits could attack the person or the whole community. This had helped a lot to guide against indiscriminate exploitation of forest resources, misuse of the forest and encroachment. As a result, conservation of biodiversity (Flora and Fauna) was being achieved. The advents of civilization and modern religion have removed the taboos and wiped off the worship of deities. Such forests are now being encroached by landless people and cleared for construction purposes.

Also trees dedicated to the worship of deities are being cut. These are generally species that are in high demand because of their economic values e.g. *Milicia exelsa* (Stephen Peake, 2017; Scott A. Bonar. 2007; John A. Dixon *et al.*, 2009). Such sacred groves constitute widespread series of traditional in-situ stands preserved in most villages or towns in Southern Nigeria. The roles of sacred forests creation by rural communities (with special emphasis on those in Ekiti State of Nigeria) on biodiversity conservation and environmental sustainability was reported (www.fao.org/3/a-i3710e.pdf; FAO, 2016; Adekunle *et al.*, 2009). Suggestion was made for the retention of small-unlogged areas in logged areas to provide shelter for primary forest species which may not recolonise the logged area. Such areas will be very useful for the conservation of endemic species and species with small home ranges (Jamnadass, 2013; Rodolfo Tello, 2016; Dhirendra Datt Dangwal, 2009).

Ex-situ conservation: This involves conserving and maintaining the genetic resources outside its area of origin or occurrence. Ex-situ conservation aids introduction of new species as well as the breeding and multiplication of difficult ones. Seed storage, pollen storage, establishment of gene banks and the use of tissue and meristem are good for ex-situ conservation of endangered species in an ecosystem. These methods are also appropriate for species that are heavily exploited and those occurring outside constituted gazetted forest reserves. Techniques like cryopreservation of embryos, pollen and tissue may enable long-term storage of desiccation of intolerant species. Also, ex-situ conservation is undertaken through the establishment of botanical gardens, arboreta and herbaria (State of World's Forests, 2014; FAO, 2016; Susan

Clayton and Gene Myers, 2015). There is decline in the activities of these conservation centres today due to poor funding. Tables 2.1 and 2.2 show in-situ and ex-situ conservation areas in Nigeria respectively 6. The preservation of biodiversity does not preclude its use in whatever manner that best serves human needs, but such need must be sustainable. To achieve this sustainability, biodiversity must be properly managed. When properly utilized and managed, it generates these renewable benefits in perpetuity. These benefits are the numerous goods and services derivable from the natural forest ecosystem.

Biodiversity Assessment Methods: Lack of adequate information on the extent and composition of biological components of any given ecosystem is a great hindrance to policy formulation and the sustainable management of such ecosystem. The pace at which biodiversity is inventoried within the tropical forests is not accelerating. Methods of biodiversity assessment are as diverse as the type of data collected as a result of the heterogeneity of the forest. (Stephen Peake, 2017; John *et al.*, 2009; Sivasubramanian, 2016) However, Gauch (1986).

Distinguished three levels of biodiversity studies 7:

Alpha (a) diversity: This involves community studies that have to do with number of species encountered in a sample.

ii. Gamma (γ) diversity: This is the total number of species encountered in a study area.

iii. Beta (~) diversity: This is measured by comparing differences or similarities between samples or locations by using similarities/differences indices.

The various biodiversity indices are discussed as follows

Alpha diversity: This is used to measure species richness i.e. the number of species in a forest ecosystem. It is usually calculated with Margalef's index and Variety Indices given by Clifford and Stephenson (1975) and Odum (1971) respectively.

Margalef's index (D):

$$D = \frac{S-1}{\ln N} \dots\dots\dots (1)$$

Formula for the Variety indices are given as:

- (i) $S-J$
- (2) $\log N$
- (3) SIN
- (4) S per individuals

Where d_1, d_2 and d_3 are variety indices

S = number of species

N = number of individuals

Gamma diversity: This is used to measure community diversity and species evenness/heterogeneity. Species evenness/heterogeneity refers to the distribution of individuals among the species. Species evenness/heterogeneity are obtained with Shannon-Weaver's index of general diversity and Simpson's index.

The equation for the Shannon-Weaver diversity index is given by Price (1997):

$$H' = - \sum_{i=1}^S U_i \ln U_i \dots\dots\dots (5)$$

H' is the Shannon diversity index, S is the total number of species in the community, P_i is the relative density and \ln is natural logarithm.

Evenness (E) of Magurran, (1988) is given as:

$$E = \frac{H'}{\ln S} \dots\dots\dots (6)$$

The Simpson's index (SI) for finite population is expressed by Simpson (1949) as:

$$SI = \frac{\sum_{i=1}^k n_i(n_i - 1)}{N(N - 1)} \dots\dots\dots (7)$$

k is the number of Spp collected.

n_i = number of individual in species I

N = total number of individual in the entire population.

The Simpson index above could be expressed to vary inversely with heterogeneity.

Therefore the formulae is inverted such

That the index varies directly with heterogeneity as:

$$SI = \frac{N - 1}{\sum_{i=1}^I n_i} \dots\dots\dots (8)$$

Beta Diversity: Wolda (1983) suggested the use of similarity indices for measuring beta diversity of which Sorensen's and

Simpson similarity indices have been found to be more suitable. Sorensen's index RI is expressed as.

a

$$RI = 100 \times \frac{a}{a+b+c} \quad \dots\dots\dots (9)$$

Where a = number of species present in both site under consideration

b = number of species present in site 1 but absent in site 2

c = number of species present in site 2 but absent in site 1
Simpson similarity index (K_{simp}) is also given as:

a

$$K_{simp} = \frac{1}{Mn(a+b)(a+c)} \quad (10)$$

$$Mn(a+b)(a+c)$$

(Variables as defined before)

All these indices could be successfully used to estimate and compare the biological diversity of plants and animals population in different ecosystems. Community with the highest index value is adjudged the one with the greatest diversity.

Biodiversity loss in Nigeria: Several authors have reported on the rapid rate at which the tropical rainforest is being lost today due to various human activities. In Nigeria, biodiversity is lost as a result of population pressure, habitat destruction, over exploitation, change in land use, pollution and lack of emphasis on conservation. (Daniel D. Chiras and John P. Reganold, 2009; Dhirendra Datt Dangwal, 2009; Mayuri R. Wijesinghe, 2005) NEST. Over 30,000 ha of forest and natural vegetation are being lost annually in Nigeria (Pius Akindele Adeniyi, 2016; Scott A. Bonar, 2007; John Glasson *et al.*, 2012). The destruction of roughly 7.5×10^6 ha of tropical rainforest annually was reported too (James Rasband *et al.*, 2009; Hansen, 2014; Mayuri R. Wijesinghe, 2005) Between 17 and 20 million hectares mainly tropical moist forests of the world are lost each year. In Omo forest reserve alone, 11,300ha are being cleared annually for the establishment of plantations of indigenous and exotic tree species (www.worldagroforestry.org/downloads/Publications/PDFS/B15713.pdf; Daniel D. Chiras and John P. Reganold, 2009; Stephen Peake, 2017). Several warnings on the environmental, ecological and economical implication of clearing two of the richest forests where biodiversity is being conserved in Nigeria for the establishment of monoculture plantations in various afforestation programmes had been issued. These are Oluwa Forest Reserve in Ondo State and Omo forest reserve in Ogun State which were cleared to establish *Gmelina arborea* stands for pulp production by the proposed Iwopin paper mill. It is feared that a large- scale extinction of genetic diversity is underway and many organisms may go extinct before they are discovered (Pius Akindele Adeniyi, 2016; Pius Akindele Adeniyi, 2016; Rodolfo Tello, 2016).

Some of the causes of biodiversity loss are further summarized below

The clearance of forestland for Agriculture: The tropical rainforests intended to retain land under forest are been clear

felled for agricultural purposes as a result of the availability of fertile land under forest cover. The ever-increasing demand for food by the increasing population has led to more pressure on the forest. There is generally unorganized encroachment of the forest by poor farmers, landless people and establishment of large-scale commercial farms. Forestry is interwoven with farming activities and in certain circumstances, life actually depends on the forest.

Exploitation for fuel wood: The use of fuel wood for domestic or industrial cooking is very important to both rural and urban dwellers worldwide. For daily energy needs, more people depend on wood than any other single energy source and that some 2,000 million people are still using wood for domestic heating and cooking today. Fuel wood is the only energy source for the poor, who constituted about 77% of Nigerian population. This is because other sources of energy principally kerosene, electricity and gas, are either not regularly available, costly or require high initial capital outlay on stoves (Jamnadass, 2013; Susan Clayton and Gene Myers, 2015; Adekunle *et al.*, 2009). This is well beyond the resources of the low-income group. About 0.54 kg of wood is consumed per person daily in Ondo State of Nigeria. 0.53 kg of fuel wood are consumed by a household daily in developing countries of the world. This rate of fuel wood consumption is a great problem to tropical forest where commodity is exploited. At this rate of consumption, if regeneration is not stepped up, deforestation will continue and its adverse effect is imminent (agri.ckcest.cn/ass/NK001-20160829003.pdf; Adekunle *et al.*, 2009; www.cfa-international.org).

Timber Exploitation: A considerable part of Nigerian forest is being destroyed through indiscriminate and reckless logging and harvesting of timber and non-timber forest products. Most often, irreparable damages are inflicted on many parts of the forests ecosystem during mechanical and manual timber harvesting. The total forest areas are affected by crawler tractors, felling damage and during road and gantry construction. About 17.74% of residual trees suffered logging damages and about 8% of the virgin ground is left bare and damaged. This intensive exploitation of forest has led to loss of biodiversity and extinction especially of many tropical plant species with narrow range. At the present rate of exploitation, many Nigerian plant species especially the rare and endemic ones are in serious danger (agri.ckcest.cn/ass/NK001-20160829003.pdf; Adekunle *et al.*, 2009; Mayuri R. Wijesinghe, 2005). Also animals are killed during felling and logging activities and the destruction of their habitat produces immediate changes in the number of wildlife available. This is because the feeding and grazing pattern of animals in wildlife conservation depend on the available tropic level. There is criticism that forest plantation in East Africa because of monoculture does not provide room and protection for complex wildlife systems. Controlling the intensity of harvesting, improving logging practice and stopping of illegal felling can reduce the damage to tropical natural forest structure and its biodiversity. Over-exploitation for so many non-timber forest products by the increasing population in Nigeria is a serious setback to the conservation efforts (Pius Akindele Adeniyi, 2016; John *et al.*, 2009; Sivasubramanian, 2016).

Overgrazing: The loss of rangeland threatening the survival of animals has led to uncontrolled grazing and browsing of the forest. When overgrazing occurs, trees and shrubs are

destroyed, the land is eroded and trampled and its productive capacity is reduced.

Construction works: The forestland is always cleared of its rich vegetation for construction of roads, public and private buildings, dams, etc.

Encroachment: Forestland encroachment by land hungry and landless people as a result of land tenure system is a great hindrance to biodiversity conservation. Lack of proper enforcement of the various forestry laws prohibiting the indiscriminate use of the forest resources and sharp practices of some forestry staff.

Unstable government and government policies: This is always the case in most developing countries of the world. This normally hinders the continuity of forestry programme, funding and conservation strategies. Every government seems to always have its own agenda and interest.

The Role of Biodiversity Conservation to National Economy: The roles of biological conservation to any society are so many and no nation could survive without a properly conserved ecosystem and the environment. These numerous roles include purification of air and water, regulation of water flow, detoxification and decomposition of wastes, generation and renewal of soil and soil fertility, carbon sequestration, biodiversity conservation, climate stabilization, moderation of temperature extremes, windbreaks, support for diverse culture and aesthetic beauty and landscape enrichment. All these indispensable products and services are provided by the forest ecosystem at the same time (Chris Maser and Carol A. Pollio, 2011; Susan Clayton and Gene Myers, 2015; www.cfa-international.org). Some researchers also reported on the potentials of tree and animal species in the forest ecosystem. Over 150 indigenous woody plants from the natural vegetation have been identified as yielding edible products for human and livestock consumption. Some of these products include nuts, honey, fruits, fodder, drugs, mushrooms etc. The non-edible products are fibers, spices, resins, gum, fuel wood, poles, chewing sticks, sponges, etc. (State of World's Forests, 2014; Stephen Peake, 2017).

There are various lists of some selected indigenous wild fruits of lowland rainforest ecosystem that are harvested and consumed either raw or cooked in Nigeria. Some of these wild fruits are *Chrysophyllum albidum*, *Irvingia gabonensis*, *Treculia africana*, *Dalium guinensis*, *Lecaniodiscus cupanioides*, *Viex doniana* and *Cola milleni* (Daniel D. Chiras and John P. Reganold, 2009; James Rasband *et al.*, 2009; Adekunle *et al.*, 2009) with various reports on the nutritional potentials of some of these edible fruits. The medicinal values of some of plant and animal species. Herbal medicine is very popular among the rural dwellers and urban poor in Nigeria. Government health facilities personnel are very scarce in the rural areas of Nigeria. Where they are available, the cost of orthodox medicine is always beyond the reach of the people Nigeria is yet to meet the World Health Organisation (WHO) recommendation of the ratio of one Medical Doctor to one thousand people forty-four years after independence (ratio of 1: 5000). They reported further that there are about 26,000 Registered Medical Doctors in Nigeria serving a population of about 130 million people and the worst affected place is the rural areas. So the only alternative is especially in the rural areas is ethno-medicine that is very cheap and readily available

(Pius Akindele Adeniyi, 2016; agri.ckcest.cn/ass/NK001-20160829003.pdf; Hansen, 2014). Traditional healers and herbal sellers have secured gainful employment in this area also. Some of the plants reported to have potential of curing various ailments when concocted or decocted encountered in this vegetation are *Antaris africana*, *Alstonia boonei*, *Zanthoxylum zanthoxyloides*, *Ceiba pentandra*, *Xylopia aethiopica*, *Khaya* spp *etc* (Pius Akindele Adeniyi, 2016; www.fao.org/3/a-i3710e.pdf; John *et al.*, 2009; www.worldagroforestry.org/downloads/Publications/PDFS/B15713.pdf). Several rural dwellers depend on the use of non-timber forest products for livelihood. These non-timber forest products are sources of raw materials for several cottage industries. The availability of different species of varying sizes makes the natural forest ecosystem to be viable for the production of these goods and services simultaneously. Wildlife abundance also depends on the heterogeneity of the forest because of the feeding levels of these animals. Wildlife (bush meat) is a source of protein to the rural dwellers and it arguments their diets that is majorly of carbohydrate origin. With the rapid rate of exploitation, these important plant and animal species are disappearing very fast today and going into extinct. The great contribution of forestry to internally generated revenue is another important benefit from reservation. Plants and animal species are also preserved in arboreta and botanical/zoological gardens for research purposes, tourism, education and posterity (Pius Akindele Adeniyi, 2016; Scott A. Bonar, 2007; Adekunle *et al.*, 2009; Mayuri R. Wijesinghe, 2005).

Conclusion and recommendation: The present status of Nigerian forest reserves and the continuous pressure on it as a result of population growth call for urgent conservation efforts that could prevent the total collapse of the ecosystem. Nigeria must move toward attaining the 20% forest cover for the country as specified in the Nation's forest policy. To achieve this, all the existing forest reserves in the country should be re-surveyed and the boundaries properly demarcated. The Nigerian forest reserves met to conserve biodiversity should not be clear felled for any other purpose including plantation development. Free areas and marginal land should be devoted for plantation establishment and enrichment planting. The shift from natural forest conservation and management to plantation development (monoculture that does not give room for biodiversity conservation) should be reversed. Both should be pursued to overcome wood deficit. Exploitation of trees below the merchantable size (~48 cm) specified by forest policy should be prevented in totality.

Even when trees are removed, it should be done in a way to preserve the residual trees and the entire forest ecosystem. Alternative sources of energy that is affordable and readily available should be provided. This will reduce the pressure on for the supply of fuel wood. The lesser-utilized species should be improved upon to reduce pressure on the most economic species as this could lead to their extinction. The forest industries (sawmills and other wood industries) should move toward greater efficiency. The role of working plan for effective forest management cannot be overemphasized. Therefore, provisional management plans should be drawn for the forest in every State and the plan should be followed strictly. 12 Forestry workers should be trained and equipped to perform their basic functions. Proper patrolling of the forest should be enhanced to curb the action of illegal fellers and forest encroachers. Officers patrolling the forest (forest and

game guards) should be given the authority to arrest illegal exploiters of natural resources. Such offenders should be prosecuted to serve as deterrent to others. A way of countering deforestation is reforestation. The large gap between removal and renewal should be closed. All the three tiers of government, the State, Local and Federal government, should increase their reforestation efforts and individual should also be involved in forest conservation. The government should provide incentive for planting trees and taking care of those planted. The rural dwellers should be made to realize the importance of planting trees and conservation of biodiversity by forestry extension agents. In-situ and Ex-situ conservation methods should be intensified and improved upon. The government, individual, institutions and research stations should pursue all methods of biological conservation vigorously. The conservation legislations currently in force in Nigeria and some State forestry laws are not properly enforced. Forest laws are been surrendered to some 'power that be' in the country. This includes political leaders and influential individuals who contravene forest laws at will. The National Conservation Strategy and National Conservation Education Strategy should be reconstituted in a bid to be directly involved in conservation of this ecosystem. The 'endangered species' law (Control of International Traffic) Decree No. 11 of 1985 and the National Resources Conservation Council Decree 1989 should be properly enforced. Forestry laws (e.g. Forestry Ordinance of 1937, chapter 75; Eastern Region Forest Law of 1955; Forestry Ordinance with amendments of Northern Region of 1960 and the Forestry Amendment Edict of Western state of 1973) should be properly enforced. Forestry staff should be enabled to enforce all the laws without prejudice and partiality as nobody is above the law.

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