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I. INTRODUCTION

The current global trend in tropical forest conservation is to bridge gaps in information flow between rural resource users and decision makers. Because natural (biotic) resources are often utilized by governments to address issues arising from food security and foreign exchange earnings. Macro-economic policies have imposed negative impact on environmental conservation yet the rural communities who live by, own and utilize natural resources are also driven by poverty, thus, both the government and rural communities depend on the natural ecosystems for survival.(1,4,7,13,18,24,32)

Traditional land use system is influenced by life styles: the culture of a people in relation to the environment. Because traditional land use systems are shaped by the diversity of natural resources, increasing human population and loss of natural forests have substantive impact on ecosystem stability. (2,10,15,17,21,27) Lack of information for long term planning has made national policies to ignore resource utilization at the local level. It is argued that for effective management of natural resources, adequate data are required on: (a) level of resource exploitation (flora, fauna and minerals); (b) response of rural communities to changes in life styles; and (c) specialization in use of resources. The study on which this paper is based examines the Impact of rural land use on the natural ecosystems. Specifically, it addresses the following questions: at what level do traditional land use systems degrade the environment? What are the causes of negative approach to environmental degradation in relation to agriculture, healthcare delivery and fuelwood exploitation? (3,6,11,30)

II. TRADITIONAL LAND USE SYSTEMS

In every sphere of life, there are rules and regulations which keep people together to maintain order and security to lives and property. The complexities of rules and regulations determine the level of cultural advancement and hence the life style patterns. The traditional land use system therefore, is a reflection of the lifestyles which are nevertheless influenced by changes in the social and economic well being of the people. The Cultural forms of agricultural production perpetrate subsistence needs of the people. The major practices are in vogue: food and livestock production. Food crops

involve shifting cultivation and intensive semi-permanent cultivation in fadamas. The livestock production is nomadic. The two major practices apply fire to clear the natural vegetation particularly in the savanna areas in the production process. (5,9,19,31)

Fadama cultivation is a dry season farming system that thrives in wetlands both in the savanna and rainforest ecosystems. The products are mainly vegetables, early grain crop or in a stabilized stage, the fadamas are used to cultivate crops like sugarcane and other perennial food crops. Shifting cultivation is a system in which relatively short periods of continuous cultivation are followed by relatively long periods of fallow” (8,12,20,22) The system employs simple technology and operates under uncontiguous farm units and inadequate farm labour. land allocation for farming is dictated by the indigenous tenure system and clear felling system of natural vegetation.

Shifting cultivation thrives best under low population density that guarantees sufficient fallow periods; and undeveloped agricultural based industries (Ruthenberg, 1974). Unfortunately, these conditions are absent in the country at moment due to factors of high population density, presence of agro-based industries, high rate of deforestation for tree crop production (cocoa, rubber, oil palm and forestry plantations) and unequal land tenure systems (23,25,26,28). Under the present conditions, shifting cultivation is still the main source of food supply in Nigeria accounting for about 95% of total food production and employing about 80% of the rural labour.

Livestock production is a major land use practice in the savanna ecosystems. The practice is by small holder and is free-ranged. Rearing of livestock is by nomadic herdsman and it involves a southwards and a northwards movement of cattle in the dry and raining seasons respectively. The herdsman face some problems: (a) extensive grazing routes, (b) uncontrolled number of cattle per unit area of land; (c) lack of range

conservation practices and (d) rearing of animals beyond traditional land rights of herdsman. Because of these problems, the sub-sector had experienced mounting deficits which ranged from 122,810 tonnes in beef supply in 1982. to 183,230 tonnes in 1985 (1,3,5,28,29,). Over 75% of the Nigerian population depends on traditional health care delivery.

The traditional health care relies heavily on wild biotic resources. Virtually all plant parts from leaf buds to mature leaves, exudates, barks, roots, flowers, nuts, fruits, wood through plant materials in the litter form are used for health care (3,7,15,20,26). However, the traditional health care is administered in three formal levels. These are: (a) preventive; this involves epidemic, rainfall, flood and others; (b) curatives: cure of ailments, diseases of infertility, body pains, warding off bad spirits, snake bites, (c) despoil; to instill sanity into the society such as unfaithfulness in married people (magun), oppression of the poor and deprivation of social rights. (Traditional titles etc). Fuelwood is the main source of domestic energy supply accounting for 90% of total requirements in rural areas. Fuelwood had in the past been gathered by women. Because of the scarcity of fuelwood particularly in the savanna zones of Sokoto, Katsina, Bauchi, Borno, Adamawa and others, the supply of the commodity has been commercialized. At present, fuelwood production is not limited to dead wood: Living trees are cut down and stacked for commercial purposes. This occupation has endangered the diversity of indigenous tree species beyond regeneration levels.

Many wooded savanna ecosystems have degenerated into grass land areas because of excessive felling of trees for fuelwood. (2,8,18,23, 29)

III. ENVIRONMENTAL IMPACT OF TRADITIONAL LAND USE SYSTEMS

3.1 Fire on the Environment

The application of fire on the natural ecosystem serves several purposes. It is used to clear the vegetation for farming, hunting and to stimulate the growth of swards of grass for grazing. The cultural use of fire is indiscriminate, regular and Intensive. The Impact of fire on the ecosystem vary over time and space. The severity of fire depends on the amount of vegetative matter, the dryness of vegetation and the soil and the frequency of fire on a unit area of land. In Nigeria, the use of fire is detrimental to the stability of the natural forests. In the semi-arid areas, frequent fire leads to a breakdown of biomass formation, The impact of Indiscriminate use of fire is a deterioration of the ecological process (4,6,14,22, 25) as given in Table 1.

3.2 Livestock Production

Free ranged livestock depletes the environment in several ways. These include: (a) massive destruction of the environment by Introduced exotic species which did not evolve with the natural environment. In particular, exotic goats, worse than the native ones, are pernicious, create ruinous effect on degraded vegetation and accelerate the destruction of the plant cover (4,16,21,28); (b) Localized grazing lead to trampling of the soils in grazing routes, increased soil compaction, exposed soils and cause soil erosion; (c) overgrazing of the vegetation beyond carrying capacities due to lack of control of animals over a unit area of land. This decreases biomass for both the livestock and native wild animal species; (d) lopping of tree branches by herdsmen to provide fodder reduce total biomass production and energy capture by trees through photosynthesis; (e) loss of native species which provide fodder in evergreen tree species in the semi-arid areas (*Balanitesaegyptiaca* and *Maerua Crassifolia*) due to overharvesting and misuse; and (f) use of farm residues by livestock in the dry season deprives the environment from effective circulation of nutrients from vegetative

matter and hereby marginalize the soil for vegetative regeneration.

3.3 Food Crop Production

Traditional food crops production degrades the environment through devegetation of actual environment. Over 75% of the total natural vegetation in the country was lost before 1985 due largely to agricultural production (9,11,18,24,28). The causes of agricultural land depletion are: (a) unequal land tenure systems. This creates migrant tenant farmers who mine the soils beyond conservation levels; (b) lack of a third party control on land use under the individual land ownership; (c) economic incentives derived from producing crops for the market (root crops and grains); and (d) a land extensive system of land cultivation under the traditional food crop production. Massive devegetation of the natural ecosystems is harmful to the stability of the environment. For example, it leads to reduction in species diversity and extinction of indigenous species of plants. Habitat loss for wild animals makes them vulnerable to disease organisms and hunting. As in some parts of Borno State, habitat destruction for elephants in their traditional routes for over centuries make them turn up in human settlements and get killed in the process. Again, watershed destruction decrease water levels in streams and thereby endanger the aquatic life.(4,8,11,17,22,28)

3.4 Traditional Health Care

The destructive effects of traditional health care on the environment result from established trade in the sales of herbs and wild animal parts in urban areas throughout the country. The exploitation process of biotic resources is in three tiers.

First, are exploiters of herbs and wild animals from natural forests. Second are middle men who procure these products from exploiters from rural areas. Third are the traders of these products in urban centres.

Aside from these are established herbal homes with prepared drugs for patients. Some of these categories establish herbal gardens to sustain their business. Nevertheless, most raw materials are derived from the natural forests in haphazard ways perhaps because of dominant user rights over trees and land under the tenure systems. Because all parts of wild plants are utilized for traditional medicine most tree species are destroyed by de-barking, up-rooting removal of leaves or by felling. The impact is massive as many of the species involved hardly coppice or regenerate after harvest. (7,15,24,31)

3.5 Fuelwood Supply

The causal factors for high dependence on fuelwood as domestic energy supply are cultural. Some of these are: (a) poverty among rural and urban dwellers who cannot afford alternative domestic energy sources: kerosene, electricity and liquefied petroleum gas; (b) traditional attachment to firewood usage creating preference for food cooked from wood to other means; (c)

social attitudes of the people in ceremonies and festivals promoting open-air preparation for participants; and (d) traditional taboos restricting some rulers and traditional title holder to eat food prepared only with firewood. Because firewood supports about 90% and 50% of rural and urban settlers in domestic energy supply and because 95% of the fuel wood needs is derived from the natural forests, it poses a threat to the stability of the ecosystem. In a recent survey, (4,8,11,20,21, 30,) showed that in commercial fuelwood logging sites, 81 % and 93% of indigenous trees of 25cm and above at diameter breast height were respectively felled per hectare in the savanna and rainforest ecosystems. In the same study, 52% of the felled trees died and only 10% coppiced in the savanna while in the rainforest 38% of the felled trees died and 16% coppiced. These data therefore, depict that the natural forests in the commercial logging zones are in the state of instability as the diversity index fell from 14.9 to 11.8 in the savanna and from 17.8 to 7.2 in the rainforest respectively before and after felling of timber for fuelwood.

Table 1: Effects of Prescribed Burning on Ecological Process

Ecological Process	Effect
Natural Succession	<ul style="list-style-type: none"> ● Curtailment of natural succession and erosion evolution ● Creation of bare area which facilitates Invasion of weeds and exotic .spp ● Local break-down of ecological balance between species ● Progressive reduction In species diversity ● Migration of wild animals to areas of nutritious plant growth
Organic Production and decomposition	<ul style="list-style-type: none"> ● Loss of biomass ● Reduced primary production and energy capture due to leaf loss ● Reduced secondary production until new flush of plant growth ● Divrsion of photosynthate to plant shoots ● Reduction In organic turnover by decomposition
Nutrient Circulation	<ul style="list-style-type: none"> ● Loss of elements by windblow ash, smoke and volatization ● Diminuiton and simpliflcation of nutrient cycle ● Enhanced loss of elements by surface run-off and leaching ● Reduced retention of nutrient capital in organic maIt.r ● Changed rate of nitrogen fixation
Water Circulation	<ul style="list-style-type: none"> ● Reduction in Interpretation of precipitation ● Reduction In transpiration ● Increase In surface run off ● Increase In water discharge ● Increase in soil moisture and htgher water table
Soil Development	<ul style="list-style-type: none"> ● Increase in soil erosion with loss of vegetation cover ● Formation of a base rich soil surface layer ● Increase in field soil surface layer affecting microorganisms (e g nitrifiers) ● Death and decomposition of plant roots ● Increase in nutrient by leaching

Table 2: Vegetation types in relation to the total area in Nigeria

Vegetation Type	Land area (%)	Land area km ²
Mangrove forest	1	12,783
Freshwater swamp	3	25,563
Tropical Rainforest	10	95,566
Derived Savanna	8	75,786
Guinea Savanna	40	400,158
Sudan Savanna	35	342,156
Sahel	3	31,453

Source: Fed. Dept. Forestry 1994

Table 3: Climatic condition of each vegetation zone

Vegetation zone	Mean annual Rainfall	Duration of Dry season
Sahel	250 -500mm	7-8 months
Sudan	500 -1140mm	5-7 months
Northern Guinea Savanna	1070-1270mm	5-6 months
Southern Guinea Savanna	1140-1520mm	4-5 months
Derived Savanna	1140-1770mm	3-4 months
Forest zone	2780-4000mm	3 months
	1140-1770mm	3-4 months
	2780-4000mm	3 months

Source : Federal Ministry of Environment, 2003

Table 4: Forest land designation

Forest Land Designation	Forest Type	Area (ha)	Gross Volume (m ³)
Forest Reserve	Lowland Rainforest	788,053	140,682,489.73
	Freshwater swamp	186,621	24,397,003.35
	Sub-total	974,674	165,079,493.08
Free Area	Lowland Rain Forest	905,930	120,7422,644.93
	Freshwater swamp	1,424,995	187,474,508.28
	Mangrove Forest	948,430	212,613.14
	Sub Total	2,342,147	308,429,366.35
Sum total	Gross Total	3,316,821	473,509,259.43

Source: Fed. Dept. Forestry 1994

3.6 Present status of the forestry sector of Nigeria

A recent forest resources study carried out by the Federal Department of Forestry, revealed that the forest estate of Nigeria has been very highly depleted. It was estimated that only about 974,674

hectares of the forest reserves is productive while another 2,342,147 hectares of free areas is partially productive.

Table 5. High forest gross timber volumes, excluding bark by forest designation and forest

types Sawn wood Sawn wood is produced by 11,684,000 m³ per year in log equivalent (Alviar, sawmills in Nigeria whose capacity is estimated at 1980).

Table 5: Sawmills estimated capacity and production in 1993

TYPE	NUMBER	CAPACITY (m ³)	PRODUCTION (m ³)
CDs & Carriages	1,600	5,500,000	2,531,000
Portables	100	57,000	30,000
Pit Sawing	1,000	285,000	150,000
Total	2,700	5,842,000	2,711,000

Source: FDF(1988) Forest Resource Study

3.7 Wildlife conservation

The main problems facing wildlife conservation in Nigeria include poaching, over exploitation, lack of accurate data, bush burning which destroys wildlife habitat especially in the savannah, overgrazing, poor funding of management and research and low managerial capability. The Federal Government has responded with the creation of 8 National Parks distributed across the major ecological zones viz

Table 6: National Park Area(ha)Year

Chad Basin	45,696 1991
Cross River	422,688 1991
Gashaka/Gumti	636,300 1991
Kainji Lake	534,082 1975
Old Oyo	251,230 1991
Yankari	224,400 1991
Kamuku	112,700 1999
Okomu	11,200 1999
Total	2,238,296

Source: Fed. Dept. Forestry 1994

There are about 1,129 forest reserves, 29 game reserves and 4 game sanctuaries and 8 National Parks.

3.8 Demand for Forest Products

Unlike the predictions by most past studies, the demand for most forest wood products have stabilized, except for round wood, fuel wood and saw log and veneer logs. With 95% certainly we are accurate in predicting that the following wood products will stabilize. Demand for some wood products.

Wood Products	Annual Demand
Industrial Round wood (m ³)	7,523,772
Sawn wood (m ³)	2,429,870
Particle board (m ³)	30,948
Paper and Paper Board Imports (M.T.)	108,451

Source: FDF(1988) Forest Resource Study

The prospect for wood products in Nigeria is bleak and Nigeria will of necessity become import dependent in respect of wood products. The demand estimate for the current study has been based on simple projection of trends of the form $Y_t = aD t + Y_{t-1}$.

Where Y_t = Demand for a particular product in year t
 Y_{t-1} = Lagged demand
a = parameter estimate
t = time
D = change

A comparison between the current and past demand estimates is presented in Tables 4 and 5. The individual forecasts are close.

Table 7: A comparison of demand forecasts for round wood (in 1000 m³).

STUDIES	1985	1995	2000	2010	2020
FDF (2000) Round wood		113,602	126,887	153,458	180,008
Fuel wood		93,544	104,244	125,644	147,044
Industrial R/wood		7,524	7,524	7,524	7,524
Saw Log/V. log		598	1,073	2,118	2,973
Gen. Woods (1994) Fuel wood			128,495	156,634	
Pulp wood			135	135	
Saw log			7,558	10,935	
Veneer logs			618	618	
IBRD (1992)* Fuel wood			109,966	111,102	
Poles			2,874	3,441	
Pulp wood			539	959	
Saw log			4,199	6,432	
Veneer log			858	1,359	
Round wood equivalent					

Source: FDF(1988) Forest Resource Study

Table 8: A comparison between demand forecasts for wood products (units in 1000)

STUDIES	1985	1995	2000	2010	2020
FDF (2000) Sawn wood (m ³)		2,430	2,430	2,430	2,430
Particle Board (m ³)		31	31	31	31
Paper & Paper bd. Inputs (M.T.)		108	108	108	108
IBRD (1992) Sawn wood (m ³)			4,199	6,432	
Plywood (m ³)			286	453	
Particle board (m ³)			111	230	
Newsprint (M.T.)			93	166	
Printing & Writing paper (M.T.)			11	21	
Other paper & Paper board (M.T.)			50	87	

Source: FDF(1988) Forest Resource Study

Past studies indicate that demand for wood products will continue to increase as opposed to the current study which predicts a stable demand.

IV. ANTICIPATED CHANGES IN THE FORESTRY SECTOR TO YEAR 2020

4.1 Land Use Dynamics

An analysis of land use in Nigeria shows the annual changes as indicated in Table 6.

Table 9: Land use trends in Nigeria

Land use category	Annual Rate of Change (ha/year)
Agriculture (Intensive/ Extensive)	554,657.10
Floodplain Agriculture	67,616.10
Grass land	131,224.60
Dominantly trees/woodlands/ shrubs	-858,720.40
Dominantly shrubs and grasses	-104,974.30
Dominantly grasses	6166.16
Forest	-104,231.00
Freshwater marsh/swamp	-69,453.05
Forested freshwater swamp	1707.86
Mangrove forest	-14,982.77
Water	45,474.02
Bare surface	129,113.70

Source: FDF(1988) Forest Resource Study

Agricultural cropland is consuming the largest chunk of 554,657.10 ha annually while dominant category of trees/woodlands and shrubs is losing the largest chunk of 858,720.40 ha annually.

Table 10: Comparative land use pattern 1995 to 2020 (ha)

Land use category	Base Year 1995	Year 2010	Year 2020	Steady State
Agric.Crop land	61,900,000	68,063,519.12	70,652,157.4	87,408,772.80
Flood plain Agriculture	2,400,000	3,141,000.30	3,390,061.50	479,782.74
Grassland	3,150,000	4,398,237.70	4,765,522.33	1,071,156.36
Dominantly trees/wood land and shrub	9,000,000	3,866,595.70	2,276,169.60	7309.53
Dominant shrubs & grass	7,100,000	4,290,518.19	3,017,151.27	102,582.79
Dominantly grasses	1,100,000	1,065,057.36	1,040,003.02	227,529.66
Forest	2,650,000	1,436,848.03	938,066.41	928.69
Freshwater mash/swamp	620,000	181,072.05	100,943.30	3534.37
Forested freshwater Swamp	1,800,000	1,820,088.57	1,834,929.55	3,134,485.64
Mangrove forest	1,190,000	978,706.18	845,074.30	701.26
Water	680,000	1,065,985.97	1,144,629.79	172,307.77
Bare surface	1,892,000	3,174,370.71	3,477,292.00	872,908.43
Total	93,482,000	93,482,000.00	93,482,000	93,482.000

Source: FDF(1988) Forest Resource Study

The consequences of the present land use trend on forestry development need no further elaboration. It will be catastrophic to say the least unless urgent steps are taken to reverse the situation.

4.2 Game Reserves

The following are some of the existing game reserves.

Falgore Game Reserves, Akpaka Game Reserves, Lam-burra Game Reserves, Kwaiambana Game Reserves Dagidda Game Reserves, Ibi Game Reserves, Pai River Game Reserves, Ankwe Game Reserves, Wase Game Santurary, Wase Rock Game Reserves Bakono Game Reserves.

4.3 National Parks

At present there are eight National Parks, they all derive their origins from previous Game Reserves. These are: Kainji Lake National Park, Yankari National Park, Old Oyo National Park, Cross River National Park, Chad Basin National Park, Gashaka Gumti National Park, Okomu National Park, Kamuku National Park.

Table 11: Distributions of Forest Reserves in Nigeria by Geopolitical Zone (Onochie, 1984)

	Geo-political zones	Total land Areas (sq.km)	Area of Reserves Forest (sq.km)	% of land Area Reserved as Forest
1	North-West	205,096.03	31,190.19	15.21 %
2	North East	278,148.03	18215.36	6.55 %
3	North Central	234,754.96	24,084.95	10.26 %
4	South West	77,656.44	12,958.77	16.69 %
5	South East	28,612.55	446.31	1.63 %
6	South South	83,784.50	13,075.94	15.61 %
	Nigeria	90,055.61	99,991.92	10.992 %

Source: FMANR, 1990.

As a result of high population density in the South East zone, it has the smallest areas of reserved forest. Other forest reserves are listed below viz : Olokemeji forest reserves, Gambari forest reserves, Omo forest reserves, Akure/Ofosu forest reserves, Idanre forest reserves, Ifon/Owo forest reserves, Eba forest reserves, Ofogbo forest reserves, Obiaruku forest reserves, Ngel-Nyaki forest reserves, Afi River Forest Reserve, forest reserves, Ibadan, Kagoro-Nindam forest reserves, Donga River Basin forest reserves, Upper Orashi forest reserves, Biseni forest reserves, Akassa forest reserves.

V. CONCLUSION

The traditional land use supporting domestic and commercial requirements for food, livestock and fuelwood sustain the rural and national economy but at great risks to the natural environment. The solution for a stable natural ecosystem is not at sight because the control and management of the factors responsible for environmental degradation are difficult to put in place. It is suggested that government should maximize opportunities of global concern for tropical rainforest conservation to raise funds for resource sustenance through public education and productive program.

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