Biodiversity Conservation for Sustainable Agriculture in Tropical Rainforest of Nigeria.

Emma-Okafor, Lilian Chinenye; Ibeawuchi, Izuchukwu Innocent, Obiefuna Julius Chiedozie
Department of Crop Science and Technology
Federal University of Technology , Owerri
PMB 1526, Owerri, Imo State, Nigeria.
Email: ii_ibeawuchi@yahoo.co.uk, juliusobiefuna@yahoo.com, lilianokafor2009@yahoo.com.

Abstract
In this article we reviewed bio-conservation degradation in our ecosystem and its importance for sustainable agriculture in the tropical rainforest zone of Nigeria. Books, journals and newspapers were used. Our findings showed that the conservation of biodiversity degradation in our ecosystem is essentially important since mankind depends largely on livelihood derived from the natural resources such as land, forest, water and air. Also agricultural system functioning and sustainability depend greatly on it. Biodiversity degradation is facilitated due to various natural physical and biological factors such as population pressure, climate change, pollution, deforestation, soil Erosion, Habitat destruction, and introduction of exotic species, genetic erosion and poor law enforcement. Conservation of biodiversity could be achieved through various strategies such as creation of awareness on the need to preserve biological reserves or gene bank, market oriented approach, use of farmer's indigenous knowledge and research based strategies. These measures will conserve and sustain Biodiversity and ensure enhanced food and health security for all. The integrated approach where scientists from all areas of biological science and agriculture put heads together to find a lasting solution to this cankerworm called biodiversity depreciation will make our ecosystem a better resource base for sustainable livelihood. [New York Science Journal. 2010;3(1):81-88]. (ISSN: 1554-0200).

Introduction
Concept of Biodiversity
Biodiversity, a contraction of "biological diversity" covers a number of concepts. Diversity is a concept which refers to the range of variation or differences among some set of entities. Biological diversity thus refers to the variety within the living world, and includes all living organisms both individuals and their relationship with one another. It is not just a collection of individuals but an interaction system where the characteristics of individuals are no less important than their functions. It is used to describe the huge variety of life on this planet.

According to convention on biological diversity definition, (en, Wikipedia.org/ wiki/biodiversity). Biodiversity encompasses the variability of all organisms from all sources and the ecological complexes of which they are part of. This includes diversity within species, between species and of ecosystem. Thus diversity holds together life on earth that is the green plants on land and the microscopic plants in oceans. Biodiversity has three fundamental and hierarchically related levels of biological organization namely: Genetic diversity which refers to genetic variability among the populations and individuals of the same species. Species diversity which refers to the diversity among species in an ecosystem and ecosystem diversity which refers to diversity of habitat in a given unit area, and it embraces variety of ecosystems on earth.   The continuous productivity of existing crops and livestock hinges to a large extent on harnessing genetic variation found within each species. Tropical rainforest is especially rich in species and their fate has many implications for many crops. Tropical forests contain wild population of thousands of crops such as coffee, rubber, mango as well as new crop and livestock etc.

Status of Biodiversity in Nigeria
Nigeria is rich in biodiversity because the country is endowed with a variety of plants and animal species found in the boundless forests and grass lands. There are about 7895 plant species identified in 338 families and 2,215 genera. There are 22, 000 vertebrates and invertebrates species. These species include about 20, 000 insects, about 1000 birds, about 1, 000 fishes, 247 mammals and 123 reptiles. Of these animals; 0.14% is threatened while 0.22% is endangered. About 1,489 species of micro-organisms have also been identified. All these animal and plant species occur in different numbers within the country's vegetation that range from the mangrove along the coast in the South to the Sahel in the North (Nigeria first National Biodiversity report 2001). Most of the biodiversity sustains the rural economy.

At present, in Nigeria the destruction of natural habitats continues apace resulting in the depletion of the country's biodiversity (Imeht and Adebobola 2001). For example the Nile crocodile (*Crocodilus niloticus*) which was once found in the Nigerian coastal waters right up to Lake chad is fast disappearing due to loss of habitat and the hunting of crocodile for their meat, egg, hide and skin (Imeht and Adebobola; 2001). Also, in Southern Nigeria, the forest elephant, chimpanzee, leopard, yellow-backed duiker, the Royal python, the Nigeria quenon (*cercophithecus erythorgaster*) are among the animals on the endangered list.

In Nigeria Forestry about 65 of 560 species of trees are now faced with extinction while many others are at different stages of risk. (Imeht and Adebobola 2001). According to website reports, about 48 species of animals, and 431 species of plants are endangered, of which 16 species of mammals and 45 species of plant are categorized as rare, 30 species of animals and 20 species of plants are endemic (www.onlinenigeria.com/links/bioticadv.asp?). All these are

of conservation concern to the country. Every year a considerable part of the nation's forest resources are destroyed through industrialization, Urbanization, road construction commercial agriculture and other activities thereby disturbing the ecological balance that nature maintains with the living and non-living resources. (Imeht and Adebobola 2001). Some governmental agencies like Nigerian conservation foundation (NCF), the federal environmental protection agency (FEPA), the national resources council (NARECO) in collaboration with the united nations environmental programme (UNEP) and the world wide fund (WWF) and several other agencies have embarked on programmes to protect and preserve the nations' biodiversity (Imeht and Adebobola 2001).

Nigeria present network of protected areas include a biosphere reserve, 8 national Parks, 445 forest reserves, 12 strick nature reserves and 28 game reserves. Other sanctuaries and game reserves were meant to conserve wild life and to supplement protein from domestic sources (Nigeria 1st National Biodiversity Report 2001). Tables 1, 2 and 3 show the threatened biodiversity species, game reserves and National Parks in Nigeria respectively.

Importance of Biodiversity in Nigeria

1. food - Wild animals like leopard, crocodile and antelope are hunted for their meat and eggs. Proteins and other nutrients are mostly supplied through these forest animals, fishes and birds providing up to 70% of their protein diet. Children collect termites, snails and caterpillars of several insects for food. Ripe fruits, vegetables, mushrooms and different kinds of leaves come from forest as diet supplement, while bees supplies us with honey and other bee products. Biodiversity provides us with varieties of food. About 80% of our food supply comes from just 20 kinds of plant and humans use at least 40, 000 species of plants and animals a day. Most people around the world depend on these species for their food, shelter and clothing (Myers 1990). For example the seed of Ogbono the wild mango (*Irvingia gabonensis*) is a very important delicacy for making sauce in the Eastern and Western parts of Nigeria.

Medicine

A significant proportion of drugs are derived directly or indirectly from biological sources. About 40% of the pharmaceuticals used in the US are manufactured using natural compounds found in plants and animals. Medicinal drugs derived from natural sources make an important global contribution to health care. An estimated 80% of people in less developed countries rely on traditional medicine for primary health care. Some 120 chemicals extracted in pure form from around 90 species of plants are used in medicines throughout the world (Kate and Laird 1999). Many of these natural chemical cannot be manufactured synthetically. The cardiac stimulant digitoxin, the most widely used cardiotonic in Western medicine is extracted directly from dried digitalis (fox glove), synthetic vincristine used to treat childhood leukemia is only 20% as affective as the natural product derived from *Catharan thusreuses* (Rossy Periwinkle) (Kate and Laird 1999). Neem (*Azadirachta indica*) products have

valuable medical properties and traditional uses as medicines and diabetic food. The leaves, fruits and oil of the Neem plant is used to cure many ailments like acne, scabies, eczema and other fungal infections. Some other notable medicinal plants in tropical rainforest of Nigeria include African nutmeg (*Monodora myristica*) guinea pepper (*Xylopia eathiopicum*) lemon grass (*Cymbopogon citrallus*), sweet basil (*Cocimum gratisimum*), garlic (*Allum sativa*), ginger (*Zingiber officinale*), Bitter leaf (*Vernonia amygdaline*) black pepper (*Gongronema latifolum*). Their versatility in preparation of traditional medicine for both young children, confined mothers and aged people are well known.

Industrial Material

A wide range of industrial materials are derived directly from biodiversity. Natural forests provide trees like mahogany, *Nauclea diderriichi* (opepe), *Terminalia superba* (Afara), *Triplochiton sceleroxylon* (Obeche) and others. They supply raw materials to our timber industries. Rubber trees also provide latex to rubber industries and used in the production of plastics, gums etc. Other industrial products include fibres, dyes, resins, oil and adhesive.

Benefit in Area of Agriculture

Biodiversity is the medium through which air, water, gases and chemical are moderated and exchanged to create environmental services that are not readily visible. It plays a part in regulating the chemistry of our atmosphere and water supply. It is potentially of use to agriculture particularly with the emerging biotechnology as well as genetically modified organisms. Much of the world population depends on the livelihood derived from natural resources such as land, forests water and the air we breathe. Wild crop and livestock species are essential for agricultural improvement because they are sources of new economic plants and animals, and they provide important services such as pollination and pest control and can be found wonderful in genetic engineering. The functionality and sustainability of agricultural systems depend greatly on biological diversity. Through research, Tilman *et al* (1996) explained that more diverse plant community use and retain nutrients more efficiently thereby attaining greater productivity and reducing the loss of nutrient via leaching in the ecosystem. Various soil microbes also efficiently recycle nutrients (LaL 1991). Earthworm, fungil and other micro-organisms that break down organic materials help to recycle nutrients and improve soil structure, play a vital role in the functioning and sustainability of agricultural systems. Biodiversity also enhances natural pest control mechanisms in the agro ecosystem. Increasing diversity of trees and other plants will increase the number of insect predators such as birds, lizards and certain insects so as to improve pest control. (Spore 1994). In Nigeria, insects like bees play major role in pollination of our crops.

Leisure, Cultural and Aesthetic Value

Many people derived value from biodiversity through leisure activities such as hiking in the country side, bird watching or natural history study. Biodiversity has inspired musicians, painters, sculptors, writers and other artists. Many cultural

groups view themselves as an integral part of the natural world and show respect for other living organisms.

Popular activities such as gardening caring for aquariums and collecting butterflies are all strongly dependent on biodiversity. A fairly outing to the botanical garden or zoo is as much an aesthetic or cultural experience as it is in educational one. It would be a dull world without the flowers and song birds around us, or the whales in the sea or the magnificent animals on the plains of Nigeria.

Given the ultimate importance of biodiversity to agriculture, there is need to identify major causes of its losses. This seminar will also highlight basic approaches aimed at conserving biodiversity in the tropical rainforest of Nigeria.

Causes of Biodiversity Losses

Biodiversity yields many sustainable development benefits, yet, paradoxically human society continue to undermine this valuable resource base, instigating large scale biodiversity losses and species extinction (Swing-land, 2003).

The factors responsible for the biodiversity losses in Nigeria include the following: -

Population Pressure

With increase in population and consequent increase in demand for biological resources, natural habitats are being destroyed for plantation establishment, irrigation, food and livestock production and non timber forest resources utilization (Nig. First national biodiversity report 2001).

Due to population pressure, Nigeria's large areas of natural forests are being exploited for tree species such as the mahogany, *Nauclea diderrichii* (opepe) Terminalia ivorensis (odigbo) terminalia superba (Afara) triplochiton sceleroxylon. (Obeche) and others known in international markets. High intensity of logging and illegal exploitation of these and other species has continued to pose serious threat to the countries biodiversity. Population explosion resulted in the increase of human habitats and rapid development of industries, filling up of water bodies for construction of dwelling places to meet the needs of the ever rising population thereby leading to loss of various species of crops and even fishes (Swingland 2003). There is also exploitation of none-timber forest products as food, medicine, oil, fuel, wood, furniture and building material all these resulting in loss of biodiversity.

Climate Change

It is now widely recognized that global warming over the past 50years is largely due to human activities that have released green house gasses such as carbon dioxide, methane, nitrous oxides, etc into the atmosphere. The most recent assessment report by the intergovernmental panel on climate change concludes that the global average surface temperature has increased by about 0.6^0c during the 20th century. This small rise in mean temperature has lead to heating up of the earth's atmosphere. The implication of these rising temperature is an increase in sea level which can lead to flooding and erosion of important biological organisms. Climate change tends to alter local weather pattern and thus disturbs life supporting natural systems and process that might affect agricultural productivity. Scientists predict that high temperature, drought and evaporation could have severe

implications to water availability, food security and loss of biodiversity (UNE 1999).

Pollution (Air Pollution Water And Soil Contamination)

The production and use of toxic chemicals pose a major and relatively new threat to mankind and the environment. The emission from cars, industrial processes, waste treatment such as incinerators, excessive use of pesticides and fertilizers for agricultural and domestic purposes release toxic substances into the air, soil or water thereby affecting existence of aquatic and other biological organisms in the environment. An investigation and report by Essential Action and Global Exchange 2000 found that oil corporation in the Niger Delta seriously threaten livelihood of neighbouring local communities. Due to many forms of oil generated environmental pollution evident throughout the region, farming and fishing have become extremely difficult in oil spilled affected areas and even drinking water has become scarce.

Heavy metals and persistent organic pollutant such as polychlorinated biphenyls, dioxins and DDT are of particular concern since they do not degrade easily in the environment. They accumulate and are lethal to plants, animals, fishes and human-beings resulting to loss of species and ecosystem disruption. Pollution has become one of the most serious problems of our time which is faced by aquatic life also. The prime reason for the loss of aquatic genetic diversity is water pollution.

Deforestation

Deforestation results from a mixture of economic, social and political causes that vary from site to site. The primary causes of deforestation in the tropics are logging and conversion to agriculture or grazing (Rowe *et al* 1992). Behind these causes are the driving forces such as policies attitudes and institution that influence production and consumption (Turner *et al*1993). Deforestation is often a complex process influenced by cultures, markets and driven by governmental policies. It is often driven by rural poverty and basic needs such as foods, shelters and fuels. It is intrinsically linked to the loss of biodiversity as original rainforests host numerous species of precious fauna and flora. Forest also offer climatic and water resource conservation benefits that directly impact on biodiversity sustenance and ecological stability.

Exploitation of the forest resources to generate income in order to survive has resulted in the hunting of wildlife on an enormous scale in Nigeria leading to extinction of some of the animals.

Soil Erosion

Soils in Nigeria suffer deficiency common to the tropical soil such as low percentage organic matter and nitrogen, shallow dept and high acidity. About 63% of agricultural soils in Nigeria are low in productivity with over 90% being alfisols and ultisols which are low in organic matter with low activity clays. (Lekwa and Whiteside 1996). about 35% of soils in eastern Nigeria are made up of acid soils with 63 to 93% sand in surface horizon, cation such as Ca, Mg and K

are easily leached thereby causing Al and Mn toxicity which is prone to high infiltration, erosion and hence loss of useful soil micro flora and fauna. According to Lekwa and Whiteside (1996), in Agulu – Nanka gully erosion complex, of over 1,000 hectares of land have been lost to erosion. The severity of these erosion can be observed at Amucha gully erosion site, Hiepaug gullies in Plateau State and the Amkpa erosion site in Kogi State. Apart from the economic and social harm caused by these erosion sites, there is a great loss of biodiversity and malfunctioning of the ecosystem.

Soil erosion in Nigeria is caused by the following:
Increase population density and pressure on agricultural lands
Over grazing due to increased stocking rate
Wide spread deforestation due to reduced fallow period
Incompatible and unsustainable agricultural practices
Increased use of fertilizers and other agro-chemicals
As a result of soil erosion, siltation takes place in aquatic ecosystems which obstructs the flow of water. This affects the spawning grounds of fishes and fish migration and decreases net production of fish.

Habitat Destruction

Any form of sustained human activity result in some modification of natural environment. The modification will affect the relative abundance of species and in extreme cases lead to extinction of certain plants and animals (Groombridge 1992). Most of the species extinction from 1, 000 AD to 2000 AD are due to human activities which in particular destroyed plants and animals. Raised rates of extinction are being driven by human consumption of organic resources especially related to tropical forest destruction (Wilson 1988). Farming method is a primary cause of habitat destruction in Nigeria as it is characterized by vegetation destruction and short fallow period. Large scale plantation establishment of cash crops as well as indiscriminate bush burning and overgrazing all these lead to habitat destruction for indigenous species of plants and animals.

Other causes of habitat destruction include increasing economic development, desertification, drought and other man – made disasters like mineral prospecting and oil spillage indicating that .continuous threats from these visible factors leads to increased pressure on biodiversity and possible extinction of some species.

Introduction of Exotic Species

The wide spread introduction of exotic species by humans pose a serious threat to biodiversity extinction as the endemic species may not survive.

The use of improved varieties of crops and complete neglect of local varieties and the land-races may lead to loss of biodiversity in Nigeria. A major example of this is the use of improved dwarf okro (*Abelmoschus esculentus)* in the place of the native material of the tall okro. Also the local varieties of sword bean (*Canavalia ensiformis*), African Yam Bean (*Sphenostylis stenocarpa*) and lima beans (*Phaseolus lunatus*) are now becoming extremely rare as only improved cowpea (*Vigna unguiculata*) is being cultivated in many farms. Similarly *Discorea dumetorum*, *Discorea bulbfera*, *Trichosanthus* species (Snake tomato) and *Digitaria exiles*

are no longer in popular cultivation as they were replaced by commercially driven improved varieties thereby causing the loss of important gene resources of all the above plant species. The exotic organism may be either predators, parasites or simply aggressive species that deprive indigenous species of nutrients, water and light thereby cause loses of the indigenous species.

Genetic Erosion and Pollution

As a result of habitat destruction resulting from land clearance for various purposes, so many species were lost. Forest exploitation and bush clearing for farming further causes natural gene – pool loss as it is occurring in many species including *Irvinga gobanensis* in the rainforest and Niger Delta areas. Most species that were originally diverse in Nigeria are becoming extinct. Overgrazing, fire and excessive use of systemic herbicides causes genetic erosion and affects biodiversity. Fire destroys large area of forest ecosystem annually with the elimination of sensitive species such as *Afromosie laxiflora*, *Ceiba pentandra, Entade abyssinica, Hildegardia barteri* and *Holarrhea wulfbergia.* Indiscriminate hunting of will life for food to complement subsistent farming and bush burning leads to loss of biodiversity and also depletes the ecosystem by causing death of wild life.

Genetic pollution (uncontrolled hybridization, introgression and genetic swamping) which leads to homogenization or replacement of local genotypes tend to threaten the naturally evolved pure breed and wild species leading to their extinction. (Zaid *et al* 1999). According to (Zaid *et al* 1999), the uncontrolled hybridization results in unprofitability, uncontrolled cross pollination and cross breeding, huge gene pools of various wild and indigenous breeds will collapse causing wide spread genetic erosion and pollution. Thus resulting in great loss in genetic diversity and biodiversity as a whole.

Cultural Practices/Poor Law Enforcement/Economic policies

The indirect causes of biodiversity losses in Nigeria include economic policies, rising demand for forest products, cultural practices, poor law enforcement and weak laws (Nig. First National Biodiversity Report 2001). Cultural practices that encourage the use of specific species for festivals often limit the population of species particularly occurring under narrow ecological range. Most of the laws that control the management of several species are outdated and their enforcement is inadequate. (Nig. First National Biodiversity Report 2001). Furthermore, low budgetary allocation for forestry subsector has curtailed national efforts to reforest large areas that have been deforested. The consequences are over exploitation of resources and subsequent loss of versity.

rder to sustain food production as well as ensure ecological stability, a strategy is needed to help preserve and conserve biodiversity in the country.

Strategies for Conservation of Biodiversity in Nigeria

5

Various policies and practices could be devised to promote biodiversity conservation in managed landscape as well as enhance the greater use of biodiversity in agriculture. Biodiversity conservation should aim at methods that can generate viable and desirable livelihood or development return over a long term while at the same time conserve biodiversity.(Swingland 2003).

Some scientists argued that resources should be concentrated in maintaining animals and plants genetic resources only in places where they occur naturally (Insitu) while others suggest that genetic variation is more useful and often safer when maintained in seed or field gene bank (Ex – situ). Both strategies are needed for conservation of biodiversity and they include the following.

a. Creation of World Heritage Site

Most parks and reserves should be setup to protect spectacular animals or endangered plants and habitats. Many areas are "hotspots" for agro biodiversity and thus warrant better conservation and management in their own rights.

Towards integrating biodiversity conservation and development, government is encouraging ecotourism in many protected areas. The major objectives of national park services in Nigeria is to conserve biodiversity and ensure its sustainable use through interpretation of the mechanism at work in the National Parks, enjoyment and understanding of the issue.

Protection of marine biodiversity is another way of integration of biodiversity conservation and development, thus the National Maritime Authority and Department of fisheries are making effort to discourage overfishing especially shrimps so as to ensure effective conservation of marine life.

Market Oriented Approach to Biodiversity Conservation

There is need to find market for lesser known crops. This will ignite interest by growers of such endangered species to increase its production. The search for planting material might save varieties that would have been abandoned.

Markets are constantly changing and new opportunities are emerging for tapping some of these dwindling pockets of agro-biodiversity to generate income for local people.

Mass Awareness and People Participation in Biodiversity Conservation

Apart from adopting various conservation measures and techniques mass awareness programme should be taken up in safe guiding existing wilderness, parks and biological reserves for future improvement of agriculture. Such parts and reserves contain wild population of crops and animals. Abuses such as deforestation and over hunting of game animals in these parks should be avoided to prevent extinction. For example by creating mass awareness on culturing threatened species of fishes, the fish farmer can play an important role in the fish conservation, multiplication and propagation of fishes in natural water bodies.

Agro-Ecological and Farmers Indigenous Knowledge in Biodiversity Conservation

In many farming system, practical ecological knowledge has been accumulated by generation of rural farmers who often undertake deliberate effort to improve or protect the values of life supporting resources to ensure long term viability (Beyer 1986).

6

order to ensure sustainability conservation strategy of diversity there is need to recognize and understand the indigenous eco-farming system and technology so as to build a strategic frame work needed to conserve biodiversity. The application of agro-ecological which involves the use of ecological principle for the design and management of sustainable resources in conserving agricultural systems offers a broad based approach to biodiversity conservation.

In addition, participatory farmers friendly method of technology development must be put in place so as to carry the farmers along. Sustainable agricultural practices which makes the best use of natures goods and services integrating agro-ecological processes into food production as well as minimizing negative side effects on environment and health offers a broad-based approach to biodiversity conservation. This is because such practices make the best use of natural capital as well as human capital by building on the skills, knowledge and ingenuity of local farmers.

Traditional Knowledge and Conservation of Aquatic Biodiversity.

Traditional ecological knowledge is a term used to describe community knowledge in some cases evolving over hundreds or thousands of years of local eco-systems. It may form the basis for local decision making for all facets of community life including natural resource management, nutrition, food preparation, healthy, education, community and social organization (warren *et al* 1995).

Indigenous knowledge of aquatic resources and ecosystem relationship has been passed orally from generation to generation and maybe incorporated into cultural practices that ensure its preservation and continuity. Typical indigenous knowledge of aquatic resource include fish location, movements and other factors explaining spatial pattern and timing in aquatic eco-system. This include sequence of events such as fish catches, marine manual sighting, aquatic blooms, fish migration, spawning, tidal changes, lunar influences and trend such as decrease in catches, early thaws, rainfall patterns and changes in migration and spawning patterns (Posey 1999). Consequently conservation of aquatic genetic resources and the conservation of community cultural values cannot be considered in isolation; the availability of aquatic genetic resources will depend on conservation at the community level.The highest aquatic genetic diversity is often located in traditional communities simply because people naturally set their roots down in areas with the greatest natural endowment. It therefore stands that promoting the restoration and maintenance of traditional knowledge and practice is a useful conservation. Conservation mechanisms can include fishing quotas or prohibition, habitat protection and restoration, gene banking and promoting sustainable community fisheries with primary objective of fishing limitation and habitat protection.

Research Strategy

There should be greater investment in research to improve the quality of information on the relationship between land use and biodiversity benefit. The research strategy must integrate the physical, economic, social and cultural condition of the farmers so as to come up with innovations and technologies that conserve and sustain biodiversity. This will involve an inter disciplinary research team made up of socio-economic and biological scientists as well as farmers all working toward a common goal of biodiversity conservation and sustainability.

Cultural Approach to Biodiversity Conservation

Some cultural activities such as non-burning, minimum tillage and the use of natural fertilizers and mulching should be encouraged.

Conservation tillage or no-till or zero till system maintains a permanent or semi permanent organic cover on the soil comprising either a growing crop or dead organic matter. The function is to protect the soil from action of sun, rain and wind and to feed soil biota. Decomposition of the additional organic matter by the soil micro flora will stimulate the activities and diversity of the micro flora, resulting in increased stabilization of the dead organic matter in the form of humid substances. This will help to improved the soil structure and reduce soil erosion. Conservation and protection against deforestation for example through the expansion of protected areas and improved fire control reduce loses of biodiversity.

Improved forest management through reduced impact logging to increase sequestration and reduction in emission also help to reduce losses of biodiversity.

Conclusion

The achievement of biodiversity conservation lies on the ability of all stake holders in agriculture to partner with one another and adopt a holistic resource conserving research frame work that will reduce biological and ecological degradation in the environment. Also, our researchers/scientists should Endeavour to tap the indigenous farmers knowledge needed for enhanced food security and agro-ecological sustainability. All practices that endanger the diverse species of plants and animal (flora and fauna) must be discontinued.

REFERENCES
1. Beyer J.L (1986). *Africa In G.A Klee (ed) world systems of traditional resource management* London. Pp 185.
2. Groombirdge .B. (1992). *Global Biodiversity: status of the earth's living resources. Chapman and Hall London.*
3. *Iment .N and Adebobola .N.* (2001). The effects of poverty in conservation of Biodiversity: The Nigeria Experience. http://www.scienceinafrica.co.20
4. Kate, K and Laird S.A. (1999). *The commercial use of Biodiversity*. Earth scan Publication LTD London Lal, R. (1991). Soil conservation and Biodiversity. *In D.L. Hawks worth ed. The Biodiversity of microorganisms and invertebrates: its role in sustainability Agriculture* pp 89-104 walling ford U.K CAB international.
5. Lekwa, G. and Whiteside E.P (1996) *coastal plain sand of southeastern Nigeria. Soil science society of American Journals* 50 pp 154-160.
6. Myers N. (1990). *"The biodiversity Challenge: Expanded hot-spots analysis" Environmentalist*, 10, 243-256.
7. Posey, D. (1999). Developing sui genens options for the protection of living aquatic resources of indigenous and Local Communities in R. Pullin B and Koolman, J. (eds) Towers polices for conservation and sustainable use *ICCARM conference proceeding* 59:14-18 April 1998 manila.
8. Prance .G. 2001: Biodiversity. In foot steps No 47 pp1-2.
9. Rowe R., Sharma, N.P and Browder J. (1992). Deforestation: problems causes and concerns. *In managing the worlds forests; looking for Balance between conservation and Development (ed N.P. Sharma)* pp 33-45 Dubuque, IA Kendall Hunt.
10. Spore 1994: Biodiversity: our common Heritage. CTA NO 54 pp 1-5.
11. Swing land IANR (2003). *Capturing carbon and conserving Biodiversity. "The market approach.* Earth scan Publications LTD.
12. Tilman D. Wedin D. and Knops J (1996) *"Productivity and sustainability influence by Biodiversity in Grassland Eco- systems.* Nature 376 (6567) 718 – 720.
13. Turner B.L, moss R.H and Skole D.L Eds) 1993 Relating land use and global land cover change: a proposal for an IGB p-HDP working group on laud use / Land cover change. *Joint publication of the International Geosphere Biosphere programme (Report No 24) and the humanDimensions of Global Environmental Programme (Report No 25) stock holm:* Royal Swedish Academy of Science.
14. UNE 1999 (United) nations Environmental Programme. Global Environment out look.
15. Warren D, Shikkerveer L. and broken Shaw D. (eds) (1995). *The cultural Dimension of Development. Indigenous Knowledge systems*. Intermediate Technology publication London.
16. Wilson, Edward .O. (1988). *Biodiversity.* National Academy press.
17. www.onlinenigeria.com/links/bioticaldv.asp?blurb=252 Biodiversity in Nigeria. July, 2008.
18. www.cbd.int/doc/world/ng/ng-nr-o1"nigeriafirstbiodiversityreport2001.
19. Zaid et al (en; Wikipedia.org/wiki/biodiversity).

TABLE 1. THREATENED BIODIVERSITY SPECIES IN NIGERIA

	SPECIES	COMMON NAME	MAINE USES	STATUS
1A	PLANT			
	Milicea excelsia	African teak	Timber	Endargered
	Diospyros elliotic	Red fruited Ebony	Carving	Endangered
	Triplochiduiton scleroxylon	African white wood	Timber	Endangered
	Mansoiea altissinia	Mansonia	Timber	Endangered
	Masilania accuminata	-	Chewing stick	Endangered
	Garcina manric	Ofun	Chewing stick Trado-	Endangered
	Oucunbaca aubrevillei	-	Medicine Medicine	Almost extinct
	Erythrina Senegalensis	Coral flower	Medicine	Endangered
	Cassia nigricans	Black grain olive	Medicine	Endangered
	Nigelle sativa	Black cumin	General	Endangered
	Hymenocardia acida	Large red heart	General	Endangered
	Kigelia Africana	Sausage tree		Endangered
1B	ANIMAL			
	Crocodylus nitoticus	Sleader snouted crocodile	Food/medicine/bags	Endangered
	Osteolaemus tetraspis	African dwarf crocodile	Food/medicine	Endangered
	Struthio camelus	Ostrich	Food/Medicine	Endangered
	Psittacus erithacus	African grey parrot	Medicine/pet	Endangered
	Cercopithecus erythrogaster	White throated monkey	Food	Endangered
	Loxodonta Africana	African bush Elephant	Food/Ivory	Endangered
	Trichecus senegalensis	Manatee	Food	Endangered
	Giraffa camelopedalus	Giraffe	Food/medicine	Endangered
	Python sabae	Royal python	Bags	Endangered
	Gazella dorcas	Dorcase gazelle	Food	Endangered

Source – Nigeria First National Biodiversity Report 2001

TABLE 2: GAME RESERVE

S/NO	KNAME RESERVE	LOCATION	VEGETATION
1.	Ebbazikampe	Kwara state	Guniea savanna
2.	Okpara	Oyo state	Rain forest
3.	Upper Ogun	Oyo state	Dry forest/Guinea Savannah
4.	Ohusu	Edo State	Lowland Rain forest
5.	Ologho	Edo state	,,
6.	Iri-Ada-Obi	Edo state	Lowland Rain forest
7.	Ologbolo-Emu-Urho	Edo state	Lowland Rain forest
8.	Orle River	Edo state	Lowland Rain forest
9.	Gilli-Gilli	Edo state	Lowland Rain forest
10.	Anambra	Anambra state	Rain forest/Derived savana
11.	Uddi/Nsukka	Enugu state	Lowland Rain forest
12.	Akpaka	Anambra state	,,
13.	Obudu	Cro Ri state	,,
14.	Stubbs creek	Akv 11 state	,,
15.	Ibi	Taraba state	Guinea savannah
16.	Wase sanctuary	Plateau state	Sudan savannah
17.	Wase rockbird sanctuary	Plateau state	Sudan savannah
18.	Pandam wildlife park	Plateau state	,,
19.	Pia river	Plateau state	,,
20.	Ankwe river	Nasarawa state	,,
21.	Damper sanectuary	Nasarawa state	,,

22.	Nasarawq	,,	,,
23.	Lama/Bura	Bauchi state	,,
24.	Kogin Kano	Kano state	,,
25.	Lake chad	Borno state	Sahel savannah
26.	Dafida	Niger state	Sudan savannah
27.	Alawa	,,	,,
28.	Kwiambana	Zamfara state	,,

Source – Nigeria First National Biodiversity Report 2001

TABLE 3.NATIONAL PARKS

	NAME OF PARK	AREA	LOCATION	VEGETATION TYPE
1.	Kamuku National Park	121,130ha	Kaduna state	Guinea savannah
2.	Kainji national park (Borgu sector)			
	Kainji National park	532,oooha	Niger state	Guinea savannah
b.				
3.	Old Oyo Notional park	253000 ha	Oyo state	Dry forest/Guinea savannah
4.	Okomu National park	200ha	Edo state	Lowland rainforest
5a	Cross River National park Oban Division			
b.	Cross River National park Okwango Division	400,000 ha	Cross River state	Low land rain forest
6.	Gashaka Gumti National park	6,402,480 ha	Taraba state	Guinea savannah/montane
7.	Yankari National park	225,000 ha	Bauchi state	Guinea savannah
8.	Chad Basin National park (Hadejia- Nguruwet) Landsloasis sector			
	Chad Basin National park (Sambisa sector)	230,000ha	Borno state	Sahel savannah
	Chad Basin National,, (Chingurme-Duguma sector)			

Source – Nigeria First National Biodiversity Report

Correspondence to:
Ibeawuchi Izuchukwu Innocent Ph.D, Emma-Okafor, Lilian Chinenye
Department of Crop Science and Technology
Federal University of Technology, Owerri

Email: ii_ibeawuchi@yahoo.co.uk, lilianokafor2009@yahoo.com.

7/11/2009